A New Control Scheme for Hybrid Chaos Synchronization

Authors
Ouannas A., Grassi G., Azar A.T., Gasri A.

Abstract
This paper presents a new hybrid chaos synchronization scheme, which assures the co-existence of the full-state hybrid function projective synchronization (FSHFPS) and the inverse full-state hybrid function projective synchronization (IFSHFPS) between wide classes of three-dimensional master systems and four-dimensional slave systems. In order to show the capability of co-existence approach, numerical example is reported, which illustrates the co-existence of FSHFPS and IFSHFPS between 3D chaotic system and 4D hyperchaotic system in different dimensions. © Springer Nature Switzerland AG 2019.
A review study: Computational techniques for expecting the impact of non-synonymous single nucleotide variants in human diseases

Authors
Hassan M.S., Shaalan A.A., Dessouky M.I., Abdelnaiem A.E., ElHefnawi M.

Abstract
Non-Synonymous Single-Nucleotide Variants (nsSNVs) and mutations can create a diversity effect on proteins as changing genotype and phenotype, which interrupts its stability. The alterations in the protein stability may cause diseases like cancer. Discovering of nsSNVs and mutations can be a useful tool for diagnosing the disease at a beginning stage. Many studies introduced the various predicting singular and consensus tools that based on different Machine Learning Techniques (MLTs) using diverse datasets. Therefore, we introduce the current comprehensive review of the most popular and recent unique tools that predict pathogenic variations and Meta-tool that merge some of them for enhancing their predictive power. Also, we scanned the several types computational techniques in the state-of-the-art and methods for predicting the effect both of coding and noncoding variants. We then displayed, the protein stability predictors. We offer the details of the most common benchmark database for variations including the main predictive features used by the different methods. Finally, we address the most common fundamental criteria for performance assessment of predictive tools. This review is targeted at bioinformaticians attentive in the characterization of regulatory variants, geneticists, molecular biologists attentive in understanding more about the nature and effective role of such variants from a functional point of views, and clinicians who may hope to learn about variants in human associated with a specific disease and find out what to do next to uncover how they impact on the underlying mechanisms. © 2018
Year:  2019

A study about using a cognitive agent in replacing level 1 and 2 service desk activities

Authors
Ibrahim A.A.S.

Abstract
The radical change in technology and high customer expectations and demand are pushing the service desk to provide a competent service for the customers. And this service should be faster, more flexible and gives a more accurate response and high user experience. Replacing the human call agent’s activities with a cognitive agent could improve the user experience by providing a faster response to customer’s requests, removing the human errors and giving 24/7 support with less operational cost. The cognitive agent has the potential to scale personalized and tailored interactions. And this will provide business scalability. The paper’s goal is giving a study about the usage of the cognitive agent and automation to replace deterministic Level 1 and Level 2 service desk incidents. So, human service desk could focus on high-level tasks. All of these incidents are done according to static steps. These requests could be handled by a cognitive agent, which will be integrated with the current business systems. Now, there are many cognitive systems that help us to build cognitive agents like IBM Watson, Amazon LEX. During this study, we have selected IBM Watson as a cognitive system, IBM WebSphere as an integration middleware layer, BotKit as a Chatbot framework and logging the user interaction through tickets. Where most of the cognitive systems are cloud based, we have selected IBM Bluemix as a cloud platform. In addition, an initial reusable architecture has been proposed in this paper that is integrated with cognitive systems, back-end system, Chatbot framework, and different interaction channels. © Springer Nature Singapore Pte Ltd. 2019.
This article presents performance evaluation and comparison between Voltage Oriented Control (VOC) methods for PWM-rectifiers, two levels and three levels, in order to demonstrate the great advantages of using a three-level Neutral Point Clamped (NPC). The control of the DC bus voltage is carried out using the PI controller. The effectiveness of this approach is illustrated by simulation results using MATLAB/Simulink. © Springer Nature Switzerland AG 2019.
Fractional order integrator/differentiator: FPGA implementation and FOPID controller application

Authors
Tolba M.F., AboAlNaga B.M., Said L.A., Madian A.H., Radwan A.G.

Abstract
This paper introduces two FPGA based design approaches of the fractional order integrator and differentiator using Grünwald Letnikov (GL) definition where fixed window and linear approximation approaches are considered. The main advantage of the linear approximation method is that it reduces the huge memory of the fractional order systems. One of the top applications of fractional calculus is the fractional order Proportional Integral Derivative (FOPID) controller. It has gained a great attention in academic studies and in industrial applications. The proposed approaches have been used as building blocks to implement FOPID controller. Oscilloscope experimental results for several cases are presented for GL and the fractional order PID controller. The proposed designs have been implemented based on Verilog Hardware Description Language (HDL) and realized on Nexys 4 Artix-7 FPGA XC7A100T. Moreover, a comparison between the proposed FPGA Implementation results for the GL operator and previous work has been investigated. © 2018 Elsevier GmbH
Fractional Order Two Degree of Freedom PID Controller for a Robotic Manipulator with a Fuzzy Type-2 Compensator

Authors
Azar A.T., Serrano F.E.

Abstract
In this paper a novel strategy for the position control and trajectory tracking of robotic manipulators is proposed. This strategy consists of an independent two degree of freedom PID controller for a two links robotic arm. Due to the capability of two degree of freedom PID controllers to deal with disturbances, each link is controlled independently considering that the disturbance does not affect the system performance due to the robustness of the closed loop system. Then, a fuzzy type-2 centralized compensator is implemented to drive the orientation variables with the desired trajectory in order to improve the robustness and system performance. In this work, it is proved that the two degree of freedom fractional order PID controllers implemented with the fuzzy type-2 compensator improves the system performance in comparison with the results found in other studies, and one important issue is that the fuzzy type-2 system can be considered as a linear system emulating the capabilities of a linear compensator. To corroborate the theoretical results explained in this study, a numerical example is shown along with the respective discussion and conclusions. © Springer Nature Switzerland AG 2019.
Memristor-based quinary half adder

Authors
Fouad A.H., Radwan A.G.

Abstract
This paper theorizes the possibilities of generalizing a memristor based ternary adder circuit, to a memristor based multi-valued logic adder. The proposition tries to achieve the theoretical advantages of processing different numbering systems, increasing the density, and decreasing the processing time, by utilizing the memristor properties and dynamics. This is done using a memristor cell based circuit structure. The memristor is quantized to more levels in order to accommodate more values of logic being processed. Quinary numbering system is used to demonstrate the generalization, then a process of generalization is shown. Circuit modifications can be made to process different numbering systems. © 2018 Elsevier GmbH
New Control Schemes for Fractional Chaos Synchronization

Authors
Ouannas A., Grassi G., Azar A.T., Singh S.

Abstract
Chaos theory deals with the behavior of dynamical systems that are highly sensitive to initial conditions. Chaotic systems are characterized by the property that small changes in the initial conditions result in widely diverging responses. In this paper, new control schemes of synchronization for different arbitrary incommensurate and commensurate fractional order chaotic systems are presented. Synchronization stability, based on stability of linear fractional-order systems and fractional Lyapunov stability, is proved theoretically. Numerical examples are given to show the effectiveness of the proposed method. © Springer Nature Switzerland AG 2019.
Reconfigurable chaotic pseudo random number generator based on FPGA

Authors
Rezk A.A., Madian A.H., Radwan A.G., Soliman A.M.

Abstract
This paper presents an FPGA Pseudo Random Number Generator (PRNG) that is based on the Lorenz and Lü chaotic systems. These two systems are used to generate four different 3D chaotic attractors. One attractor is generated from Lorenz while the other three attractors are generated from Lü. The output attractor of the proposed PRNG can be reconfigured during real time operation using an efficient hardwired shifting and multiplexing scheme. Furthermore, in order to exploit the proposed reconfiguration feature, the proposed PRNG has been embedded in an FPGA cascaded encryption processor that ciphers the input data from one up to four times successively. In each ciphering operation the PRNG is set to a new configuration and is initialized according to a part of the encryption key. The size of the encryption key can be varied according to the number of required ciphering operations. The proposed PRNG has been realized using VHDL, synthesized on Xilinx using the FPGA device XC5VLX50T, and analyzed using MATLAB and the NIST statistical suite. The proposed PRNG has utilized only 1.4% from the FPGA’s slices, achieved an operating frequency up to 78 MHz, and successfully passed all the NIST statistical tests. © 2018 Elsevier GmbH
Self-balancing Robot Modeling and Control Using Two Degree of Freedom PID Controller

Authors
Azar A.T., Ammar H.H., Barakat M.H., Saleh M.A., Abdelwahed M.A.

Abstract
This paper represents the control of a two-wheel self-balancing robot based on the theory of controlling the inverted pendulum. This paper dividing the system modeling into two main parts. The first part is the dc motor and the second part are the whole mechanical design and its characteristics as a function in the motor speed and the torque depending on the system, creating two control closed loops inner and outer. The study uses conventional proportional–integral–derivative (PID) and two degree of freedom PID controllers to obtain a robust controller for the system. The inner loop controls the motor speed use the motor speed feedback signal from the encoder. The outer loop keeps the robot always in the accepted vertical angle boundary, using a six-degree of freedom gyroscope and accelerometer as a feedback signal. A state space model is obtained considering some assumptions and simplifications. The results are verified through simulations and experiments. Numerical simulation results indicate that the 2-DOF PID controller is superior to the traditional PID controller. © Springer Nature Switzerland AG 2019.
Two-Degree of Freedom Proportional Integral Derivative (2-DOF PID) Controller for Robotic Infusion Stand

Authors
Azar A.T., Hassan H., Razali M.S.A.B., de Brito Silva G., Ali H.R.

Abstract
Infusion Stand is one of the medical supportive tools in the field of biomedical that assist in holding and carrying medications to patients via intravenous injections. Mobilization of Infusion Stand from a place to another place is necessary not only for the patients itself but also for the nurses. Therefore, this leads to not only uneasiness but also inconvenience for both parties. Therefore, to improve the existing situation and current Infusion Stand in the market, a proposal to design and implement a prototypic Robotic Infusion Stand is submitted. In this paper, 2-Degree of Freedom Proportional Integral Derivative (2-DOF PID) controller is proposed for Robotic Infusion Stand after comparison between 1-Degree of Freedom Proportional Integral Derivative (1-DOF PID) to find the most suitable controller. Analysis of reference tracking, disturbance rejection and controller effort are performed which demonstrate the ability of the proposed approach within the system parameters. © Springer Nature Switzerland AG 2019.
A novel 4-D chaotic hyperjerk system with four quadratic nonlinearities is presented in this work. It is interesting that the hyperjerk system has no equilibrium. A chaotic attractor is said to be a hidden attractor when its basin of attraction has no intersection with small neighborhoods of equilibrium points of the system. Thus, our new nonequilibrium hyperjerk system possesses a hidden attractor. Chaos in the system has been observed in phase portraits and verified by positive Lyapunov exponents. Adaptive backstepping controller is designed for the global chaos control of the nonequilibrium hyperjerk system with a hidden attractor. An electronic circuit for realizing the nonequilibrium hyperjerk system is also introduced, which validates the theoretical chaotic model of the hyperjerk system with a hidden chaotic attractor.
A computed tomography-based planning tool for predicting difficulty of minimally invasive aortic valve replacement

Authors

Abstract
OBJECTIVES Minimally invasive aortic valve replacement has proven its value over the last decade by its significant advancement and reduction in mortality, morbidity and admission time. However, minimally invasive aortic valve replacement is associated with some on-site difficulties such as limited aortic annulus exposure. Currently, computed tomography scans are used to evaluate the anatomical relationship among the intercostal spaces, ascending aorta and aortic valve prior to surgery. We hypothesized that quantitative measurements of access distance and access angle are associated with outcome and access difficulty. METHODS We introduce a novel minimally invasive aortic valve replacement planning prototype that allows automatic measurements of access angle, access distance and aortic annulus dimensions. The prototype visualizes these measurements on the chest cage as ISO contours. The association of these measures with outcome parameters such as extracorporeal circulation time, aortic cross-clamping time and access difficulty score was assessed. We included 14 patients who received a new valve by ministernotomy. RESULTS The mean access angle was 40.3 ± 5.1°. It was strongly associated with aortic cross-clamping time (Pearson correlation coefficient = 0.60, P = 0.02) and access difficulty score (Spearman's rank correlation coefficient = 0.57, P = 0.03). Access angles were significantly different between easy and difficult access groups (P = 0.03). There was no significant association between access distance and outcome parameters. CONCLUSIONS Access angle is strongly associated with procedure complexity. The automated presentation of this measure suggests added value of the prototype in clinical practice. © The Author(s) 2018. Published by Oxford University Press on behalf of the European Association for Cardio-Thoracic Surgery. All rights reserved.
Year: 2018

A fuzzy approach of sensitivity for multiple colonies on ant colony optimization

Authors

Abstract
In order to solve combinatorial optimization problems are used mainly hybrid heuristics. Inspired from nature, both genetic and ant colony algorithms could be used in a hybrid model by using their benefits. The paper introduces a new model of Ant Colony Optimization using multiple colonies with different level of sensitivity to the ant’s pheromone. The colonies react different to the changing environment, based on their level of sensitivity and thus the exploration of the solution space is extended. Several discussion follows about the fuzziness degree of sensitivity and its influence on the solution of a complex problem. © Springer International Publishing AG 2018.
A generalized family of memristor-based voltage controlled relaxation oscillator

Authors

Abstract
Recently, memristive oscillators are a significant topic in the nonlinear circuit theory where there is a possibility to build relaxation oscillators without existence of reactive elements. In this paper, a family of voltage-controlled memristor-based relaxation oscillator including two memristors is presented. The operation of two memristors-based voltage relaxation oscillator circuits is demonstrated theoretically with the mathematical analysis and with numerical simulations. The generalized expressions for the oscillation frequency and conditions are derived for different cases, where a closed form is introduced for each case. The effect of changing the circuit parameters on the oscillation frequency and conditions is investigated numerically. In addition, the derived equations are verified using several transient PSPICE simulations. The power consumption of each oscillator is obtained numerically and compared with its PSPICE counterpart. Furthermore, controlling the memristive oscillator with a voltage grants the design an extra degree of freedom which increases the design flexibility. The nonlinear exponential model of memristor is employed to prove the oscillation concept. As an application, two examples of voltage-controlled memristor-based relaxation oscillator are provided to elaborate the effect of the reference voltage on the output voltage. This voltage-controlled memristor-based relaxation oscillator has nano size with storage property that makes it more efficient compared with the conventional one. It would be helpful in many communication applications. Copyright © 2018 John Wiley & Sons, Ltd.
A Hydro-Kinematic approach for the design of compact corrugated plate interceptors for the de-oiling of produced water

Authors
Boraey M.A.

Abstract
A Hydro-Kinematic approach is proposed for the design of compact corrugated plate interceptors (CPIs) for the de-oiling of produced water. For a given set of design targets of a specific flow rate, maximum retention time and minimum captured oil droplet diameter, the Hydro-Kinematic approach proposes a systematic way to determine the CPI unit dimensions and operating conditions with the minimum volume and area per unit input flow rate. The approach takes into account the hydrodynamic constraints in the design of the CPI imposed by the behavior of the dispersed oil droplets in response to the hydrodynamic field. Design charts and equations are given to ease the design process for a wide range of design target parameters. The same approach can be used to determine the best operating conditions for existing CPI units.
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A new hyperchaotic temperature fluctuations model, its circuit simulation, FPGA implementation and an application to image encryption

Authors
Vaidyanathan S., Azar A.T., Rajagopal K., Sambas A., Kacar S., Cavusoglu U.

Abstract
In this paper, we propose a new hyperchaotic temperature fluctuations model and describe its modelling in detail. We study the characteristics of the new hyperchaotic temperature fluctuations model such as its phase portraits, rest points, symmetry, invariance, Lyapunov characteristic exponents, bifurcation analysis, etc. In fact, it is shown that the new temperature fluctuations model has a self-excited, two-scroll, hyperchaotic attractor with complex properties. The circuit simulation of the new temperature fluctuations model is carried out in MultiSim to verify the feasibility of the theoretical model. In addition, FPGA implementation of the new hyperchaotic temperature fluctuations model is also presented. An engineering application of the new hyperchaotic temperature fluctuations model for image encryption has been also described. Copyright © 2018 Inderscience Enterprises Ltd.
A new static-based framework for ransomware detection

Authors
Medhat M., Gaber S., Abdelbaki N.

Abstract
Recently, ransomware attacks are on the rise hitting critical infrastructures and organizations globally. Ransomware uses advanced encryption techniques to encrypt important files on the targeted computer, then it requests payment to decrypt the encrypted files again. Therefore, the detection and prevention of ransomware attacks represent major challenges for security researchers. This research proposes a novel static-based rules ransomware detection framework. The decision rules of the proposed framework are based on static features extracted from the ransomware files. When scanned file reached rules threshold, the framework evaluates triggered rules through logical operations to assign a score for each file. Every score represents a confidence level whether this file is ransomware or not from critical to low. The proposed framework has proven that it can detect new families based on rules and logical operations with high accuracy and detection ratio. © 2018 IEEE.
A New Web Deception System Framework

Authors
El-Kosairy A., Azer M.A.

Abstract
Web applications have many vulnerabilities that allow attackers to compromise sensitive data and gain unauthorized access to the production web servers. Compromised web-sessions represent a major threat. Current random attacks draw attention to the need for new protection and detection tools. In this paper, we propose a web deception scheme to mitigate web attacks in the production web site. The solution is more like a call for arms, using game theory, honeyweb, and honeytokens with ransomware and intrusion detection. The proposed scheme is explained in details as well as simulation results. © 2018 IEEE.
A novel 4-D hyperchaotic system with two quadratic nonlinearities and its adaptive synchronisation

Authors
Vaidyanathan S., Azar A.T., Boukhoune A.

Abstract
This work announces an eleven-term novel 4-D hyperchaotic system with two quadratic nonlinearities. A qualitative analysis of the properties of the novel 4-D hyperchaotic system is presented. A special feature of our novel hyperchaotic system is that it has three equilibrium points of which two are unstable and one is locally asymptotically stable. The Lyapunov exponents of the novel hyperchaotic system are obtained as $L_1 = 1.5146$, $L_2 = 0.2527$, $L_3 = 0$ and $L_4 = -12.7626$. The Kaplan-Yorke dimension of the novel hyperchaotic system is derived as $DKY = 3.1385$. Next, this work describes the design of an adaptive controller for the global hyperchaos synchronisation of identical novel hyperchaotic systems with unknown parameters. MATLAB simulations are shown to describe all the main results derived in this work. Copyright © 2018 Inderscience Enterprises Ltd.
A Novel Actuator Fault-tolerant Control Strategy of DFIG-based Wind Turbines Using Takagi-Sugeno Multiple Models

Authors
Abdelmalek S., Azar A.T., Dib D.

Abstract
In this paper, a new combined fuzzy observer-based fault-tolerant tracking control scheme is proposed for a doubly fed induction generator (DFIG) based wind turbine (WT) subject to actuator faults. The main contribution consists of the proposal of a novel fault-tolerant fuzzy tracking controller combined with a nominal control law. The control objective is to ensure good state references tracking regardless of the actuator faults effects and simultaneous system state and faults estimation. This later requires the knowledge of the occurrence of actuator faults which are estimated from a Takagi-Sugeno Fuzzy Proportional Integral Observer (T-S FPIO). Within this control scheme, a T-S FPIO has been developed to provide stability tracking error dynamics even the system is subjected to different actuator faults. A compensation term is appended to the composite controller and to ensure robustness against actuator faults. Stability and tracking analysis properties are demonstrated through a quadratic Lyapunov function, which are formulated in terms of Linear Matrix Inequalities (LMIs). The observer gains are determined based on the proposed LMIs stability conditions. A numerical simulation is carried out on a typical 1.5 MW DFIG based WT system to access the effectiveness of the proposed control scheme in comparison to the existing results. © 2018, Institute of Control, Robotics and Systems and The Korean Institute of Electrical Engineers and Springer-Verlag GmbH Germany, part of Springer Nature.
A novel hyperchaotic system with adaptive control, synchronization, and circuit simulation

Authors
Vaidyanathan S., Singh S., Azar A.T., Alain K.S.T., Sambas A., Serrano F.E.

Abstract
This chapter announces a new four-dimensional hyperchaotic system having two positive Lyapunov exponents, a zero Lyapunov exponent, and a negative Lyapunov exponent. Since the sum of the Lyapunov exponents of the new hyperchaotic system is shown to be negative, it is a dissipative system. The phase portraits of the new hyperchaotic system are displayed with both two-dimensional and three-dimensional phase portraits. Next, the qualitative properties of the new hyperchaotic system are dealt with in detail. It is shown that the new hyperchaotic system has three unstable equilibrium points. Explicitly, it is shown that the equilibrium at the origin is a saddle-point, while the other two equilibrium points are saddlefocus equilibrium points. Thus, it is shown that all three equilibrium points of the new hyperchaotic system are unstable. Numerical simulations with MATLAB have been shown to validate and demonstrate all the new results derived in this chapter. Finally, a circuit design of the new hyperchaotic system is implemented in MultiSim to validate the theoretical model. © 2018, IGI Global. All rights reserved.
Year: 2018

A qualitative comparison between the proportional navigation and differential geometry guidance algorithms

Authors
Alqudsi Y.S., El-Bayoumi G.M.

Abstract
This paper discusses and presents an overview of the proportional navigation (PN) guidance law as well as the differential geometry (DG) guidance algorithm that are used to develop the intercept course of a certain target. The intent of this study is to illustrate the advantages of the guidance algorithm generated based on the concepts of differential geometry against the well-known PN guidance law. The basic principles behind the both algorithms are mentioned. Moreover, the different versions of the PN approach is briefly clarified to show the essential improvement from one version to the other. The paper terminated with numerous two-dimension simulation figures to give a great value of visual aids, illustrating the significant relations and main features and properties of both algorithms. © 2018. Published by INCAS.
A study in WPA2 enterprise recent attacks

Authors
Abo-Soliman M.A., Azer M.A.

Abstract
Organizations and network developers continuously exert much money and efforts to secure wireless transmission. WPA2 framework is widely deployed for Wi-Fi communications since it is efficient and secure against several wireless attacks. However, WPA2 security has been lately threatened by advanced developed versions of wireless attacks. The increase of computer processing power, continuous efforts by penetration testers, network evaluators and researchers led to the emerging of new advanced attacking techniques that may exploit WPA2 wireless systems detected vulnerabilities. In this paper, we shed the light on the newly emerged attacks conducting practical tests to evaluate WPA2 security through a prototype of WPA2/EAP-TTLS implementation. This evaluation comes out with recommendations and guidelines for protecting wireless enterprise communication. © 2017 IEEE.
A survey on smart cities’ IoT

Authors
Nassar A.S., Montasser A.H., Abdelbaki N.

Abstract
The rise of the Internet of Things (IoT) has led to a numerous and diverse amount of products and real life implementations for smart cities in the last few years. With the many opportunities and challenges, the academic and industrial field has come up with many hardware and middleware platforms. We categorise these different IoT applications and solutions into different domains and present an application for each. This survey aims at defining the state-of-the-art major and common technologies, frameworks, and applications used to open doors to drive future research and to spark new ideas for other industrial ventures. Also, we discuss the significant challenges, and opportunities facing this field. © 2018, Springer International Publishing AG.
Active control for multi-switching combination synchronization of non-identical chaotic systems

Authors
Singh S., Azar A.T., Bhat M.A., Vaidyanathan S., Ouannas A.

Abstract
This chapter investigates the multi-switching combination synchronization of three non-identical chaotic systems via active control technique. In recent years, some advances have been made with the idea of multi-switching combination synchronization. The different states of the master systems are synchronized with the desired state of the slave system in multi-switching combination synchronization scheme. The relevance of such kinds of synchronization studies to information security is evident in the wide range of possible synchronization directions that exist due to multi-switching synchronization. Numerical simulations justify the validity of the theoretical results discussed. © 2018, IGI Global. All rights reserved.
Adaptive decentralised sliding mode controller and observer for asynchronous nonlinear large-scale systems with backlash

Authors
Azar A.T., Serrano F.E.

Abstract
In this article an adaptive decentralised sliding mode controller and observer for asynchronous nonlinear large-scale systems with backlash is proposed. In the literature, only the synchronous case for input nonlinearities such as dead-zone and saturation is found. In this article, the asynchronous case for systems with backlash is studied considering the backlash effect. Owing to the complexity of the backlash nonlinearity, an adaptive decentralised controller is proposed because of the capability of this strategy to deal with uncertainties and to improve the system performance when this nonlinearity is found. Additionally, a decentralised sliding mode observer is proposed in order to estimate the states of the system. © 2018 Inderscience Enterprises Ltd.
Advances in system dynamics and control

Authors
Azar A.T., Vaidyanathan S.

Abstract
Complex systems are pervasive in many areas of science. With the increasing requirement for high levels of system performance, complex systems has become an important area of research due to its role in many industries. Advances in System Dynamics and Control provides emerging research on the applications in the field of control and analysis for complex systems, with a special emphasis on how to solve various control design and observer design problems, nonlinear systems, interconnected systems, and singular systems. Featuring coverage on a broad range of topics, such as adaptive control, artificial neural network, and synchronization, this book is an important resource for engineers, professionals, and researchers interested in applying new computational and mathematical tools for solving the complicated problems of mathematical modeling, simulation, and control. © 2018 by IGI Global. All rights reserved.
Aggrandize efficiency of ultra-thin silicon solar cell via topical clustering of silver nanoparticles

Authors

Abstract
A highly efficient photovoltaic nanocomposite device is demonstrated by fabrication of structural clusters of silver nanoparticles (Ag NPs) on silicon solar cells via a boil deposition method. The efficiency of silicon solar cell was augmented by coating Ag NPs ultra-thin-film deposition on silicon solar cell. Chemically synthesized silver NP’s, their consumption on a silicon thin layer and the operation of photovoltaic nanocomposite device were characterized by using several electron probe microscopic spectroscopic and spectrometric techniques viz. x-ray diffraction (XRD), scanning electron microscopy (SEM), high resolution transmission electron microscopy (HR-TEM), Photoluminescence, UV–visible absorption, dielectric, current vs. voltage (I~V) and capacitance vs. voltage (C~V) characteristics. Poly-dispersed nature of ‘Ag’ nanoparticles established the anisotropy of these NPs when coated on silicon solar cells. Their efficiency enhancement was confirmed from HR-TEM image via time-domain finite-difference technique to deliberate the particle distribution effect on an ultra-thin film of silicon solar cell, indicating the sufficient enrichment in the efficiency of solar cell. Furthermore, the current work explores the development of novel glass frits for utilization in next generation of high efficiency smart solar cells. © 2018 Elsevier B.V.

Year: 2018
An analysis of the financial inclusion in South Africa considering race, education and income

Authors
Omran M.F.

Abstract
The paper examines the issue of financial inclusion in South Africa by analysing the likelihood of ownership of a bank account of an adult individual by race, education and income. Although racial segregation in South Africa was ended on May 10th, 1994, there is still considerable evidence that self-employed and entrepreneurs’ successes are related to their ethnic groups. The paper examines how likely it is that higher education, after controlling for income, increase awareness of financial planning and therefore bank accounts ownership. Education is found to be a significant factor that increases the likelihood of owning a bank account. The odds of owning a bank account increases by 15% for every extra year of education, holding race and income constant. The Whites have the highest median years of education of 12 years, followed by ten years for Asians, nine years for Africans, and eight years for coloured. Copyright © 2018 Inderscience Enterprises Ltd.
An energy-efficient multiobjective scheduling model for monitoring in internet of things

Authors
Mostafa B., Benslimane A., Saleh M., Kassem S., Molnar M.

Abstract
To ensure robustness in wireless networks, monitoring the network state, performance and functioning of the nodes and links is crucial, especially for critical applications. This paper targets Internet of Things (IoT) networks. In the IoT, devices (things) are vulnerable due to security risks from the Internet. Moreover, they are resource-constrained and connected via lossy links. This paper addresses the optimized scheduling of the monitoring role between the embedded devices in IoT networks. The objective is to minimize energy consumption and communication overhead of monitoring, for each node. Several subsets of the potential monitoring nodes are generated by solving a minimal vertex cover (VC) problem with constraint generation. Assuming periodical functioning, VC’s are optimally assigned to time periods in order to distribute the monitoring role throughout the entire network. The assignment of VC’s to periods is modeled as a multiobjective generalized assignment problem. To further optimize the energy consumption of the monitors, they are sequenced across time periods to minimize the state transitions of nodes. This part of the problem is modeled as a traveling salesman path problem. The proposed model is tested on randomly generated instances and the experimental results illustrate its effectiveness to optimize the scheduled monitoring for fault tolerance in IoT networks. © 2018 IEEE.
Approximation of the fractional-order laplacian $s^{\alpha}$ as a weighted sum of first-order high-pass filters

Authors
AbdelAty A.M., Elwakil A.S., Radwan A.G., Psychalinos C., Maundy B.J.

Abstract
A new approximation method of the fractional-order Laplacian operator $s^{\alpha}$ is introduced. The approximation is based on a weighted sum of first-order filter sections and its analytical proof is given. The optimal high-pass filter section parameters that cover six frequency decades are obtained using the flower pollination algorithm while the effect of the number of filter sections on the accuracy of the approximation is investigated. Approximations of fractional-order capacitors of orders $\alpha = 0.5$ and $\alpha = 0.7$ synthesized in Foster-II form are given as a validating example. Further, an active emulator of a fractional-order differentiator function based on this technique is also proposed and experimentally validated. © 2018 IEEE.
Artificial neural network for PWM rectifier direct power control and DC voltage control

Authors

Abstract
In this chapter, a new technique has been proposed for reducing the harmonic content of a three-phase PWM rectifier connected to the networks with a unit power factor and also providing decoupled control of the active and reactive instantaneous power. This technique called direct power control (DPC) is based on artificial neural network (ANN) controller, without line voltage sensors. The control technique is based on well-known direct torque control (DTC) ideas for the induction motor, which is applied to eliminate the harmonic of the line current and compensate for the reactive power. The main idea of this control is based on active and reactive power control loops. The DC voltage capacitor is regulated by the ANN controller to keep it constant and also provides a stable active power exchange. The simulation results are very satisfactory in the terms of stability and total harmonic distortion (THD) of the line current and the unit power factor. © 2018, IGI Global. All rights reserved.
Year: 2018

Band-Pass Filter and Relaxation Oscillator using Electric Double-Layer Capacitor

Authors
Allagui A., Elwakil A.S., Said Z., Abdelkareem M.A., Zhang D.

Abstract
Supercapacitors are electrochemical devices that can store and restore electrical energy and are mostly used for powering dc or close-to-dc applications. As such they have not been explored enough for non-dc circuits. In this study, we implement a band-pass for frequency selectivity purposes and a relaxation oscillator for timing applications using a solid-state carbon electric double-layer capacitor. The expected behavior was observed for both circuits in the sub-Hertz and tens of Hertz frequency ranges. This confirms the possibility of using the frequency-dependent capacitive behavior of such devices in non-conventional low frequency applications not related to dc energy storage but requiring large time constants. © 2018 Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim
Behaviorally-Based Textual Similarity Engine for Matching Job-Seekers with Jobs

Authors
Heggo I.A., Abdelbaki N.

Abstract
Understanding both of job-seekers and employers behavior in addition to analyzing the text of job-seekers and job profiles are two important missions for the e-recruitment industry. They are important tasks for matching job-seekers with jobs to find the top relevant suggestions for each job-seeker. Recommender systems, information retrieval and text mining are originally targeted to assist users and provide them with useful information, which makes human-computer interaction plays a fundamental role in the users’ acceptance of the produced suggestions. We introduce our intelligent framework to help build the knowledge required to produce the most relevant jobs based on processing each job-seeker profile’s text, the behaviorally collected text and the jobs’ profile content. We analyzed the available textual similarity scoring algorithms to find the best suitable relevancy ranking model which is plugged into our developed textual similarity engine. The main purpose is enhancing the recommendation quality in the challenging domain of e-recruitment by finding the textually similar jobs for each job-seeker profile. © 2018, Springer International Publishing AG.
Biochar affects community composition of nitrous oxide reducers in a field experiment

Authors

Abstract
N2O is a major greenhouse gas and the majority of anthropogenic N2O emissions originate from agriculturally managed soils. Therefore, developing N2O mitigation strategies is a key challenge for the agricultural sector and biochar soil treatment is one reported option. Biochar's capacity to increase soil pH and to foster activity of specialized N2O reducers has been proposed as possible mechanisms for N2O mitigation. An experiment was undertaken to investigate whether changes in the community composition of N2O reducers was observed under field conditions after biochar application. The study objective was to assess the abundance and taxonomic composition of the functional marker genes nosZ and nosZ-II across a vegetation period of Zea mays L. after biochar or lime addition compared to an untreated control. After fertilization, biochar amendment resulted in a significant increase of nosZ gene copy numbers compared to the control and the lime treatment. Simultaneously a shift in community composition of nosZ-II bearing bacteria was observed in the biochar treatment that went beyond the sole liming effect. This study broadens our understanding of the functional impact of biochar on N2O emissions and emphasizes the possibility to shape the functioning of the N2O reducing microbial community through the addition of biochar at a field scale. © 2018 Elsevier Ltd
Bioinformatics functional analysis of let-7a, miR-34a, and miR-199a/b reveals novel insights into immune system pathways and cancer hallmarks for hepatocellular carcinoma

Authors
Soliman B., Salem A., Ghazy M., Abu-Shahba N., El Hefnawi M.

Abstract
Let-7a, miR-34a, and miR-199 a/b have gained a great attention as master regulators for cellular processes. In particular, these three micro-RNAs act as potential onco-suppressors for hepatocellular carcinoma. Bioinformatics can reveal the functionality of these micro-RNAs through target prediction and functional annotation analysis. In the current study, in silico analysis using innovative servers (miRror Suite, DAVID, miRGator V3.0, GeneTrail) has demonstrated the combinatorial and the individual target genes of these micro-RNAs and further explored their roles in hepatocellular carcinoma progression. There were 87 common target messenger RNAs (p ≤ 0.05) that were predicted to be regulated by the three micro-RNAs using miRror 2.0 target prediction tool. In addition, the functional enrichment analysis of these targets that was performed by DAVID functional annotation and REACTOME tools revealed two major immune-related pathways, eight hepatocellular carcinoma hallmarks–linked pathways, and two pathways that mediate interconnected processes between immune system and hepatocellular carcinoma hallmarks. Moreover, protein–protein interaction network for the predicted common targets was obtained by using STRING database. The individual analysis of target genes and pathways for the three micro-RNAs of interest using miRGator V3.0 and GeneTrail servers revealed some novel predicted target oncogenes such as SOX4, which we validated experimentally, in addition to some regulated pathways of immune system and hepatocarcinogenesis such as insulin signaling pathway and adipocytokine signaling pathway. In general, our results demonstrate that let-7a, miR-34a, and miR-199 a/b have novel interactions in different immune system pathways and major hepatocellular carcinoma hallmarks. Thus, our findings shed more light on the roles of these miRNAs as cancer silencers. © 2018, © The Author(s) 2018.
Browsers fingerprinting motives, methods, and countermeasures

Authors
Elbanna A., Abdelbaki N.

Abstract
With the continuous and aggressive competition in advertising businesses, uncontrollably desires have emerged to identify and classify consumers. It is proven that companies must have a clear definition of its target market. Based on this we have seen different ways to identify, analyze, and track consumers, either voluntarily or without their consent. Browser fingerprinting techniques have evolved from being privacy-friendly to privacy intrusive to serve these demands. This also has pushed privacy concerned people to save no effort to advance countermeasures. In this paper we introduce different browser fingerprinting techniques and their relevant technologies in the wild. It additionally elaborates widely known countermeasures. © 2018 IEEE.
Centralized coded caching and delivery is studied for a partially-connected fog radio access network (F-RAN), whereby a set of $H$ edge nodes (ENs) (without caches), connected to a cloud server via orthogonal fronthaul links, serve $K$ users over the wireless edge. The cloud server is assumed to hold a library of $N$ files, each of size $F$ bits; and each user, equipped with a cache of size $MF$ bits, is connected to a distinct set of $r$ ENs; or equivalently, the wireless edge from the ENs to the users is modeled as a partial interference channel. The objective is to minimize the normalized delivery time (NDT), which refers to the worst case delivery latency, when each user requests a single file from the library. An achievable coded caching and transmission scheme is proposed, which utilizes maximum distance separable (MDS) codes in the placement phase, and real interference alignment (IA) in the delivery phase, and its achievable NDT is presented for $r = 2$ and arbitrary cache size $M$, and also for arbitrary values of $r$ when the cache capacity is sufficiently large. © 2018 IEEE.
Abstract
This paper characterizes the performance of a generic K-tier cache-aided heterogeneous network (CHN), in which the base stations (BSS) across tiers differ in terms of their spatial densities, transmission powers, pathloss exponents, activity probabilities conditioned on the serving link and placement caching strategies. We consider that each user connects to the BS which maximizes its average received power and at the same time caches its file of interest. Modeling the locations of the BSS across different tiers as independent homogeneous Poisson Point processes (HPPPs), we derive closed-form expressions for the coverage probability and local delay experienced by a typical user in receiving each requested file. We show that our results for coverage probability and delay are consistent with those previously obtained in the literature for a single tier system. © 2017 IEEE.
Abstract
In this letter, we show that Huffman's source coding method is not optimal for cache-aided networks. To that end, we propose an optimal algorithm for the cache-aided source coding problem. We define cache-aided entropy, which represents a lower bound on the average number of transmitted bits for cached-aided networks. A sub-optimal low-complexity cache-aided coding algorithm is presented. In addition, we propose a novel polynomial-time algorithm that obtains the global-optimal source code for wide range of cache sizes. Simulation results show a reduction in the average number of transmitted bits by more than 50% over Huffman's method at moderate cache sizes. © 1997-2012 IEEE.
Capacitive behavior and stored energy in supercapacitors at power line frequencies

Authors
Allagui A., Elwakil A.S., Fouda M.E., Radwan A.G.

Abstract
Supercapacitors are commonly viewed and mainly employed as dc electrical energy storage devices. Their behavior at far-from-dc is usually overlooked and not well explored for potential applications. In this work, we investigate analytically and experimentally the performance of supercapacitor at high frequencies, including the 50 Hz/60 Hz power line frequencies. The variation of effective capacitance, power and energy with frequency are analyzed using a fractional-order model consisting of a series resistance and a constant phase element for both pure sinusoidal and full-wave rectified voltage signals. We show that, although supercapacitors drastically lose their dc-rated capacitance at high frequencies (and therefore their energy storage capability), there still exists sufficient capacitive behavior to be used for power line applications. A 220 V/6 V, 50 Hz step-down transformer, a bridge rectifier circuit and a 3 F dc-rated supercapacitor are used in the experimental setup to drive a dc motor taken as a load. The supercapacitor is proven to be able to function as a filtering capacitor during normal operation with a percentage ripple of 0.83%, and as an energy backup device in the event of ac power interruption. © 2018 Elsevier B.V.
CdS nanowires encapsulated liquid crystal in-plane switching of LCD device

Abstract
Well-defined ultra-thin ‘wire’ like cadmium sulfide (CdS) nanostructures have been synthesized by applying simple cost-effective hydrothermal route. The content of nanostructures modifies the nature of surface interaction between two liquid crystal (LC) components as revealed by optical and electrical investigation. Those synthesized nanowires have an average diameter of about 7–10 nm and length up to several micrometers region. A possible mechanism has been proposed and the addition of cationic surfactant cetyltrimethylammonium bromide (CTAB) into the two mixed-solvents would play an important role on the growth dynamics of the desired product. Those CdS-nanowires dispersing LC was found a remarkable signature on the nucleation and provides a more fundamental approach to modify the crystallographic configuration of host nanostructures. Polarizing optical microscopy (POM) revealed temperature dependent various phases appearance in different textural patterns are the proof the significant influence of CdS nanomaterials complete homogenous dispersion with host LC-matrix. Most observed phenomena are discussed in terms of a new smectic ordering labeled as ‘Smectic X*’, which is sandwiched between the traditional ‘Nematic’ and convectional ‘Smectic C*’ phases. This feature article deals with dielectric relaxations, rotational viscosity, spontaneous polarization in the smectic C phase have been analyzed. A range of remarkable responses of the capacitance with voltage in a Preisach model, fourfold dipolar species in hybrid nanocomposites matrix as well as bi-stable DC switching also offering recent breakthroughs in next generation smart display (LCD) and novel switchable device. © 2018, Springer Science+Business Media, LLC, part of Springer Nature.
Chaos and bifurcation in controllable jerk-based self-excited attractors

Authors
Sayed W.S., Radwan A.G., Fahmy H.A.H.

Abstract
In the recent decades, utilization of chaotic systems has flourished in various engineering applications. Hence, there is an increasing demand on generalized, modified and novel chaotic systems. This chapter combines the general equation of jerk-based chaotic systems with simple scaled discrete chaotic maps. Two continuous chaotic systems based on jerk-equation and discrete maps with scaling parameters are presented. The first system employs the scaled tent map, while the other employs the scaled logistic map. The effects of different parameters on the type of the response of each system are investigated through numerical simulations of time series, phase portraits, bifurcations and Maximum Lyapunov Exponent (MLE) values against all system parameters. Numerical simulations show interesting behaviors and dependencies among these parameters. Analogy between the effects of the scaling parameters is presented for simple one-dimensional discrete chaotic systems and the continuous jerk-based chaotic systems with more complicated dynamics. The impacts of these scaling parameters appear on the effective ranges of other main system parameters and the ranges of the obtained solution. The dependence of equilibrium points on the sign of one of the scaling parameters results in coexisting attractors according to the signs of the parameter and the initial point. In addition, switching can be used to generate double-scroll attractors. Moreover, bifurcation and chaos are studied for fractional-order of the derivative. © 2018, Springer International Publishing AG.
Chaos-based hardware speech encryption scheme using modified tent map and bit permutation

Authors

Abstract
This paper proposes a speech encryption scheme based on a generalized modified chaotic tent map and bit permutation and presents its hardware realization. The generalization scales the output range and increases the key space. The modification controls the bounds on the output range through a parameter such that chaotic output exists for almost all values of the parameter. The security and efficiency of the speech encryption scheme are validated through the randomness of the encrypted signal, the key sensitivity and the hardware resources utilization. The proposed scheme utilizes less FPGA resources compared to previous works and increases the throughput from 1.49 Gbit/sec to 4.35 Gbit/sec. © 2018 IEEE.
Cloud computing privacy issues, challenges and solutions

Authors
El-Zoghby A.M., Azer M.A.

Abstract
There are many cloud computing initiatives that represent a lot of benefit to enterprise customers. However, there are a lot of challenges and concerns regarding the security and the privacy of the customer data that is hosted on the cloud. We explore in this paper the various aspects of cloud computing regarding data life cycle and its security and privacy challenges along with the devised methodology to address those challenges. We mention some of the regulations and law requirements in place to ensure cloud customer data privacy. © 2017 IEEE.
Year: 2018

Combining lexical features and a supervised learning approach for arabic sentiment analysis

Authors
El-Beltagy S.R., Khalil T., Halaby A., Hammad M.

Abstract
The importance of building sentiment analysis tools for Arabic social media has been recognized during the past couple of years, especially with the rapid increase in the number of Arabic social media users. One of the main difficulties in tackling this problem is that text within social media is mostly colloquial, with many dialects being used within social media platforms. In this paper, we present a set of features that were integrated with a machine learning based sentiment analysis model and applied on Egyptian, Saudi, Levantine, and MSA Arabic social media datasets. Many of the proposed features were derived through the use of an Arabic Sentiment Lexicon. The model also presents emoticon based features, as well as input text related features such as the number of segments within the text, the length of the text, whether the text ends with a question mark or not, etc. We show that the presented features have resulted in an increased accuracy across six of the seven datasets we’ve experimented with and which are all benchmarked. Since the developed model outperforms all existing Arabic sentiment analysis systems that have publicly available datasets, we can state that this model presents state-of-the-art in Arabic sentiment analysis. © Springer International Publishing AG, part of Springer Nature 2018.
Comparison between three approximation methods on oscillator circuits

Authors
Elwy O., Rashad S.H., Said L.A., Radwan A.G.

Abstract
The promising capabilities of fractional-order devices challenge researchers to find a way to build it physically. Approximating the Laplacian operator $s^\alpha$ can pave the way to emulate the fractional-order devices till its off-the-shelf appearance. This paper introduces three approximations of the Laplacian operator $s^\alpha$: Oustaloup, Matsuda, and Valsa by comparing their behaviors through two types of oscillator circuits. The first two are well-established approximations and the latter is proposed for the first time by converting its model network to an integer polynomial approximation of the fractional operator $s^\alpha$. In addition to that, three emulators for the fractional-order capacitor are introduced based on Foster-I, Foster-II, and Cauer-I techniques. The Wien-bridge family and the phase-shift oscillators are chosen to be examples of two and three fractional-order elements circuits, respectively. The approximation comparison is held through the oscillators based on oscillation condition and frequency. Also, a comparison between the circuit's behavior with three approximations and the exact solution is provided to investigate which approximation has the lowest error. The sensitivity of approximations to emulators’ circuit components is investigated through Monte Carlo analysis. The effects of 5% and 10% uniform random deviation in the emulators’ circuit components are investigated. Numerical simulations using MATLAB and Spice simulations for the two oscillators are provided. Also, some cases are validated experimentally. © 2018 Elsevier Ltd
Comparison of Machine Learning Approaches for Prediction of Advanced Liver Fibrosis in Chronic Hepatitis C Patients

Authors
Hashem S., Esmat G., Elakel W., Habashy S., Raouf S.A., ElHefnawi M., Eladawy M., ElHefnawi M.

Abstract
Background/Aim: Using machine learning approaches as non-invasive methods have been used recently as an alternative method in staging chronic liver diseases for avoiding the drawbacks of biopsy. This study aims to evaluate different machine learning techniques in prediction of advanced fibrosis by combining the serum biomarkers and clinical information to develop the classification models. Methods: A prospective cohort of 39,567 patients with chronic hepatitis C was divided into two sets - one categorized as mild to moderate fibrosis (F0-F2), and the other categorized as advanced fibrosis (F3-F4) according to METAVIR score. Decision tree, genetic algorithm, particle swarm optimization, and multi-linear regression models for advanced fibrosis risk prediction were developed. Receiver operating characteristic curve analysis was performed to evaluate the performance of the proposed models. Results: Age, platelet count, AST, and albumin were found to be statistically significant to advanced fibrosis. The machine learning algorithms under study were able to predict advanced fibrosis in patients with HCC with AUROC ranging between 0.73 and 0.76 and accuracy between 66.3 and 84.4 percent. Conclusions: Machine-learning approaches could be used as alternative methods in prediction of the risk of advanced liver fibrosis due to chronic hepatitis C. © 2004-2012 IEEE.
Control of a two link planar electrically-driven rigid robotic manipulator using fractional order SOFC

Authors
Azar A.T., Kumar J., Kumar V., Rana K.P.S.

Abstract
An intelligent adaptive fuzzy logic control technique, Fractional Order Self Organizing Fuzzy Controller (FOSOFC) is presented and applied to control a two link planar electrically-driven rigid robotic (EDRR) manipulator system. As EDRR is a multi-input multi-output complex nonlinear system, an intelligent adaptive controller, FOSOFC is considered to control it perfectly. To show the efficacy of the FOSOFC controller, the obtained performance is compared with fractional order fuzzy proportional integral and derivative (FOFPID) controller for study in servo as well as the regulatory problems. Gains of the controllers are tuned by a meta-heuristic bio-inspired algorithm namely Cuckoo Search Algorithm. Based on the trajectory tracking and disturbance rejection (DR) performances, efficiency of controllers has been accessed and it has been found that FOSOFC outperforms on FOFPID controller. © 2018, Springer International Publishing AG.
Control of new type of fractional chaos synchronization

Authors
Azar A.T., Ouannas A., Singh S.

Abstract
Based on stability theory of linear fractional order systems and stability theory of linear integer order systems, the problem of coexistence of various types of synchronization between different dimensional fractional chaotic systems is investigated in this paper. Numerical and simulation results have clearly shown the effectiveness of the novel approach developed herein. © 2018, Springer International Publishing AG.
Control-based maximum power point tracking for a grid-connected hybrid renewable energy system optimized by particle swarm optimization

Authors
Smida M.B., Sakly A., Vaidyanathan S., Azar A.T.

Abstract
There has been a great deal of interest in renewable energy sources for electricity generation, particularly for photovoltaic and wind generators. These energy resources have enormous potential and can meet the current global demand for energy. Despite the obvious advantages of renewable energy sources, they have significant disadvantages, such as the discontinuity of their generation, due to their heavy dependence on weather and climate change, which affects their effectiveness in the conversion of renewable energy. Faced with this conflict, it is essential to optimize the performance of renewable systems in order to increase their efficiency. Several unconventional approaches to optimization have been developed in the literature. In this chapter, the management of a hybrid renewable energy system is optimized by intelligent approach based on particle swarm optimization comprising a shaded photovoltaic generator and a wind generator. © 2018, IGI Global. All rights reserved.
Abstract
Most commercial Small Unmanned Aerial Vehicles (SUAVs) rely solely on Global Navigation Satellite Systems (GNSSs) - such as GPS and GLONASS - to perform localization tasks during the execution of autonomous navigation activities. Despite being fast and accurate, satellite-based navigation systems have typical vulnerabilities and pitfalls in urban settings that may prevent successful drone localization. This paper presents the novel concept of 'Deep Urban Signatures' where a deep convolutional neural network is used to compute a unique characterization for each urban area or district based on the visual appearance of its architecture and landscape style. Such information is used to identify the district and subsequently perform localization. The paper presents the methodology to compute the signatures and discusses the experiments carried out using Google maps and Bing maps, where the latter is used to simulate footage captured by SUAVs at different altitudes and/or using different camera zoom levels. The results obtained demonstrate that Deep Urban Signatures can be used to successfully accomplish district-level aerial drone localization with future work comprising accurate localization within each identified district. © 2017 IEEE.
Cooperative D2D communications in the uplink of cellular networks with time and power division

Authors
Kiwan D., Sherif A.E., Elbatt T.

Abstract
Cooperative device-to-device (D2D) communication is proposed as a promising technology to improve the spectral efficiency in crowded communication networks. In this paper, we consider a transmitter-receiver pair, operating in the D2D transmission mode, overlaying the cellular network. The D2D transmitter (DT) acts as a relay for the undelivered packets of cellular user equipment (CUE). We consider the case in which the DT transmits its own data along with the relayed data using superposition coding in the uplink. We investigate how the time slot is split between the cellular network transmission and the D2D transmission. Moreover, the optimal approach to split the DT power between the transmission of the DT data and the relayed CUE data is explored. Our main objective is to achieve the maximum D2D throughput. Towards this objective, we describe the system using a queuing theoretic model and formulate an optimization problem to maximize the throughput of the D2D link by allocating time and power for DT while satisfying the stability conditions for the queues of the system. Finally, numerical results show the merits of our system, with optimal time and power allocation, as compared to the constant time or power allocation scenarios, in terms of the maximum achievable D2D throughput. © 2018 IEEE.
Year: 2018

Correction to: Optimization of energy-constrained wireless powered communication networks with heterogeneous nodes

Authors
Abd-Elmagid M.A., ElBatt T., Seddik K.G.

Abstract
The original version of this article contained error in author affiliation. Also, the article note and acknowledgement sections are missing. © 2018 Springer Science+Business Media, LLC, part of Springer Nature
Correlation between protocol selection and packet drop attack severity in ad hoc networks

Authors
Reda M., Azer M.A.

Abstract
Mobile Ad hoc Network (MANET) are self-configuring, dynamic, networks that consist of nodes with various capabilities communicating through a wide spectrum of frequencies. Such flexibility in infrastructure and design comes with great risks in form of attacks on its nodes and the routing protocols that connect the network together. The aim of this paper is to explore the correlation between the attack severity and the protocol used. In this paper, the comparison will be mainly between the Dynamic Source Routing (DSR) protocol, and the Ad-Hoc On-Demand Distance Vector (AODV) protocol and how both respond to a Packet Drop attacks. © 2017 IEEE.
Decoding arm kinematics from EMG signals using Kalman filter

Authors
ElMohandes H., Eldawlatly S., Audf J.M.C., Ruff R., Hoffmann K.-P.

Abstract
Myoelectric control of prosthetic arms provides a new hope for providing naturalistic movements to amputees. Extensive work has been made in recent years to use Electromyography (EMG) signals to enhance the operation of prosthetic arms. In this paper, we propose an EMG Kalman filter-based model, where we identify the relationship between the joint angles and recorded EMG signals. EMG signals were recorded from biceps and triceps muscles and used to train a Kalman filter decoder. We assessed the performance of the decoder by computing the correlation and the normalized root mean-square error (NRMSE) between the decoded and actual joint angles. When decoding using biceps EMG only, an average correlation of 0.61 was obtained with a NRMSE of 0.35. For triceps EMG only, an average correlation of 0.5 was obtained with a NRMSE of 0.5. Finally, when decoding the EMG of both the biceps and triceps muscles, the average correlation increased to 0.87 while the average NRMSE decreased to 0.18. These results outperform recent studies in similar applications which indicates the efficacy of the proposed decoder in decoding joint angles from recorded EMG. This could help in enhancing the control of prosthetic arms. © 2018 Association for Computing Machinery.
Degrees of freedom region of device-relaying cellular network

Authors
Roushdy A., El-Keyi A., Nafie M.

Abstract
In this paper, we characterize the degrees of freedom (DoF) region of a MIMO device-relaying cellular network (DRCN) with three users and one base station (BS), where each user exchanges unicast messages with the BS. We assume that one of the users has no direct link to the BS, and hence, device-relaying is utilized to exchange data between this user and the BS, i.e., data is relayed via another user which has a direct link to the BS and a device to device (D2D) link to this user. We assume that each node operates in perfect full-duplex mode. Cut-set and genie-aided bounds are utilized to derive an outer bound on the DoF region. We provide achievability schemes that utilize signal space alignment for network coding, null-space beamforming and zero-forcing. The achievable schemes provide an inner bound on the DoF region that coincides with the outer bound. © 2018 IEEE.
Design and analysis of 2T2M hybrid CMOS-Memristor based RRAM

Authors

Abstract
In this paper, a Static Noise Margin (SNM) analysis for 2T2M RRAM cell is investigated. The proposed analysis is done using mathematical formulation and verified by SPICE simulations. The analysis is tested for both, write and read modes. Moreover, the analysis is applied to diverse types of RRAM cells, and a comparison between the performance of such cells is discussed. Additionally, the effect of the exponential memristor model on the memristor behaviour in terms of switching speed and the range of the memristor resistance are discussed in detail. The circuits design and simulations were carried out using TSMC 130 nm CMOS technology and Cadence Virtuoso tool. Finally, comparison between different RAM technologies is briefly presented. © 2018 Elsevier Ltd
Design and Implementation of Fuzzy PID Controller into Multi Agent Smart Library System Prototype

Authors

Abstract
This paper compares the performance of four different controllers implemented on two multi agent robots to stabilize its motion from one station to another during delivery tasks. The controllers are; multi-position controller, PID controller, fuzzy logic controller and fuzzy-PID controller. The aim of this paper is to control the mobile robot robustly to arrive its target destination. The robots and station coordinates are recognized using machine vision system and all programming is carried out in LabVIEW. The paper compares the transient response and steady state error of each of controller and experimental results show that the Fuzzy-PID controller produced the best performance and good trajectory of robot from its current position to its target position. It had a better convergence rate when compared with other controllers like PID and Fuzzy logic controllers. © 2018, Springer International Publishing AG.
Design of low order controllers for decoupled mimo systems with time response specifications

Authors
Smida M.B., Sakly A., Vaidyanathan S., Azar A.T.

Abstract
The design of a low order controller for decoupled MIMO systems is proposed. The main objective of this controller is to guarantee some closed loop time response performances such as the settling time and the overshoot. The controller parameters are obtained by resolving a non-convex optimization problem. In order to obtain an optimal solution, the use of a global optimization method is suggested. In this chapter, the proposed solution is the GGP method. The principle of this method consists of transforming a non-convex optimization problem to a convex one by some mathematical transformations. So as to accomplish the fixed goal, it is imperative to decouple the coupled MIMO systems. To approve the controllers' design method, the synthesis of fixed low order controller for decoupled TITO systems is presented firstly. Then, this design method is generalized in the case of MIMO systems. Simulation results and a comparison study between the presented approach and a PI controller are given in order to show the efficiency of the proposed controller. It is remarkable that the obtained solution meets the desired closed loop time specifications for each system output. It is also noted that by considering the proposed approach the user can fix the desired closed loop performances for each output independently. © 2018, IGI Global. All rights reserved.
Detection and Countermeasures of DDoS Attacks in Cloud Computing

Authors
Elsayed M.S., Azer M.A.

Abstract
Greater portions of the world are moving to cloud computing because of its advantages. However, due to its distributed nature, it can be easily exploited by Distributed Denial of Service (DDoS) attacks. In distributed DDoS attacks, legitimate users are prevented from using cloud resources. In this paper, the various DDoS detection and defenses mechanisms cloud computing are reviewed. We propose a new technique based on Remote Triggered Black Hole (RTBH) to prevent DDoS attacks before it target to cloud resources. © 2018 IEEE.
Dynamic behavior and damping characteristics of carbon black polymer composites at high strain rates

Authors
Akl W., Baz A.M.

Abstract
The dynamic stress–strain behavior and the damping characteristics of carbon black (CB)/polymer composites at high strain rates are measured using the split Hopkinson pressure bar. These characteristics are determined for polyurethane impregnated with 20% CB nanoparticles and compared with those of pristine polyurethane at strain rates ranging between 2,400 and 7,000 s⁻¹. The obtained results indicate that the CB/polymer composites exhibit highly hysteretic stress–strain characteristics and have high storage modulus as well as high loss factor as compared to pristine polyurethane polymers. With such characteristics, the CB/polymer composites are observed to dissipate energy much higher than that dissipated by pristine polymers. © 2018 Wiley Periodicals, Inc.
Abstract
In this chapter, the dynamics of a particular topology of Colpitts oscillator with fractional order dynamics is presented. The first part is devoted to the dynamics of the model using standard nonlinear analysis techniques including time series, bifurcation diagrams, phase space trajectories plots, and Lyapunov exponents. One of the major results of this innovative work is the numerical finding of a parameter region in which the fractional order Colpitts oscillator's circuit experiences multiple attractors' behavior. This phenomenon was not reported previously in the Colpitts circuit (despite the huge amount of related research works) and thus represents an enriching contribution to the understanding of the dynamics of Chua's oscillator. The second part of this chapter deals with the synchronization of fractional order system. Based on fractional-order Lyapunov stability theory, this chapter provides a novel method to achieve generalized and phase synchronization of two and network fractional-order chaotic Colpitts oscillators, respectively. © 2018, IGI Global. All rights reserved.
Dynamics of fractional and double-humped logistic maps versus the conventional one

Authors

Abstract
This paper presents the dynamic analysis of two discrete logistic chaotic maps versus the conventional map. The first map is the fractional logistic map with the extra degrees of freedom provided by the added number of variables. It has two more variables over the conventional one. The second map is the double-humped logistic map. It is a fourth-order map which increases the non-linearity over the conventional one. The dynamics of the three maps are discussed in details, including mathematical derivations of fixed points, stability analysis, bifurcation diagrams and the study of their chaotic regions. The chaotic behavior of the three maps, is investigated using the Maximum Lyapunov exponent (MLE). © 2017 IEEE.
Year: 2018

Editorial

Authors
Azar A.T., Vaidyanathan S.

Abstract

[No abstract available]
Year: 2018

Editorial

Authors
Azar A.T., Vaidyanathan S., Boulkroune A.

Abstract
[No abstract available]
Editorial

Authors
Azar A.T., Vaidyanathan S., Boulkroune A.

Abstract
[No abstract available]
Abstract

Having an approximate realization of the fractance device is an essential part of fractional-order filter design and implementation. This encouraged researchers to introduce many approximation techniques of fractional-order elements. In this paper, the fractional-order KHN low-pass and high-pass filters are investigated based on four different approximation techniques: Continued Fraction Expansion, Matsuda, Oustaloup, and Valsa. Fractional-order filter fundamentals are reviewed then a comparison is made between the ideal and actual characteristic of the filter realized with each approximation. Moreover, stability analysis and pole movement of the filter with respect to the transfer function parameters using the exact and approximated realizations are also investigated. Different MATLAB numerical simulations, as well as SPICE circuit results, have been introduced to validate the theoretical discussions. Also, to discuss the sensitivity of the responses to component tolerances, Monte Carlo simulations are carried out and the worst cases are summarized which show good immunity to component deviations. Finally, the KHN filter is tested experimentally. © 2018, Springer Science+Business Media, LLC, part of Springer Nature.
Effective supervisory controller to extend optimal energy management in hybrid wind turbine under energy and reliability constraints

Authors
Meghni B., Dib D., Azar A.T., Saadoun A.

Abstract
One of the major factors that can increase the efficiency of wind turbines (WTs) is the simultaneous control of the different parts in several operating area. The main problem associated with control design in wind generator is the presence of asymmetric in the dynamic model of the system, which makes a generic supervisory control scheme for the power management of WT complicated. Consequently, supervisory controller can be utilized as the main building block of a wind farm controller (offshore), which meets the grid code requirements and can increased the efficiency and protection of WTs in (region II and III) at the same time. This paper proposes a new effective adaptive supervisory controller for the optimal management and protection simultaneously of a hybrid WT, in both regions (II and III). To this end, the second order sliding mode with the adaptive gain super-twisting control law and fuzzy logic control are used in the machine side, batteries side and grid side converters, to achieve four control objectives: (1) control of the rotor speed to track the optimal value; (2) adaptive control (commutative mode) in order to maximum power point tracking (MPPT) or power limit in various regions; (3)regulate the average DC link voltage near to its nominal value;(4) ensure: a smooth regulation with high quality of power supply injected into the grid, a satisfactory power factor correction and a high harmonic performance in relation to the AC source and eliminating the chattering effect. Results of extensive simulation studies prove that the proposed supervisory control system guarantees to track reference signals with a high harmonic performance despite external disturbance uncertainties. © 2016, Springer-Verlag Berlin Heidelberg.
Emotional tone detection in Arabic tweets

Authors
Al-Khatib A., El-Beltagy S.R.

Abstract
Emotion detection in Arabic text is an emerging research area, but the efforts in this new field have been hindered by the very limited availability of Arabic datasets annotated with emotions. In this paper, we review work that has been carried out in the area of emotion analysis in Arabic text. We then present an Arabic tweet dataset that we have built to serve this task. The efforts and methodologies followed to collect, clean, and annotate our dataset are described and preliminary experiments carried out on this dataset for emotion detection are presented. The results of these experiments are provided as a benchmark for future studies and comparisons with other emotion detection models. The best results over a set of eight emotions were obtained using a complement Naïve Bayes algorithm with an overall accuracy of 68.12%. © Springer Nature Switzerland AG 2018.
Energy-efficient cooperative cognitive relaying schemes for cognitive radio networks

Authors
El Shafie A., Khattab T., El-Keyi A.

Abstract
We investigate a cognitive radio network in which a primary user (PU) may cooperate with a cognitive radio user (i.e., a secondary user (SU)) for transmissions of its data packets. The PU is assumed to be a buffered node operating in a time-slotted fashion where the time is partitioned into equal-length slots. We develop two schemes which involve cooperation between primary and secondary users. To satisfy certain quality of service (QoS) requirements, users share time slot duration and channel frequency bandwidth. Moreover, the SU may leverage the primary feedback message to further increase both its data rate and satisfy the PU QoS requirements. The proposed cooperative schemes are designed such that the SU data rate is maximized under the constraint that the PU average queueing delay is maintained less than the average queueing delay in case of non-cooperative PU. In addition, the proposed schemes guarantee the stability of the PU queue and maintain the average energy emitted by the SU below a certain value. The proposed schemes also provide more robust and potentially continuous service for SUs compared to the conventional practice in cognitive networks where SUs transmit in the spectrum holes and silence sessions of the PUs. We include primary source burstiness, sensing errors, and feedback decoding errors to the analysis of our proposed cooperative schemes. The optimization problems are solved offline and require a simple 2-dimensional grid-based search over the optimization variables. Numerical results show the beneficial gains of the cooperative schemes in terms of SU data rate and PU throughput, average PU queueing delay, and average PU energy savings. © 2018 Elsevier B.V.
Enhanced plasmonic photovoltaic using embedded novel gear-shaped nanoparticles

Authors
Medhat M., El-Batawy Y.M., Abdelmageed A.K., Soliman E.A.

Abstract
In this paper, novel gear-shaped nanoparticles are introduced for the first time to enhance the photovoltaic (PV) efficiency. This has been achieved via increasing the overall power absorption by the PV semiconductor material in both visible and near-infrared ranges. The modes of the new gear-shaped nanoparticles are investigated. A parametric study has been performed which demonstrates how the design parameters of the proposed nanoparticles can be engineered for best overall power absorption within a Si surrounding medium. A figure of merit (FoM) is defined that takes into account all objectives. An optimization technique is applied to obtain the optimum set of the gear’s dimensions, penetration depth, and periodicity for the maximum possible FoM. The optimum gear-shaped nanoparticles design offers 48% enhancement in the FoM if compared with a bare Si block with no nanoparticles and 7% enhancement over the conventional disk-shaped nanoparticles. The enhancement gained by the embedded gear-shaped nanoparticles on the J-V characteristics of the PV is also studied, and the effects of changing the dimensions and the position of nanoparticles on the J-V characteristics enhancement are investigated. © 2018 Optical Society of America.
Enterprise WLAN security flaws current attacks and relative mitigations

Authors
Abo-Soliman M.A.

Abstract
The Increasing number of mobiles and handheld devices that allow wireless access to enterprise data and services is considered a major concern for network designers, implementers and analysts. Enhancements of wireless technologies also accelerate the adoptions of enterprise wireless networks that are widely deployed solely or as an extension to existing wired networks. Bring Your Own Device is an example of the new challenging wireless trends. BYOD environments allow the use of personal mobile computing devices like smart phones, tablets, and laptops for business activities. BYOD has become popular in workplaces since they keep users in their comfort zone leading to higher productivity and cost reduction for businesses. Nevertheless, business data and services are consequentially subject to several wireless attacks, whether they are hosted on a cloud or on premises, especially when travelling through the open air. Corporates usually apply network-access-control systems for securing enterprise wireless LANs. However, the security systems may be compromised due to detected flaws posing the enterprise critical information to leakage or the entire network to interruption or complete failure. In this paper, we study the impact of wireless attacks on enterprise wireless LANs. The study helps in evaluating the real risks that threaten wireless technologies. In additions, recommended mitigations and practices to overcome the detected vulnerabilities and security flaws are proposed. © 2018 Association for Computing Machinery.
Year:  2018

Evaluation of computational techniques for predicting non-synonymous single nucleotide variants pathogenicity

Authors
Hassan M.S., Shaalan A.A., Dessouky M.I., Abdelnaiem A.E., ElHefnawi M.

Abstract
The human genetic diseases associated with many factors, one of these factors is the non-synonymous Single Nucleotide Variants (nsSNVs) cause single amino acid change with another resulting in protein function change leading to disease. Many computational techniques have been released to expect the impacts of amino acid alteration on protein function and classify mutations as pathogenic or neutral. Here in this article, we assessed the performance of eight techniques; FATHMM, SIFT, Provean, iFish, Mutation Assessor, PANTHER, SNAP2, and PON-P2 using a VaribenchSelectedPure dataset of 2144 pathogenic variants and 3777 neutral variants extracted from the free standard database “Varibench.” The first five techniques achieve (45.60–83.75) % specificity, (52.64–94.13) % sensitivity, (51.00–88.90) % AUC, and (49.76–88.24) % ACC on whole dataset, while all eight techniques achieve (36.54–77.88) % specificity, (50.00–75.00) % sensitivity, (51.00–76.40) % AUC, and (25.00–77.78) % ACC on random sample dataset. We also created a Meta classifier (CSTJ48) that combines FATHMM, iFish, and Mutation Assessor. It registers 96.33% specificity, 86.07% sensitivity, 91.20% AUC, and 91.89 ACC. By comparing the results, it’s clear that FATHMM gives the highest performance over the seven individual techniques, where it achieves 83.75% and 77.88% specificity, 94.13%, and 75.00% sensitivity, 88.90% and 76.40% AUC, and 88.24% and 77.78% ACC on whole and random sample dataset, respectively. Also, the launched Meta classifier (CSTJ48) is outperforming over all the eight individual tools that compared here. © 2018 Elsevier Inc.
Year: 2018

Extraction of Phase Information from Magnitude-Only Bio-impedance Measurements Using a Modified Kramers–Kronig Transform

Authors
Al-Ali A.A., Elwakil A.S., Maundy B.J., Freeborn T.J.

Abstract
The need for portable and low-cost bio-impedance analyzers that can be deployed in field studies has significantly increased. Due to size and power constraints, reducing the hardware in these devices is crucial and most importantly is removing the need for direct phase measurement. In this paper a new magnitude-only technique based on modified Kramers–Kronig transforms is proposed and tested. Comparison with impedance measurements of fresh and aging tomato samples using a precise industry standard impedance analyzer is carried out and explained. Error and noise analysis of the proposed algorithm are also reported. © 2017, Springer Science+Business Media, LLC, part of Springer Nature.
Year: 2018

FPGA implementation of fractional-order Chua's chaotic system

Authors

Abstract
This paper introduces FPGA implementation of fractional order double scrolls chaotic system based on Chua circuit. Grunwald-Letnikov's (GL) definition is used to generalize the chaotic system equations into the fractional-order domain. Xilinx ISE 14.5 is used to simulate the proposed design and Artix-7 XC7A100T FPGA is used for system realization. Experimental results are presented on digital oscilloscope and the error between theoretical and experimental results is calculated. Also, various interesting attractors are obtained with respect to different parameters values and window sizes. Some techniques have been employed to increase the throughput to 7.685 Gbit/Sec with 96-bits overall output. © 2018 IEEE.
FPGA implementation of fractional-order integrator and differentiator based on Grünwald Letnikov's definition

Authors
Tolba M.F., Said L.A., Madian A.H., Radwan A.G.

Abstract
The fractional-order derivative and integral of Grünwald Letnikov's definition are implemented based on FPGA for different fractional orders. A new algorithm is proposed to implement the GL integral based on linear approximation approach, where the memory dependency of the fractional order systems is eliminated. Moreover, the linear approximation design shows an improvement of 91% and 92% in the error and the mean percentage error compared with prior art. The proposed approach has been designed and implemented based on Verilog Hardware Description Language (HDL) and realized on Nexys 4 Artix-7 FPGA XC7A100T. © 2017 IEEE.
FPGA realization of speech encryption based on modified chaotic logistic map

Authors
Tolba M.F., Sayed W.S., Radwan A.G., Abd-El-Hfiz S.K.

Abstract
This paper presents an FPGA design and implementation of a chaotic speech encryption and decryption system based on bit permutations. Different encryption schemes are realized and compared. In addition, various testing methods including entropy, mean squared error, and correlation coefficients are used to analyze the efficiency of the system. The techniques for area and delay minimization are used. Carry look-ahead adder, multi-operand adder and booth multiplier are used to improve the performance of the encryption schemes design. A comparison between the different encryption architectures and the state of the art is introduced. The results demonstrate the good security of the proposed systems, which enables their utilization in speech telecommunication. The designs have been simulated using Xilinx ISE 14.7 and realized on FPGA Xilinx virtex-5 xc5lx50T. A throughput of 7.9 Gbit/sec for bit permutation design, 2.6 Gbit/sec for bit permutation and chaotic modified logistic map is achieved compared with 1.1 Gbit/sec and 1.49 Gbit/sec for previous work. © 2018 IEEE.
This paper introduces high-speed FPGA implementations of two different chaotic systems that rely on a switching-type nonlinearity. In particular, the single-switch Jerk system and the two-wing butterfly system (previously implemented only in analog form) are realized on a modular FPGA platform. For each system, two different hardware architectures are described: a parameters-independent architecture and a customized one with fixed parameters that utilizes less FPGA resources and thus has high throughput with the minimum number of clock cycles. Experimental results show that the parameters-independent architecture utilizes 70% more of the FPGA resources, while the customized one achieves a maximum clock frequency 172.5 MHz for the Jerk and 142.6 MHz for the two-wing system. © 2018, Springer Science+Business Media B.V., part of Springer Nature.
Fractional Order Sliding Mode PID Controller/Observer for Continuous Nonlinear Switched Systems with PSO Parameter Tuning

Authors
Azar A.T., Serrano F.E.

Abstract
In this article a fractional order sliding mode PID controller and observer for the stabilization of continuous nonlinear switched systems is proposed. The design of the controller and observer is done following the separation principle, this means that the observer and controller are designed in a separate fashion, so a hybrid controller is implemented by designing the sliding mode controller part using an integral sliding mode surface along with a PI$\lambda$D$\mu$ controller part which is the fractional order PID controller that is implemented to stabilizes the system. For the observer part, an integral sliding manifold is implemented, so the error between the measured and estimated variable is reduced to zero when time approaches to infinity. The fractional order PID part is tuned by particle swarm optimization algorithm to derive the $\lambda$ and $\mu$ parameters along with the gain matrices. Finally, the stability of the closed loop system is assured in synchronous switching, this means that the mode in the controller and the system is the same at every switching time, the average dwell time is implemented for this purpose. © 2018, Springer International Publishing AG.
**Year:** 2018

**Fractional-Order Model (FOM) for high-strength substrate biodegradation in conventional UASB reactor**

**Authors**
El-Seddik M.M., Galal M.M., Radwan A.G., Abdel-Halim H.S.

**Abstract**
This paper introduces a Fractional-Order Model (FOM) of Up-flow Anaerobic Sludge Blanket (UASB) reactor for wastewater treatment regarding high-strength substrate biodegradation. The model can investigate the biogas production rate as well as the specific growth rate of bacteria with extra degree of freedom. Also, the hereditary effect of resident biomass on substrate degradation is studied on periodically long terms. Moreover, biomass concentration is examined in reactor under the influence of various fractional orders. Several numerical simulation results are introduced based on Grünwald-Letnikov to reveal the role of fractional derivatives on the treatment process for conventional UASB reactor using Andrews kinetics. An enhancement in the performance may owe to the ability of FOM to interpret the behavior of biomass accumulation in reactor. Furthermore, model validation can be accomplished through a prediction of the measured results of high-strength wastewater in UASB pilot plant installed at El-Berka Wastewater treatment plant (WWTP), Cairo, Egypt. © 2018 Elsevier B.V.
Fuzzy Logic Controller with Color Vision System Tracking for Mobile Manipulator Robot

Authors
Azar A.T., Ammar H.H., Mliki H.

Abstract
The purpose of this article is to present a theoretical and practical implementation of a fuzzy algorithm methodology to control a mobile manipulator path planning using a real-time vision system tracking. To meet high performance response and robust stability of the platform navigation, a fuzzy logic controller is designed with realistic constrains. OpenCV library is used to implement Background Modeling technique to track in real time a color object and to extract its (X, Z) coordinates, then an ultrasonic sensor is coupled with the camera to calculate the depth “Y” of the tracked object position. The inverse kinematics is used to control an arm robot to achieve a grasping task of the tracked object. The robot uses the vision system and the ultrasonic sensor to approximate the position of object compared to the cart as well as the position of the arm end effector to the target. The proposed technique shows through simulations and hardware implementation the high efficiency of the algorithm implemented. The fuzzy controller technique presents a good stability and robustness behavior results. The obtained results conclude that the combination between a 2D vision system and an ultrasonic sensor applied to a rigorous fuzzy logic algorithm can perform good results similar to a tracking technique based on a 3D camera. © 2018, Springer International Publishing AG.
Generalized double-humped logistic map-based medical image encryption

Authors

Abstract
This paper presents the design of the generalized Double Humped (DH) logistic map, used for pseudo-random number key generation (PRNG). The generalized parameter added to the map provides more control on the map chaotic range. A new special map with a zooming effect of the bifurcation diagram is obtained by manipulating the generalization parameter value. The dynamic behavior of the generalized map is analyzed, including the study of the fixed points and stability ranges, Lyapunov exponent, and the complete bifurcation diagram. The option of designing any specific map is made possible through changing the general parameter increasing the randomness and controllability of the map. An image encryption algorithm is introduced based on pseudo-random sequence generation using the proposed generalized DH map offering secure communication transfer of medical MRI and X-ray images. Security analyses are carried out to consolidate system efficiency including: key sensitivity and key-space analyses, histogram analysis, correlation coefficients, MAE, NPCR and UACI calculations. System robustness against noise attacks has been proved along with the NIST test ensuring the system efficiency. A comparison between the proposed system with respect to previous works is presented.

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Gesture recognition for improved user experience in augmented biology lab

Authors
Hassan G., Abdelbaki N.

Abstract
The Learning process in education systems is one of the most important issues that affect all societies. Advances in technology have influenced how people communicate and learn. Gaming Techniques (GT) and Augmented Reality (AR) technologies provide new opportunities for a learning process. They transform the student’s role from passive to active in the learning process. It can provide a realistic, authentic, engaging and interesting learning environment. Hand Gesture Recognition (HGR) is a major driver in the field of Augmented Reality (AR). In this paper, we propose an initiative Augmented Biology Lab (ABL) which mix between Augmented Reality and Gaming Techniques to make the learning process more effective in biology learning. Our contribution in this paper focuses on the integration of hand gesture recognition technique for the use within the proposed ABL to reduce the gap between biology lessons, especially in body anatomy and understanding in an interactive and collaborative way. Furthermore, we present a reliable and robust hand gesture recognition system (ABL-HGR). © 2018, Springer International Publishing AG.
Guidance optimization for tactical homing missiles and air defense systems

Authors
Alqudsi Y.S., El-Bayoumi G.M.

Abstract
The aim of this paper is to develop a functional approach to optimize the engagement effectiveness of the tactical homing missiles and air defense systems by utilizing the differential geometric concepts. In this paper the engagement geometry of the interceptor and the target is developed and expressed in differential geometric terms in order to demonstrate the possibilities of the impact triangles and specify the earliest interception based on the direct intercept geometry. Optimizing the missile heading angle and suitable missile velocity against the target velocity is then examined to achieve minimum missile latency, minimum time-to-go (time-to-hit) and minimum appropriate missile velocity that is guaranteed a quick and precise interception for the given target. The study terminates with different scenarios of engagement optimization with two-dimensional simulation to demonstrate the applicability of the DG approach and to show its properties. © 2018. Published by INCAS.
Health Records Privacy Issues in Cloud Computing

Authors
Elsayed M.S., Azer M.A.

Abstract
Personal health record service avail patients to store and dominate their healthy information data through the cloud. Many users like medical doctors, health care providers and family members can access this data through the internet. However, there are privacy issues related to data exposure and data breaches, causing risk to patients' lives. Encryption techniques like public key encryption are applied but they are not efficient and very complex, in addition to scalability problems. In this paper, various multi-authority attributes based on encryption solutions features are discussed that able to protect the privacy for E-Health records after divide it to private and public domains. © 2018 IEEE.
A fractional-order capacitor and inductor emulator, implemented using MOS transistors, instead of passive capacitors, is introduced in this paper. This is achieved using current mirrors as active elements, without passive resistors, and therefore reducing the circuit complexity and resulting in both a resistorless and capacitorless topology. The emulator has been designed by combining fractional-order differentiator or integrator topologies with a voltage-to-current converter. An important benefit from the design flexibility point of view is that the same topology could be used for emulating a fractional-order capacitor or inductor through an appropriate selection of the time constants and gain factors. Considering that the MOS transistors operate in the strong inversion region, it is feasible for this emulator to operate at high frequencies. The evaluation of the proposed topology has been performed using Cadence IC design suite and the Design Kit provided by the Austrian Micro Systems 0.35 μm CMOS process. © 2017, Springer Science+Business Media, LLC.
HTTP application layer DDoS attack mitigation using resources monitor

Authors
Mohamed M.A., Abdelbaki N.

Abstract
Denial of Service attacks are one of the most annoying day to day challenges for any security expert and IT professional. This is according to the attack nature. It can be run against any kind of network resources, whether exposed to the Internet or internally in a corporate network, regardless of the type of service it provides and its role in the network. There is no one complete solution or unified framework method against this type of attack. The most dangerous type of DoS attack is the DDoS type. The attack flow from many sources at the same time. In the context of mitigation from DDoS attack, the detection mechanisms are the first step in the way. Mechanisms like IPS and firewall are not effective because of the current challenging DDOS attack methods against application layer. The attackers use vulnerability in the application itself to disrupt the service it provides. Current mitigation techniques depend on preventing the attack traffic from reaching web servers. In this paper we study http application layer DDoS attacks against web servers. We propose new approach for mitigation that depends on absorbing the attack effects on the web server and increases server’s resistance against DDoS attacks. © 2018, Springer International Publishing AG.
Year: 2018

Hybrid feedback-based access scheme for cognitive radio systems

Authors

Abstract
In this paper, a cognitive radio system is studied in which the secondary user (SU) leverages the primary user (PU) channel quality indicator feedback (CQI) and the PU automatic repeat request (ARQ). The SU randomly accesses the PU channel with access probabilities based on its spectrum sensing outcome and the PU feedbacks. The SU's access probabilities are selected though an optimization problem with the objective to maximize the SU's throughput while ensuring the stability of the PU's packet queue. This system is modeled using a multidimensional Markov chain. This model enabled us to derive a closed-form expression for the SU's throughput, which is used in the throughput maximization problem. The proposed scheme is shown to improve the SU service rate compared to the system where no PU feedback is exploited by the SU, the system where the SU utilizes only the PU CQI feedback, and the system where the SU utilizes only the PU ARQ feedback. © 2017 IEEE.
Hybrid Information Filtering Engine for Personalized Job Recommender System

Authors
Heggo I.A., Abdelbaki N.

Abstract
The recommendation system, also known as recommender system or recommendation engine/platform, is considered as an interdisciplinary field. It uses the techniques of more than one field. Recommender system inherits approaches from all of machine learning, data mining, information retrieval, information filtering and human-computer interaction. In this paper, we propose our value-added architecture of the hybrid information filtering engine for job recommender system (HIFE-JRS). We discuss our developed system’s components to filter the most relevant information and produce the most personalized content to each user. The basic idea of recommender systems is to recommend items for users to suit their interests. Similarly the project tends to recommend relevant jobs for job-seekers by utilizing the concepts of recommender systems, information retrieval and data mining. The project solves the problem of flooding job-seekers with thousands of irrelevant jobs which is a frustrating and time-wasting process to let job-seekers rely on their limited searching abilities to dig into tons of jobs for finding the right job. © 2018, Springer International Publishing AG.
Hybrid rough-bijective soft set classification system

Authors
Inbarani H.H., Kumar S.U., Azar A.T., Hassanien A.E.

Abstract
In today’s medical world, the patient’s data with symptoms and diseases are expanding rapidly, so that analysis of all factors with updated knowledge about symptoms and corresponding new treatment is merely not possible by medical experts. Hence, the essential for an intelligent system to reflect the different issues and recognize an appropriate model between the different parameters is evident. In recent decades, rough set theory (RST) has been broadly applied in various fields such as medicine, business, education, engineering and multimedia. In this study, a hybrid intelligent system that combines rough set (RST) and bijective soft set theory (BISO) to build a robust classifier model is proposed. The aim of the hybrid system is to exploit the advantages of the constituent components while eliminating their limitations. The resulting approach is thus able to handle data inconsistency in datasets through rough sets, while obtaining high classification accuracy based on prediction using bijective soft sets. Toward estimating the performance of the hybrid rough-bijective soft set (RBISO)-based classification approach, six benchmark medical datasets (Wisconsin breast cancer, liver disorder, hepatitis, Pima Indian diabetes, echocardiogram data and thyroid gland) from the UCI repository of machine learning databases are utilized. Experimental results, based on evaluation in terms of sensitivity, specificity and accuracy, are compared with other well-known classification methods, and the proposed algorithm provides an effective method for medical data classification. © 2016, The Natural Computing Applications Forum.
Improved Production Key Performance Indicators (KPI's) Using Intelligent-Manufacturing Execution Systems (I-MES)

Authors
Mahmoud M.I., Ammar H.H., Eissa M.H., Hamdy M.M.

Abstract
The aim of this research is to reduce the gap between manufacture expertise and management expertise by using modern technology like Manufacturing Execution System (MES) via Artificial Intelligence (AI) and Machine Learning (ML). A design of MES has been proposed and implemented on El-Araby Plastic Injection Molding (PIM) factory. This work is based on the International Society of Automation Standard (ISA-S95). A fully automated data management system has been designed and implemented to control data flow between shop floor e.g. (machines and operators) and management floor e.g. (production, quality, inventory and Enterprise Resource Planning (ERP) staff). A real-time MES quality control and monitoring has been also designed and implemented using either classic computing, or AI and ML techniques. Fuzzy Logic (FL) controllers have been designed and implemented as feedforward controllers; to improve the performance of existed classical PID controller of injection parameters. An expert FL system has been used as one of AI techniques to implement manufacturer expertise in MES. An FL product quality classifier as ML has been designed and implemented depending on injection molding conditions to give the expected product quality. An expert system has been developed based on machine manufacturers, raw material suppliers and production engineer expertise’s using FL to give the injection parameters set points according to the product quality measure. The final results of this work are an intelligent computing system named (I-MES). © 2018, Springer International Publishing AG.
Intercept algorithm for maneuvering targets based on differential geometry and Lyapunov theory

Authors
Alqudsi Y.S., El-Bayoumi G.M.

Abstract
Nowadays, the homing guidance is utilized in the existed and under development air defense systems (ADS) to effectively intercept the targets. The targets became smarter and capable to fly and maneuver professionally and the tendency to design missile with a small warhead became greater, then there is a pressure to produce a more precise and accurate missile guidance system based on intelligent algorithms to ensure effective interception of highly maneuverable targets. The aim of this paper is to present an intelligent guidance algorithm that effectively and precisely intercept the maneuverable and smart targets by virtue of the differential geometry (DG) concepts. The intercept geometry and engagement kinematics, in addition to the direct intercept condition are developed and expressed in DG terms. The guidance algorithm is then developed by virtue of DG and Lyapunov theory. The study terminates with 2D engagement simulation with illustrative examples, to demonstrate that, the derived DG guidance algorithm is a generalized guidance approach and the well-known proportional navigation (PN) guidance law is a subset of this approach. © 2018. Published by INCAS.
Internet of Things security framework

Authors
Imam A.H., Azer M.A.

Abstract
For the past decade, Internet of Things (IoT) had an important role in our lives. It connects a large number of embedded devices. These devices fulfill very difficult and complicated tasks, which facilitate our work. Till now the security of IoT faces many challenges such as privacy, authentication, confidentiality, trust, middleware security, mobile security and policy enforcement. In order to provide a secure environment for IoT, this paper proposes a framework for IoT devices. © 2017 IEEE.
IoT Agile Framework Enhancement

Authors
Gabr B., Azer M.A.

Abstract
Internet of Things (IoT) is considered as a trend nowadays. Devices connected to the internet interact with surrounding; this poses strong challenges in handling big data with a certain level of security. In this paper IoT devices will be divided into two categories: high vulnerability devices and low vulnerability devices. The classification depends on the ease of attacks. In order to ensure the security of IoT devices, an agile approach is used to secure high vulnerability devices as first step and then low vulnerability devices by applying encryption algorithms. © 2018 IEEE.
IoT ethics challenges and legal issues

Authors
AboBakr A., Azer M.A.

Abstract
IoT systems have different technologies such as: RFID, NFC, 3G, 4G, and Sensors. Their function is to transfer very large sensitive and private data. There are many ethical challenges that need to be taken into consideration by individuals and companies that use this technology. Amongst the challenges is the user awareness of attack risks. This paper discusses different ethical and legal challenges that need to be taken in account for IoT health care applications during the near future. © 2017 IEEE.
Introducing Unicode characters to domain names enabled end users to register a domain name in different languages, i.e., Russian, Arabic or Chinese. This process is defined as Internationalized Domain Names (IDN). The Unicode standard contains a large number of characters and character sets. Some of those Unicode characters' sets may resemble some ASCII characters (this is commonly referred as 'homoglyph') which are the basic building blocks for a domain name address. As such, an attacker could use the concept of homoglyph to spoof a domain name and lure an innocent user to visit a decoy domain instead of a legitimate one. IDN domain spoofing could be best detected at the end user side or by using a centralized monitoring solution. This research work is focusing on the different IDN spoofing attack types, and it proposes a new centralized monitoring system that can detect those attacks. © 2018 IEEE.

Authors

Abstract
The Unmanned Aerial Vehicles (UAV) are widely used for capturing images in border area surveillance, disaster intensity monitoring, etc. An aerial photograph offers a permanent recording solution as well. But rapid weather change, low quality image capturing equipments results in low/poor contrast images during image acquisition by Autonomous UAV. In this current study, a well-known meta-heuristic technique, namely, Firefly Algorithm (FA) is reported to enhance aerial images taken by a Mini Unmanned Aerial Vehicle (MUAV) via optimizing the value of certain parameters. These parameters have a wide range as used in the Log Transformation for image enhancement. The entropy and edge information of the images is used as an objective criterion for evaluating the image enhancement of the proposed system. Inconsistent with the objective criterion, the FA is used to optimize the parameters employed in the objective function that accomplishes the superlative enhanced image. A low-light imaging has been performed at evening time to prove the effectiveness of the proposed algorithm. The results illustrate that the proposed method has better convergence and fitness values compared to Particle Swarm Optimization. Therefore, FA is superior to PSO, as it converges after a less number of iterations. © 2018 World Scientific Publishing Company.
LTE dynamic scheduling scheme for massive M2M and H2H communication

Authors
Alaa Y., ElAttar H.M., Digham F., Afify L.H., El Badawy H.

Abstract
Machine-to-Machine (M2M) has become a generally used term owing to the concept of the Internet of Things (IOT). M2M communications have numerous areas of implementation such as medicine, transportation, environmental monitoring, and smart grids. As the field of its implementation extends, the number of M2M equipment are projected to grow proportionally in the upcoming few years. Current cellular network technologies will not be able to cope with the expected increase in the number of M2M services while considering QoS as a major topic. Many applications of M2M are delay sensitive that will lead to overhead on the physical random access channel, in addition to the lack of their standardization. In this paper, a model is proposed, by using Non-Preemptive Queuing Model, in order to investigate the performance of different M2M and H2H traffic classes under dynamic Access Grant Time Interval (AGTI) controlled scheduling scheme. This is done by using M/G/m/m queuing model focusing on the resource utilization and the Quality of Service (QoS). The proposed technique achieves a better percentage in delay reduction and a less percentage of packet loss. © 2017 IEEE.
Malicious VBScript detection algorithm based on data-mining techniques

Authors
Wael D., Shosha A., Sayed S.G.

Abstract
Malware attacks are amongst the most common security threats. Not only malware incidents are rapidly increasing, but also the attack methodologies are getting more complicated. Moreover malware writers expand in using different platforms and languages. This raises the need for new detection methods which support more reliable, low resource consuming and fast solutions. In this paper, a new algorithm has been proposed based on machine learning techniques and static analysis features to detect malicious scripts specifically for VBScript files. Experimental results show that the proposed algorithm can achieve 97% detection ratio. © 2017 IEEE.
Mathematical analysis of gene regulation activator model

Authors

Abstract
This paper presents a complete analysis of the mathematical model of the gene regulation process. The model describes the induced gene expression under the effect of activators. The model differential equations are solved analytically, and the exact solution of the gene model is introduced. Moreover, a study of the model dynamics, including the fixed points and stability conditions are presented. The parameters effects on the phase plane portraits and the transient responses of the mRNA as well as the protein concentrations are intensively detailed. This work serves as a brick stone towards a complete model for a complete gene regulation biological process for future prediction and control of diseases at the genetic level. © 2018 IEEE.
Memristor-CNTFET based ternary logic gates

Authors
Soliman N.S., Fouda M.E., Radwan A.G.

Abstract
Multilevel electronic systems offer the reduction of implementation’ complexity, power consumption, and area. Ternary system is a very promising system where more information is represented in the same number of digits compared to the binary systems. In this paper, ternary logic gates and some of their ternary circuit applications are presented using memristors and CNTFET inverter. This integration between memristors and CNTFET offers low static power, small area and high performance. The proposed circuits do not require refreshment like the previously published circuits and are not initial state dependent because the memristors switch between the low resistance and high resistance states according to each input. In addition, we investigate the mathematical analysis of the proposed memristor ternary logic gates circuits. In the circuit simulations, a VTEAM model is used to verify the proposed circuits. Finally, a comparison between the proposed circuits with the previously published implementations is discussed showing better performance in terms of power, delay and area. © 2017 Elsevier Ltd
Minimization of Spread of Time-Constants and Scaling Factors in Fractional-Order Differentiator and Integrator Realizations

Authors
Kapoulea S., Psychalinos C., Elwakil A.S.

Abstract
The approximations of fractional-order differentiator/integrator transfer functions are currently performed using integer-order rational functions, which are in general implemented through appropriate multi-feedback topologies. The spreading in the values of time-constants and scaling factors, needed to implement these topologies, increases as the order of the differentiator/integrator and/or the order of the approximation increases. This leads to non-practical values of capacitances and resistances/transconductances in the implementation. A solution to overcome this obstacle is introduced in this paper, based on the employment of a combination of fractional-order and integer-order integrators and differentiators for implementing the desired function. The performance of the proposed scheme is verified through post-layout simulations using Cadence and the Design Kit provided by the Austria Mikro Systeme 0.35μm CMOS technology process. © 2018, Springer Science+Business Media, LLC, part of Springer Nature.
Year: 2018

Modeling of target tracking system for homing missiles and air defense systems

Authors
Alqudsi Y.S., El-Bayoumi G.M.

Abstract
One reason of why the guidance and control systems are imperfect is due to the dynamics of both the tracker and the missile, which appears as an error in the alignment with the LOS and delay in the response of the missile to change its orientation. Other reasons are the bias and disturbances as well as the noise about and within the system such as the thermal noise. This paper deals with the tracking system used in the homing guidance and air defense systems. A realistic model for the tracking system model is developed including the receiver servo dynamics and the possible disturbance and noise that may affect the accuracy of the tracking signals measured by the seeker sensor. Modeling the parameters variability and uncertainty is also examined to determine the robustness margin of the tracking system. © 2018. Published by INCAS.
Modified methods for solving two classes of distributed order linear fractional differential equations

Authors
Semary M.S., Hassan H.N., Radwan A.G.

Abstract
This paper introduces two methods for the numerical solution of distributed order linear fractional differential equations. The first method focuses on initial value problems (IVPs) and based on the $\alpha$th Caputo fractional definition with the shifted Chebyshev operational matrix of fractional integration. By applying this method, the IVPs are converted into simple linear differential equations which can be easily handled. The other method focuses on boundary value problems (BVPs) based on Picard's method frame. This method is based on iterative formula contains an auxiliary parameter which provides a simple way to control the convergence region of solution series. Several numerical examples are used to illustrate the accuracy of the proposed methods compared to the existing methods. Also, the response of mechanical system described by such equations is studied. © 2017 Elsevier Inc.
Year: 2018

Multistability Analysis and Function Projective Synchronization in Relay Coupled Oscillators

Authors
Azar A.T., Adele N.M., Tewa Alain K.S., Kengne R., Bertrand F.H.

Abstract
Regions of stability phases discovered in a general class of Genesio-Tesi chaotic oscillators are proposed. In a relatively large region of two-parameter space, the system has coexisting point attractors and limit cycles. The variation of two parameters is used to characterize the multistability by plotting the isospike diagrams for two nonsymmetric initial conditions. The parameters window in which the jerk system exhibits the unusual and striking feature of multiple attractors (e.g., coexistence of six disconnected periodic chaotic attractors and three-point attraction) is investigated. The second aspect of this study presents the synchronization of systems that act as mediators between two dynamical units that, in turn, show function projective synchronization (FPS) with each other. These are the so-called relay systems. In a wide range of operating parameters; this setup leads to synchronization between the outer circuits, while the relaying element remains unsynchronized. The results show that the coupled systems can achieve function projective synchronization in a determined time despite the unpredictability of the scaling function. In the coupling path, the outer dynamical systems show finite-time synchronization of their outputs, that is, displaying the same dynamics at exactly the same moment. Further, this effect is rather general and it has a wide range of applications where sustained oscillations should be retained for proper functioning of the systems. © 2018 Ahmad Taher Azar et al.
Multi-switching master–slave synchronization of non-identical chaotic systems

Authors
Singh S., Azar A.T., Zhu Q.

Abstract
This paper investigates the multi-switching master–slave synchronization of non-identical chaotic systems in which state variables of a master system are synchronized with different state variables of a slave system using the sliding mode control technique. To design the appropriate controllers via sliding mode control for different switches, Lyapunov stability theory is taken into account. Theoretical results are applied by considering two non-identical chaotic systems where one is considered as master system and another is considered as slave system. Numerical simulations are performed to justify the theoretical results discussed. © Springer Nature Singapore Pte Ltd. 2018.
Nicotinic Acid Coated Magnetite Nanorods Evaluation by Lipid Profile Analysis and Genetic Tests

Authors
Attallah O.A., Khalil W.K.B., Mottaleb M.M.S.A., Girgis E.

Abstract
In our present work some biological tests were carried out to assess the biocompatibility of nicotinic acid coated magnetite nanorods. Pure and coated nanorods were injected intraperitoneally to cholesterol fed mice with dose values of 25, 50 mg/Kg. Investigations were done on treated mice with/without exposure to low frequency electromagnetic field (EMF) and samples were collected fourteen days post treatment. Toxicological effects were evaluated using Micronucleus and DNA fragmentation analysis. The results indicated that low dose (25 mg/Kg) nicotinic acid coated nanorods had insignificant toxicological effects in comparison to that of control group. Lipid profile analysis and gene expression of atheroprotective (eNOS) and atherogenic (p65) genes were also investigated. It was found that experimental groups treated with low dose nicotinic acid coated magnetite nanorods and exposed to EMF showed interesting alterations in mice lipid profile. As a result, an insignificant but slight increase in gene expression levels of eNOS and a significant decrease in p65 gene expression were observed. Our study suggests that our proposed magnetic nanosystem in combination with EMF has good biocompatibility and can be a potential drug precursor with therapeutic values.
Year: 2018

Noise-estimation-based anisotropic diffusion approach for retinal blood vessel segmentation

Authors
Ben Abdallah M., Azar A.T., Guedri H., Malek J., Belmabrouk H.

Abstract
Recently, numerous research works in retinal-structure analysis have been performed to analyze retinal images for diagnosing and preventing ocular diseases such as diabetic retinopathy, which is the first most common causes of vision loss in the world. In this paper, an algorithm for vessel detection in fundus images is employed. First, a denoising process using the noise-estimation-based anisotropic diffusion technique is applied to restore connected vessel lines in a retinal image and eliminate noisy lines. Next, a multi-scale line-tracking algorithm is implemented to detect all the blood vessels having similar dimensions at a selected scale. An openly available dataset, called “the STARE Project’s dataset,” has been firstly utilized to evaluate the accuracy of the proposed method. Accordingly, our experimental results, performed on the STARE dataset, depict a maximum average accuracy of around 93.88%. Then, an experimental evaluation on another dataset, named DRIVE database, demonstrates a satisfactory performance of the proposed technique, where the maximum average accuracy rate of 93.89% is achieved. © 2017, The Natural Computing Applications Forum.
On the Analysis and Design of Fractional-Order Chebyshev Complex Filter

Authors
AbdelAty A.M., Soltan A., Ahmed W.A., Radwan A.G.

Abstract
This paper introduces the concept of fractional-order complex Chebyshev filter. A fractional variation of Chebyshev differential equations is introduced based on Caputo fractional operator. The proposed equation is solved using fractional Taylor power series method. The condition for fractional polynomial solutions is obtained and the first four polynomials scaled using an appropriate scaling factor. The fractional-order complex Chebyshev low-pass filter based on the obtained fractional polynomials is developed. Two methods for obtaining the transfer functions of the complex filter are discussed. Circuit implementations are simulated using Advanced Design System (ADS) and compared with MATLAB numerical simulation of the obtained transfer functions to prove the validity of the two approaches. © 2017, Springer Science+Business Media New York.
On the Effect of Uplink Power Control on Temporal Retransmission Diversity

Authors
Arshad R., Afify L.H., El Sawy H., Al-Naffouri T.Y., Alouini M.

Abstract
Using stochastic geometry, this article studies the retransmission performance in uplink cellular networks with fractional path-loss inversion power control (FPC). We first show that the signal-to-interference-ratio (SIR) is correlated across time, which imposes temporal diversity loss in the retransmission performance. In particular, FPC with lower path-loss compensation factor decreases inter-cell interference but suffers from degraded retransmission diversity. On the other hand, full path-loss inversion achieves almost full temporal diversity (i.e., temporal SIR independence) at the expense of increased inter-cell interference. To this end, the results show that ramping-down the power upon transmission failure improves the overall coverage probability in interference-limited uplink networks. IEEE
Optimal resource allocation for green and clustered video sensor networks

Authors
Arar A., Mohamed A., El-Sherif A.A., Leung V.C.M.

Abstract
Wireless video sensor networks (WVSNs) are opening the door for many applications, such as industrial surveillance, environmental tracking, border security, and infrastructure health monitoring. In WVSN, energy conservation is very essential because: 1) sensors are usually battery-operated and 2) each sensor node needs to compress the video prior to transmission, which consumes more power than conventional wireless sensor networks. In this paper, we study the problem of minimizing the total power consumption in a cluster-based WVSN, leveraging cross-layer design to optimize the encoding power, the transmission power, and the source rate at each sensor node. To realize this problem, we devise a resource optimization framework, which takes into account the video signal distortion due to compression, in addition to packet loss in the wireless channel while trying to allocate network resources among multiple video sensors. Leveraging duality theory, we design a proximal minimization algorithm that is capable of achieving the optimal allocation of network resources, source rates, and encoding and communication powers, while providing application-level quality of service represented by video distortion. The algorithm is extended for sensor nodes with hybrid energy sources, leveraging energy harvesting to minimize the aggregate power, while addressing the tradeoff between renewable versus grid energy sources. © 2007-2012 IEEE.
Year: 2018

Optimal uplink and downlink resource allocation for wireless powered cellular networks

Authors
El Diwany B.E., El-Sherif A.A., El Batt T.

Abstract
In this paper, we characterize optimal resource allocation for the uplink and downlink of wireless powered cellular networks (WPCNs). In particular, we investigate a time-slotted WPCN, where a hybrid access point (HAP) is in charge of energy replenishing of M cellular users (CUs), along with transmission/reception of information to/from them. Unlike prior works, which give attention to information transmission in only one direction (either uplink or downlink), our work incorporates information transmission in both directions, along with energy transfer over the downlink. Besides harvesting energy explicitly from the HAP, each user opportunistically harvests the RF energy borne by the information sent by the HAP over the downlink to the remaining M - 1 users, in order to boost its uplink throughput. Towards this objective, we formulate the total (uplink and downlink) sum throughput maximization problem to characterize the optimal time allocation for energy, downlink information, and uplink information slots, subject to time allocation constraints. Furthermore, we establish the convexity of the problem, and an efficient algorithm based on the gradient projection method is proposed. The obtained numerical results reveal valuable insights about the fairness-throughput trade-offs. Moreover, and among others, the network dynamics are introduced, which clarify how the optimal time allocation pattern is changed in accordance with the change of the users' placement, and the HAP's transmission power, in both energy and information slots. © 2017 IEEE.
Passivity based decoupling of lagrangian systems

Authors
Azar A.T., Serrano F.E.

Abstract
In this article a novel decoupling strategy for complex systems, in specific, Lagragian models which represents mechanical systems is proposed. In this study a passivity based approach is shown considering that the decoupling law improves some results found in literature in which only a state feedback decoupling law is implemented. The passivity based decoupling law is obtained by selecting an appropriate storage function and then the $\alpha$ and $\beta$ functions for the passivity based controller are obtained to yield the optimal system performance so the decoupled system response is similar to the coupled system. One of the advantages of the passivity based decoupling is the energy considerations in the design of the decoupling law, so this approach provides an efficient strategy to be implemented in the design of different kinds of controllers where the difference of the response between the decoupled and coupled Lagrangian system is not significant. The Lagrangian system studied in this work is highly coupled considering that most of the mechanical systems and robots have a strong coupling due to the kinematic and dynamic model obtained by the Euler-Lagrange formulation. It is proved by experiments that the theoretical results shown in this study provide optimal results. © 2018, Springer International Publishing AG.
Predicting all star player in the national basketball association using random forest

Authors
Soliman G., El-Nabawy A., Misbah A., Eldawlatly S.

Abstract
National Basketball Association (NBA) All Star Game is a demonstration game played between the selected Western and Eastern conference players. The selection of players for the NBA All Star game purely depends on votes. The fans and coaches vote for the players and decide who is going to make the All Star roster. A player who continues to receive enough votes in following years will play more All Star games. The selection of All Star players in NBA is subjective based on voting and there are no selection criteria that take out the human bias and opinion. Analyzing data from previous sports leagues can provide insight into the factors that lead to winning games and titles. This study aims to classify the players into regular or All Star players from the National Basketball Association and identify the most important characteristics that make a player an All Star player. To accomplish this, the performance per minute of play and per average of total minutes of player were analyzed using Random Forest supported in Apache Spark's scalable machine learning library to identify which variables best predict the regular and All Star players categories. The NBA men basketball dataset is used that is publically available at open source sports in the period 1937 till 2011. This study showed that Random Forest predicts All Star players with an accuracy of 92.5% when studying the performance per average of total minutes of player, whereas an accuracy of 92.48% is obtained for the performance per minute of play. The results identified the features of importance that contribute significantly to scoring and performance index rating of player. In this study, the Cross-Industry Standard Process for Data Mining (CRISP-DM) methodology is implemented to address the data mining problem in consistent and professional way. CRISP-DM presents a hierarchical and iterative process model, and provides an extendable framework with generic-To-specific approach, starting from six phases, which are further detailed by generic and then specialized tasks. © 2017 IEEE.
Year: 2018

Preface

Authors
Azar A.T., Vaidyanathan S.

Abstract
[No abstract available]
Proactive power allocation and caching node selection for regular service guarantees

Authors
Abdellatif B., Tadrous J., Khafagy M.G., Khattab T.

Abstract
This paper studies the potential of proactive resource allocation to prolong the communication sessions in networks with limited energy budgets and stringent quality-of-service (QoS) requirement, particularly a regular service guarantee. A threshold-based proactive communication policy is proposed to minimize the consumed transmission energy and maximize the network lifetime based on the different link states and the buffer state at the destination node. A closed-form expression is presented for the proactive gain in terms of the channel gain threshold, the amount of the proactively-transmitted data, the QoS requirement, and the channel statistics. The optimal amount of proactively-transmitted data is also provided in closed-form. Finally, corroborated by numerical simulations, the performance of the proposed proactive policy is compared to simple non-proactive communication, as well as non-causal transmission with perfect genie-aided channel knowledge. The presented results show the promising proactivity gains that can be reaped when channel statistics are further taken into account, as compared to legacy myopic approaches which allocate power based solely on instantaneous channel conditions. © 2018 IEEE.
Proportional integral loop shaping control design with particle swarm optimization tuning

Authors
Azar A.T., Serrano F.E., Vaidyanathan S.

Abstract
Backlash is one of several discontinuities found in different kinds of systems. It can be found in actuators of different types, such as mechanical and hydraulic, giving way to unwanted effects in the system behavior. Proportional integral (PI) loop shaping control design implementing a describing function to find the limit cycle oscillations and the appropriate control gain selection by particle swarm optimization is developed. Therefore, a frequency domain approach is implemented for the control of nonlinear system of any kind such as robotics, mechatronics, and other kind of mechanisms, electrical motors, etc. Finally, in order to corroborate the theoretical background explained in this chapter, the stabilization of a cart-pendulum system with the proposed control strategy is shown. © 2018, IGI Global. All rights reserved.
Abstract

Recently, fractional edge detection algorithms have gained focus of many researchers. Most of them concern on the fractional masks implementation without optimization of threshold levels of the algorithm for each image. One of the main problems of the edge detection techniques is the choice of optimal threshold for each image. In this paper, the genetic algorithm has been used to get the optimal threshold levels for each image to enhance the edge detection of the fractional masks. A fully automatic way to cluster an image using K-means principle has been applied to different fractional edge detection algorithms to extract required number of thresholds to be optimized by the genetic algorithm. A performance comparison has been done between different fractional algorithms with and without genetic algorithm. Evaluation of the noise performance upon the addition of salt and pepper noise is measured through the peak signal to noise ratio (PSNR) and bit error rate (BER) simulated by using MATLAB. © 2018, Intelligent Network and Systems Society.
Replay attack on lightweight CAN authentication protocol

Authors
Noureldeen P., Azer M.A., Refaat A., Alam M.

Abstract
Day after day, users' expectations of tomorrow vehicles' features are increasing. Although the industry's prime goal is users' satisfaction, many unsolved problems are still present. Amongst the major challenges are the huge interconnections and dependability within the Electronic Control Unit (ECU) used inside vehicles. Five years ago, the number of ECUs within a vehicle was about 70 ECUs. This number has doubled nowadays, and it is expected to double again in the near future. This adds challenges to both of network management and network security. The purpose of this paper is to enhance the CAN immunity against attacks. In this paper, we focus on the lightweight CAN authentication protocol, investigate the protocol immunity against Denial of service attack, and propose a solution for this attack. As a result, we achieve security protocol that is suitable for all security aspects. © 2017 IEEE.
Review of fractional-order electrical characterization of supercapacitors

Authors

Abstract
The tests and calculation of the key performance metrics of supercapacitors including capacitance, power and energy stored are commonly reported by the academia and the industry based on formulæ valid only for ideal capacitors. This is inconsistent with the fact that supercapacitors exhibit electrical behaviors that are different from those of ideal capacitors whether they are looked at in the time domain or in the frequency domain. This results inevitably in errors in their characterization, design and system integration. Based on recent literature, this review article is an attempt to present and discuss the main differences between ideal capacitors and supercapacitors, and especially how the performance metrics of the latter depend on the operating frequency, the charging/discharging waveform type as well as their deviation from ideality. We present a set of calculation methods for supercapacitor metrics using fractional-order calculus when such devices are operated under the commonly used (i) sinusoidal excitation, (ii) step current input and (iii) linear voltage input. We hope to bring such analysis, which is proven to be much more reliable and effective than the standard integer-order-based analysis of ideal capacitors, to the attention of researchers, manufacturers, and end-users of these devices particularly as their range of application is surging. © 2018 Elsevier B.V.
Role of 3-Acetyl-11-Keto-Beta-Boswellic Acid in Counteracting LPS-Induced Neuroinflammation via Modulation of miRNA-155

Authors
Sayed A.S., Gomaa I.E.O., Bader M., El Sayed N.S.E.D.

Abstract
Neuroinflammation is one of the most important mechanisms underlying neurodegeneration. Lipopolysaccharide (LPS) is a potent inflammogen which causes cognitive dysfunction. Boswellia serrata is known since many years as a powerful anti-inflammatory herbal drug. Its beneficial effect mainly arises from inhibition of 5-lipoxygenase (5-LO) enzyme. 3-acetyl-11-keto-β-boswellic acid (AKBA) is the most potent 5-LO inhibitor extracted from the oleo-gum-resin of Boswellia serrata. The aim of the present work is to study the molecular mechanisms underlying the anti-inflammatory and neuroprotective effects of AKBA and dexamethasone (DEX) in LPS-induced neuroinflammatory model. A single intraperitoneal (i.p.) dose of LPS (0.8 mg/kg) was injected to induce cognitive dysfunction. The LPS-treated mice were administered for 7 days with either AKBA or DEX at intraperitoneal doses of 5 and 1 mg/kg, respectively. Cognitive, locomotor functions, and anxiety level were first examined. The level of the phosphorylated inhibitory protein for NF-κB, IκB-α (P-IκB-α), was measured, and the expression levels of the inflammatory microRNA-155 (miR-155) and its target gene, suppressor of cytokine signaling-1 (SOCS-1), were determined in the brain. Moreover, the level of carbonyl proteins as a measure of oxidative stress and several cytokines as well as markers for apoptosis and amyloidogenesis was detected. Results showed that AKBA and DEX reversed the behavioral dysfunction induced by LPS. AKBA decreased P-IκB-α, miRNA-155 expression level, and carbonyl protein content. It restored normal cytokine level and increased SOCS-1 expression level. It also showed anti-apoptotic and anti-amyloidogenic effects in LPS-injected mice. These findings suggest AKBA as a therapeutic drug for alleviating the symptoms of neuroinflammatory disorders. © 2017, Springer Science+Business Media, LLC.
Rough set theory with Jaya optimization for acute lymphoblastic leukemia classification

Authors
Jothi G., Inbarani H.H., Azar A.T., Devi K.R.

Abstract
Early diagnosis of malignant leukemia can enormously help the physicians in choosing the right treatment for the patient. A lot of diagnostic techniques are available to identify leukemia disease, but these techniques are costly. Hence, there is a need for a less time-consuming and cost-effective method for the classification of leukemia blood cells. In this paper, application of graphical user interface technique for the differentiation of acute lymphoblastic leukemia nucleus from healthy lymphocytes in a medical image is described. This method employs backtrack search optimization algorithm for clustering. Five different categories of features are extracted from the segmented nucleus images, i.e., morphological, wavelet, color, texture and statistical features. Feature selection plays a very important role in medical image processing. It reduces the computational time and memory space. The hybrid intelligent framework includes the benefits of the basic models; and in the meantime, it overcomes their limitations. Three different kinds of hybrid supervised feature selection algorithms such as tolerance rough set particle swarm optimization-based quick reduct, tolerance rough set particle swarm optimization-based relative reduct and tolerance rough set firefly-based quick reduct are applied for selecting prominent features. These algorithms incorporate the strengths of evolutionary algorithms. The redundant features are eliminated to generate the reduced set which gives predictive capability equal to that of the original set of features. Jaya algorithm is applied for optimizing the rules generated from classification algorithms. Classification algorithms such as Naïve Bayes, linear discriminant analysis, K-nearest neighbor, support vector machine, decision tree and ensemble random undersampling boost are applied on leukemia dataset. Experimental results depict that the above classification algorithms after optimizing with Jaya algorithm improve classification accuracy compared to the results obtained before optimizing with Jaya algorithm. © 2018 The Natural Computing Applications Forum
Self-excited attractors in jerk systems: Overview and numerical investigation of chaos production

Authors
Sayed W.S., Radwan A.G., Abd-El-Hafiz S.K.

Abstract
Chaos theory has attracted the interest of the scientific community because of its broad range of applications, such as in secure communications, cryptography or modeling multi-disciplinary phenomena. Continuous flows, which are expressed in terms of ordinary differential equations, can have numerous types of post transient solutions. Reporting when these systems of differential equations exhibit chaos represents a rich research field. A self-excited chaotic attractor can be detected through a numerical method in which a trajectory starting from a point on the unstable manifold in the neighborhood of an unstable equilibrium reaches an attractor and identifies it. Several simple systems based on jerk-equations and different types of nonlinearities were proposed in the literature. Mathematical analyses of equilibrium points and their stability were provided, as well as electrical circuit implementations of the proposed systems. The purpose of this chapter is double-fold. First, a survey of several self-excited dissipative chaotic attractors based on jerk-equations is provided. The main categories of the included systems are explained from the viewpoint of nonlinearity type and their properties are summarized. Second, maximum Lyapunov exponent values are explored versus the different parameters to identify the presence of chaos in some ranges of the parameters. © 2018, Springer International Publishing AG.
Abstract

Mobile communication networks are using signaling protocols to allow mobile users to communicate using short messages, phone calls and mobile data. Signaling protocols are also used to manage billing for operators and much more. The design flaws that signaling inherits made them vulnerable to attacks such as location tracking of subscriber, fraud, calls and SMS interception. With the high rate of these emerging attacks on telecommunication protocols there is a need to create a comprehensive penetration testing framework for signaling. In this paper, we propose a framework called Sigploit that takes into consideration the following protocols: SS7, GTP, Diameter and SIP. © 2018 IEEE.
Simple MOS-based circuit designed to show pinched hysteresis behavior

Authors
Maundy B., Elwakil A., Psychalinos C.

Abstract
We propose and validate a simple 3-transistor MOS circuit that shows an all-positive pinched hysteresis behavior. Complete analysis of the circuit is provided along with experimental results using a commercial CMOS transistor array. Copyright © 2018 John Wiley & Sons, Ltd.
Single active element implementation of fractional-order differentiators and integrators

Authors
Kapoulea S., Psychalinos C., Elwakil A.S.

Abstract
A novel topology for implementing fractional-order differentiator and integrator transfer functions is presented in this paper. This topology is based on the employment of a second generation Current Conveyor with EXtra inputs (EX-CCII), passive resistors, and fractional-order capacitors. The main benefit offered by this implementation is that both fractional-order differentiator and integrator transfer functions are simultaneously available at different output terminals, and that their frequency characteristics can be orthogonally adjusted without disturbing each other. With only one EX-CCII device needed, the proposed design is attractive from the active component count point of view. As an application example, a fractional-order controller is designed in order to control the velocity of a small scale submersible equipped with one propeller. Evaluation of the performance of the presented topology is performed using Cadence and the Design Kit provided by the Austria Mikro Systeme (AMS) 0.35μm CMOS process, as well as through experimental results. © 2018 Elsevier GmbH
Sliding mode control technique for multi-switching synchronization of chaotic systems

Authors

Abstract
In this manuscript, a sliding mode control technique is proposed for multi-switching synchronization of chaotic systems in which state variables of a master system are synchronized with different state variables of a slave system. Based on the sliding mode control technique and Lyapunov stability theory, the suitable controllers are designed for different switches. To implement this methodology, Lorenz chaotic system is taken as a master system and Pehlivan chaotic system is taken as a slave system. Simulation results are carried out to justify the theoretical results and revealed that the error dynamics tends to zero and required synchronization is obtained. © 2017 IEEE.
Speech encryption using generalized modified chaotic logistic and tent maps

Authors
Sayed W.S., Tolba M.F., Radwan A.G., Abd-El-Hafiz S.K.

Abstract
This paper presents a speech encryption application, which utilizes several proposed generalized modified discrete chaotic maps based on the logistic and tent maps for pseudo-random number generation. The generalization scales the output range and the key space. The modification controls the bounds on the output range through a parameter such that chaotic output exists for almost all values of the parameter. Consequently, the modified maps do not suffer from the inherited problems of conventional chaotic generators such as islands of stability and drifting from chaos due to dynamical degradation induced by finite precision. The security and efficiency of the speech encryption scheme is validated through perceptual and statistical aspects, key sensitivity, resistance to brute force and differential attacks and computational complexity. © 2018 IEEE.
Abstract
Cyber crime is a growing threat affecting all business sectors. Stock Exchanges, a financial services sector, are not far from it. Trading stocks via Internet exposes the process to cyber threats that might take advantage of a system defect to breach security and cause possible harm. Online Trading websites are protected by various security systems. Digital Certificate, which is based on Secure Socket Layer (SSL) protocol, is an example. This research examines implementation of Digital Certificate in online trading servers. This evaluation helps to identify security weaknesses and take actions for protection improvement. © 2018, Springer International Publishing AG.
Study of fractional flux-controlled memristor emulator connections

Authors

Abstract
In this paper, the series and parallel connections of the fractional flux-controlled memristors are studied. Asymmetric I-V hysteresis with high I-V nonlinearity can be obtained from single fractional memristor as reported in literature. However, connecting different memristor emulators can convert the asymmetric hysteresis to symmetric one and maintaining the high I-V nonlinearity to be used in some memristor devices. The proposed circuits have been analyzed mathematically to study the effect of changing the frequency and fractional power. Different cases have been verified on PSpice using commercial off the shelf components. Some experimental results are provided. © 2018 IEEE.
Sybil attack prevention through identity symmetric scheme in vehicular ad-hoc networks

Authors
Khalil M., Azer M.A.

Abstract
Vehicular Ad-hoc Networks (VANETs) are a subset of Mobile Ad-hoc Networks (MANETs). They are deployed to introduce the ability of inter-communication among vehicles in order to guarantee safety and provide services for people while driving. VANETs are exposed to many types of attacks like denial of service, spoofing, ID disclosure and Sybil attacks. In this paper, a novel lightweight approach for preventing Sybil attack in VANETs is proposed. The presented protocol scheme uses symmetric key encryption and authentication between Road Side Units (RSUs) and vehicles on the road so that no malicious vehicle could gain more than one identity inside the network. This protocol does not need managers for Road Side Units (RSUs) or Certification Authority (CA) and uses minimum amount of messages exchanged with RSU making the scheme efficient and effective. © 2018 IEEE.
Targeted photodynamic-induced singlet oxygen production by peptide-conjugated biodegradable nanoparticles for treatment of skin melanoma

Authors
Sebak A.A., Gomaa I.E.O., ElMeshad A.N., AbdelKader M.H.

Abstract
Background: Photodynamic therapy (PDT) has been determined to be a promising treatment modality in the most resistant tumors such as malignant melanoma. However, the key cytotoxic agent of PDT, singlet oxygen (1O2) - represents a high risk of photodynamic-associated side effects e.g. skin photosensitization. Recently, controllable photosensitization, where 1O2 is produced on demand, has received increasing attention. In our study, this could be achieved via loading the photosensitizer (PS) in nanoparticles (NPs) decorated with target-specific moieties characterized by 1O2 quenching abilities to specifically locate the PS in the targeted cells and assure that 1O2 is only produced where desired after cellular processing. Methods: Polymeric and hybrid lipid-polymer NPs were formulated and assayed for their physicochemical properties. This was followed by conjugation with an active targeting ligand, cRGDyk, cyclic (Arginine-Glycine-Aspartic acid-D-Tyrosine-Lysine) peptide. Finally, photodynamic potential of the selected formulations was assayed by quantification of 1O2 production and in vitro cytotoxicity. Results: Three formulations were selected and nominated to be formulations of choice (FOCs); FOC-1 (200 nm, polymeric), FOC-2 (130 nm, polymeric) and FOC-3 (200 nm, hybrid). Physicochemical properties, most importantly particle size and NPs’ composition have shown to be the major determinants in targeted NPs’ 1O2 production and PDT-mediated cytotoxicity of melanoma. Conclusion: Proper selection of formulations intended for PDT application and target-specific ligands could achieve dual targeting; enhanced accumulation of NPs and protection of 1O2 production elsewhere other than target cells. © 2018 Elsevier B.V.
TLBO algorithm optimized fractional-order PID controller for AGC of interconnected power system

Authors

Abstract
The present study focuses on the problem of automatic generation control (AGC) by employing the design of fractional-order proportional–integral–derivative controller (FOPID). A hydrothermal power system with governor dead band (GDB) and generation rate constraint (GRC) is considered for investigation. FOPID controller optimal values are obtained by using teacher learning-based optimization (TLBO) technique, and the employed objective function is integral time-multiplied absolute error (ITAE). The supremacy of the proposed controller is also shown by comparing with PID controller. Further, the performance of the system is analyzed by varying parameter values of the system. From the simulation results, it reveals that TLBO optimized FOPID controller minimizes the errors in frequency of the control areas and tie-line power effectively. © Springer Nature Singapore Pte Ltd. 2019.
The surge in demand for Internet of Things (IoT) systems and applications has motivated a paradigm shift in the development of viable radio frequency identification technology (RFID)-based solutions for ubiquitous real-Time monitoring and tracking. Bit tracking-based anti-collision algorithms have attracted considerable attention, recently, due to its positive impact on decreasing the identification time. We aim to extend bit tracking to work effectively over erroneous channels and scalable multi RFID readers systems. Towards this objective, we extend the bit tracking technique along two dimensions. First, we introduce and evaluate a type of bit errors that appears only in bit tracking-based anti-collision algorithms called false collided bit error in single reader RFID systems. A false collided bit error occurs when a reader perceives a bit sent by tag as an erroneous bit due to channel imperfection and not because of a physical collision. This phenomenon results in a significant increase in the identification delay. We introduce a novel, zero overhead algorithm called false collided bit error selective recovery tackling the error. There is a repetition gain in bit tracking-based anti-collision algorithms due to their nature, which can be utilized to detect and correct false collided bit errors without adding extra coding bits. Second, we extend bit tracking to 'error-free' scalable multi-reader systems, while leaving the study of multi-readers tag identification over imperfect channels for future work. We propose the multi-reader RFID tag identification using bit tracking (MRTI-BT) algorithm which allows concurrent tag identification, by neighboring RFID readers, as opposed to time-consuming scheduling. MRTI-BT identifies tags exclusive to different RFIDs, concurrently. The concept of bit tracking and the proposed parallel identification property are leveraged to reduce the identification time compared to the state-of-The-Art. © 2013 IEEE.
Year: 2018

Towards optimal resource allocation in caching at relay networks

Authors
Mohamed A.M., Hassan R.A., Nafie M., Batt T.E., Digham F.

Abstract
We investigate the performance of caching in relay networks where an intermediate relay station (RS) caches content for future demand by end users. With uncertain user demand over multiple data items and dynamically changing wireless links, we characterize the optimal transmission time for serving data items, cached data portion allocation of relay station and optimal service portion, which represents a part from the cached portion, to minimize the total average transmission energy. We argue that under several settings fully caching the higher popular items is the optimal caching policy which minimizes the total expected transmission energy. © 2018 IEEE.
True random bit generators based on current time series of contact glow discharge electrolysis

Authors
Rojas A.E., Allagui A., Elwakil A.S., Alawadhi H.

Abstract
Random bit generators (RBGs) in today's digital information and communication systems employ a high rate physical entropy sources such as electronic, photonic, or thermal time series signals. However, the proper functioning of such physical systems is bound by specific constrains that make them in some cases weak and susceptible to external attacks. In this study, we show that the electrical current time series of contact glow discharge electrolysis, which is a dc voltage-powered micro-plasma in liquids, can be used for generating random bit sequences in a wide range of high dc voltages. The current signal is quantized into a binary stream by first using a simple moving average function which makes the distribution centered around zero, and then applying logical operations which enables the binarized data to pass all tests in industry-standard randomness test suite by the National Institute of Standard Technology. Furthermore, the robustness of this RBG against power supply attacks has been examined and verified. © 2018 Author(s).
Tunnel-Based EAP Effective Security Attacks WPA2 Enterprise Evaluation and Proposed Amendments

Authors
Abo-Soliman M.A., Azer M.A.

Abstract
Tunnel-Based Extensible Authentication Protocol has become fundamental for wireless Network access Control. It provides authentication, privacy and authorization for enterprise network access protected by WPA/WPA2 security framework. WPA2 is considered the latest and most secure standard for wireless communication especially for Wi-Fi networks. However, WPA/WPA2-PSK have been lately threatened by advanced versions of wireless attacks. In this paper, we study WPA/WPA2-Enterprise authentication with Tunnel-Based EAP common methods focusing on their strength and weak points and the impact of recent WPA/WPA2 attacks. We also propose protection techniques to mitigate discovered security flaws. © 2018 IEEE.
Abstract
This paper presents two general topologies of fractional order oscillators. They employ Current Feedback Op-Amp (CFOA) and RC networks. Two RC networks are investigated for each presented topology. The general oscillation frequency, condition and the phase difference between the oscillatory outputs are investigated in terms of the fractional order parameters. Numerical simulations and P-Spice simulation results are provided for some cases to validate the theoretical findings. The fractional order parameters increase the design flexibility and controllability which is proved by the provided experimental results. © 2018 IEEE.
Year: 2018

Using deep neural networks for extracting sentiment targets in arabic tweets

Authors
El-Kilany A., Azzam A., El-Beltagy S.R.

Abstract
In this paper, we investigate the problem of recognizing entities which are targeted by text sentiment in Arabic tweets. To do so, we train a bidirectional LSTM deep neural network with conditional random fields as a classification layer on top of the network to discover the features of this specific set of entities and extract them from Arabic tweets. We’ve evaluated the network performance against a baseline method which makes use of a regular named entity recognizer and a sentiment analyzer. The deep neural network has shown a noticeable advantage in extracting sentiment target entities from Arabic tweets. © 2018, Springer International Publishing AG.
Validation of the Nonlinear Superposition Method (NSM) for elastic shakedown limit pressures via comparison with experimental test results of spherical vessels with radial and oblique nozzles

Authors
Abdalla H.F., Megahed M.M.

Abstract
The present research revisits rare experiments which determined elastic shakedown (SD) limit pressures of full scale radial and oblique nozzles partially penetrating spherical vessels. The experiments were conducted at Berkeley Nuclear Laboratories in England [1]. The SD limit pressures were determined via conducting consecutive series of internal pressure cycles and observing cyclic strain variation recorded by strain gauges cemented at predetermined various critical locations within the junctions’ vicinities. The Nonlinear Superposition Method (NSM), formulated for computing elastic SD limit loads based on Melan's lower bound SD theorem, is successfully validated against recorded experimental outcomes for both nozzle configurations. Furthermore, full elastic-plastic cyclic loading finite element simulations were executed and illustrated very good correlation to the NSM results. © 2018 Elsevier Ltd
Year: 2018

Weighted sum degrees of freedom of the asymmetric MIMO Y channel with common and private messages

Authors
Salah M., El-Keyi A., Nafie M., Mohasseb Y.

Abstract
This paper investigates the weighted sum degrees of freedom (DoF) of the MIMO Y channel that consists of three users, where the j-Th user is equipped with Mj antennas, and a relay equipped with N antennas. In this network, each user conveys two private messages to the other two users in addition to a common message directed to both of them. As there is no direct link between the users, communication occurs through the relay. We define a weighted sum DoF metric that integrates all the network messages and weights the common message by a factor of $\alpha$. Then, we study the weighted sum DoF maximization problem for $\alpha \geq 0$. Specifically, we show that the weighted sum DoF of the network, with $M_1 \geq M_2 \geq M_3$, is given by $\min\{2N, 2M_2+2M_3, M_1+M_2+M_3\}$, for $0 \leq \alpha \leq 4/3$. While, for $4/3 < \alpha \leq 2$, the weighted sum DoF is equal to $\min\{3\alpha N/2, 2(N-M_3) + 3\alpha M_3/2, 2(2N-M_2-M_3) + 3\alpha(M_2+M_3-N)/2, (6N-2(M_1+M_2+M_3)) + 3\alpha(M_1+M_2+M_3-2N)/2, 2M_2+2M_3, M_1+M_2+M_3\}$, and finally, for $\alpha > 2$, the weighted sum DoF is equal to $\min\{3\alpha N/2, \alpha(2N+M_3)/2, 2(N-3M_3/2) + 2\alpha M_3, \alpha(N +M_2 +M_3)/2, N+M_2-3M_3+2\alpha M_3, \alpha(M_1 +M_2 +M_3)/2, M_1+M_2-3M_3+2\alpha M_3, 2(M_2-M_3) + 2\alpha M_3\}$. Achievability of the sum DoF is shown by using signal space alignment for network coding in the uplink phase, and zero-forcing precoding in the downlink phase. © 2017 IEEE.
Wireless energy and information transfer in networks with hybrid ARQ

Authors
Abad M.S.H., Ercetin O., Elbatt T., Nahe M.

Abstract
In this paper, we consider a class of wireless powered communication devices using hybrid automatic repeat request (HARQ) protocol to ensure reliable communications. In particular, we analyze the trade-off between accumulating mutual information and harvesting RF energy at the receiver of a point-to-point link over a time-varying independent and identically distributed (i.i.d.) channel. The transmitter is assumed to have a constant energy source while the receiver relies, solely, on the RF energy harvested from the received signal. At each time slot, the incoming RF signal is split between information accumulation and energy accumulation with the objective of minimizing the expected number of re-transmissions. A major finding of this work is that the optimal policy minimizing the expected number of re-transmissions utilizes the incoming RF signal to either exclusively harvest energy or to accumulate mutual information. This finding enables achieving an optimal solution in feasible time by converting a two dimensional uncountable state Markov decision process (MDP) with continuous action space into a countable state MDP with binary decision space. © 2018 IEEE.
A hybrid TDMA-MAC cooperative relaying scheme: Stability and delay analysis

Authors
Salman M., El-Keyi A., Nafie M., Hasna M.

Abstract
We consider a cooperative relaying system with any number of source terminals, one shared relay, and a common destination. We assume a slotted time division multiple access (TDMA) framework in which each source terminal is allocated a fraction of the time. We propose a novel hybrid cooperative scheme for the described network. In contrast to former works which assume that the relay only transmits in the idle time slots, we assume that the relay can, simultaneously, transmit with the source terminals via multi-access channel (MAC). In the hybrid cooperative scheme, the relay operates in two modes each with a certain probability; the TDMA mode and the MAC mode. We derive expressions for the stability conditions and the average delay for all the queues in the network. We design the probability of each relaying mode such that the stable throughput is maximized while the network queues are stable. The problem is formulated as a non-convex quadratic constrained quadratic programming (QCQP) optimization problem. Numerical results reveal that the hybrid cooperative scheme significantly enhances the performance of the network in terms of stability region, average delay, and spectral efficiency. © 2016 IEEE.
A new fractional hybrid chaos synchronisation

Authors
Ouannas A., Azar A.T., Vaidyanathan S.

Abstract
Over the last decades, synchronisation of chaotic systems has become an active research area and has been extensively and intensively studied due to the variety of important applications. Different types of chaos synchronisation have been presented, and many various methods and techniques for chaos synchronisation have been reported to investigate some types of chaos. In this paper, by combining full state hybrid projective synchronisation (FSHPS) and inverse full state hybrid projective synchronisation (IFSHPS), a new type of hybrid synchronisation between different dimensional incommensurate fractional order chaotic systems is proposed. Based on fractional control laws and stability theory of linear fractional order systems, a new theorem is derived to demonstrate the co-existence of FSHPS and IFSHPS. Numerical simulations are used to validate the theoretical results. Copyright © 2017 Inderscience Enterprises Ltd.
A new method to synchronize fractional chaotic systems with different dimensions

Authors
Ouannas A., Ziar T., Azar A.T., Vaidyanathan S.

Abstract
By using two scaling function matrices, the synchronization problem of different dimensional fractional order chaotic systems in different dimensions is developed in this chapter. The controller is designed to assure that the synchronization of two different dimensional fractional order chaotic systems is achieved using the Lyapunov direct method. Numerical examples and computer simulations are used to validate numerically the proposed synchronization schemes. © Springer International Publishing AG 2017.
A new method to synchronize fractional chaotic systems with different dimensions

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A novel chaotic system without equilibrium: Dynamics, synchronization, and circuit realization

Authors

Abstract
A few special chaotic systems without unstable equilibrium points have been investigated recently. It is worth noting that these special systems are different from normal chaotic ones because the classical Shilnikov criterion cannot be used to prove chaos of such systems. A novel unusual chaotic system without equilibrium is proposed in this work. We discover dynamical properties as well as the synchronization of the new system. Furthermore, a physical realization of the system without equilibrium is also implemented to illustrate its feasibility. © 2017 Ahmad Taher Azar et al.
A postmortem forensic analysis for a JavaScript based attack

Authors
Mosaad S., Abdelbaki N., Shosha A.F.

[No abstract available]
A study on coexistence of different types of synchronization between different dimensional fractional chaotic systems

Authors
Ouannas A., Azar A.T., Ziar T., Radwan A.G.

Abstract
In this study, robust approaches are proposed to investigate the problem of the coexistence of various types of synchronization between different dimensional fractional chaotic systems. Based on stability theory of linear fractional order systems, the co-existence of full state hybrid function projective synchronization (FSHFPS), inverse generalized synchronization (IGS), inverse full state hybrid projective synchronization (IFSHPS) and generalized synchronization (GS) is demonstrated. Using integer-order Lyapunov stability theory and fractional Lyapunov method, the co-existence of FSHFPS, inverse full state hybrid function projective synchronization (IFSHFPS), IGS and GS is also proved. Finally, numerical results are reported, with the aim to illustrate the capabilities of the novel schemes proposed herein. © Springer International Publishing AG 2017.
A study on coexistence of different types of synchronization between different dimensional fractional chaotic systems

Authors
Ouannas A., Azar A.T., Ziar T., Radwan A.G.

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In this study, robust approaches are proposed to investigate the problem of the coexistence of various types of synchronization between different dimensional fractional chaotic systems. Based on stability theory of linear fractional order systems, the co-existence of full state hybrid function projective synchronization (FSHFPS), inverse generalized synchronization (IGS), inverse full state hybrid projective synchronization (IFSHPS) and generalized synchronization (GS) is demonstrated. Using integer-order Lyapunov stability theory and fractional Lyapunov method, the co-existence of FSHFPS, inverse full state hybrid function projective synchronization (IFSHFPS), IGS and GS is also proved. Finally, numerical results are reported, with the aim to illustrate the capabilities of the novel schemes proposed herein. © Springer International Publishing AG 2017. All rights reserved.
A three-dimensional no-equilibrium chaotic system: Analysis, synchronization and its fractional order form

Authors
Pham V.-T., Vaidyanathan S., Volos C.K., Azar A.T., Hoang T.M., Van Yem V.

Abstract
Recently, a new classification of nonlinear dynamics has been introduced by Leonov and Kuznetsov, in which two kinds of attractors are concentrated, i.e. self-excited and hidden ones. Self-excited attractor has a basin of attraction excited from unstable equilibria. So, from that point of view, most known systems, like Lorenz’s system, Rössler’s system, Chen’s system, or Sprott’s system, belong to chaotic systems with self-excited attractors. In contrast, a few unusual systems such as those with a line equilibrium, with stable equilibria, or without equilibrium, are classified into chaotic systems with hidden attractor. Studying chaotic system with hidden attractors has become an attractive research direction because hidden attractors play an important role in theoretical problems and engineering applications. This chapter presents a three-dimensional autonomous system without any equilibrium point which can generate hidden chaotic attractor. The fundamental dynamics properties of such no-equilibrium system are discovered by using phase portraits, Lyapunov exponents, bifurcation diagram, and Kaplan-Yorke dimension. Chaos synchronization of proposed systems is achieved and confirmed by numerical simulation. In addition, an electronic circuit is implemented to evaluate the theoretical model. Finally, fractional-order form of the system with no equilibrium is also investigated. © Springer International Publishing AG 2017.
Abstract
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Achievable degrees of freedom of the K-user MISO broadcast Channel with alternating CSIT via interference creation-resurrection

Authors
Seif M., El-Keyi A., Nafie M.

Abstract
Channel state information at the transmitter affects the degrees of freedom of the wireless networks. In this paper, we analyze the DoF for the K-user multiple-input single-output (MISO) broadcast channel (BC) with synergistic alternating channel state information at the transmitter (CSIT). Specifically, the CSIT of each user alternates between three states, namely, perfect CSIT (P), delayed CSIT (D) and no CSIT (N) among different time slots. For the K-user MISO BC, we show that the total achievable degrees of freedom (DoF) are given by \( \frac{K^2}{K^2 - 1} \) through utilizing the synergistic benefits of CSIT patterns. We compare the achievable DoF with results reported previously in the literature in the case of delayed CSIT and hybrid CSIT models. © 2016 IEEE.
Adaptive control of a novel nonlinear double convection chaotic system

Authors
Vaidyanathan S., Zhu Q., Azar A.T.

Abstract
This research work describes a six-term novel nonlinear double convection chaotic system with two nonlinearities. First, this work presents the 3-D dynamics of the novel nonlinear double convection chaotic system and depicts the phase portraits of the system. Our novel nonlinear double convection chaotic system is obtained by modifying the dynamics of the Rucklidge chaotic system (1992). Next, the qualitative properties of the novel chaotic system are discussed in detail. The novel chaotic system has three equilibrium points. We show that the equilibrium point at the origin is a saddle point, while the other two equilibrium points are saddle-foci. The Lyapunov exponents of the novel nonlinear double convection chaotic system are obtained as $L_1 = 0.2089$, $L_2 = 0$ and $L_3 = -3.2123$. The Lyapunov dimension of the novel chaotic system is obtained as $D_L = 2.0650$. Next, we present the design of adaptive feedback controller for globally stabilizing the trajectories of the novel nonlinear double convection chaotic system with unknown parameters. Furthermore, we present the design of adaptive feedback controller for achieving complete synchronization of the identical novel nonlinear double convection chaotic systems with unknown parameters. The main adaptive control results are proved using Lyapunov stability theory. MATLAB simulations are depicted to illustrate all the main results derived in this research work for the novel nonlinear double convection system. © Springer International Publishing AG 2017.
Adaptive control of a novel nonlinear double convection chaotic system

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Vaidyanathan S., Zhu Q., Azar A.T.

Abstract
This research work describes a six-term novel nonlinear double convection chaotic system with two nonlinearities. First, this work presents the 3-D dynamics of the novel nonlinear double convection chaotic system and depicts the phase portraits of the system. Our novel nonlinear double convection chaotic system is obtained by modifying the dynamics of the Rucklidge chaotic system (1992). Next, the qualitative properties of the novel chaotic system are discussed in detail. The novel chaotic system has three equilibrium points. We show that the equilibrium point at the origin is a saddle point, while the other two equilibrium points are saddle-foci. The Lyapunov exponents of the novel nonlinear double convection chaotic system are obtained as $L_1 = 0.2089$, $L_2 = 0$ and $L_3 = -3.2123$. The Lyapunov dimension of the novel chaotic system is obtained as $D_L = 2.0650$. Next, we present the design of adaptive feedback controller for globally stabilizing the trajectories of the novel nonlinear double convection chaotic system with unknown parameters. Furthermore, we present the design of adaptive feedback controller for achieving complete synchronization of the identical novel nonlinear double convection chaotic systems with unknown parameters. The main adaptive control results are proved using Lyapunov stability theory. MATLAB simulations are depicted to illustrate all the main results derived in this research work for the novel nonlinear double convection system. © Springer International Publishing AG 2017. All rights reserved.
Abstract
Bipolar electrochemistry is used as an economical, single-step, and scalable process for the oxidation of a wireless graphite substrate, and the subsequent electrophoretic deposition of graphene oxide thin film on a second wireless substrate. An all-solid-state symmetric double-layer capacitor (EDLC) using binderless reduced graphene oxide electrodes exhibited outstanding reversibility and capacitance retention over 18000 cycles, as well as superior capacitive behavior at far-from-dc frequencies (for example 45 and 47 µF cm$^{-2}$), effective capacitances at 75 and 189 Hz, respectively (computed using a series resonance network with ideal inductors), compared to 55 µF cm$^{-2}$ at close-to-dc (computed from cyclic voltammetry at 10 mV s$^{-1}$). This makes the device well-suited for ac filtering applications. A one-hour thermal treatment of the electrodes at 900 °C under vacuum increased the capacitance 13-fold (719 µF cm$^{-2}$) at close-to-dc, which decreased to 185 and 150 µF cm$^{-2}$ as the frequency was increased to 37 and 106 Hz, respectively. These properties make this device suitable for both reasonable dc energy storage and higher frequency applications. © 2017 Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim
An eight-term 3-D novel chaotic system with three quadratic nonlinearities, its adaptive feedback control and synchronization

Authors
Vaidyanathan S., Azar A.T., Ouannas A.

Abstract
This research work describes an eight-term 3-D novel polynomial chaotic system consisting of three quadratic nonlinearities. First, this work presents the 3-D dynamics of the novel chaotic system and depicts the phase portraits of the system. Next, the qualitative properties of the novel chaotic system are discussed in detail. The novel chaotic system has four equilibrium points. We show that two equilibrium points are saddle points and the other equilibrium points are saddle-foci. The Lyapunov exponents of the novel chaotic system are obtained as $L_1 = 0.4715$, $L_2 = 0$ and $L_3 = -2.4728$. The Lyapunov dimension of the novel chaotic system is obtained as $D_L = 2.1907$. Next, we present the design of adaptive feedback controller for globally stabilizing the trajectories of the novel chaotic system with unknown parameters. Furthermore, we present the design of adaptive feedback controller for achieving complete synchronization of the identical novel chaotic systems with unknown parameters. The main adaptive control results are proved using Lyapunov stability theory. MATLAB simulations are depicted to illustrate all the main results derived in this research work for eight-term 3-D novel chaotic system. © Springer International Publishing AG 2017.
**Year:** 2017

**An eight-term 3-D novel chaotic system with three quadratic nonlinearities, its adaptive feedback control and synchronization**

**Authors**
Vaidyanathan S., Azar A.T., Ouannas A.

**Abstract**
This research work describes an eight-term 3-D novel polynomial chaotic system consisting of three quadratic nonlinearities. First, this work presents the 3-D dynamics of the novel chaotic system and depicts the phase portraits of the system. Next, the qualitative properties of the novel chaotic system are discussed in detail. The novel chaotic system has four equilibrium points. We show that two equilibrium points are saddle points and the other equilibrium points are saddle-foci. The Lyapunov exponents of the novel chaotic system are obtained as $L_1 = 0.4715$, $L_2 = 0$ and $L_3 = -2.4728$. The Lyapunov dimension of the novel chaotic system is obtained as $DL = 2.1907$. Next, we present the design of adaptive feedback controller for globally stabilizing the trajectories of the novel chaotic system with unknown parameters. Furthermore, we present the design of adaptive feedback controller for achieving complete synchronization of the identical novel chaotic systems with unknown parameters. The main adaptive control results are proved using Lyapunov stability theory. MATLAB simulations are depicted to illustrate all the main results derived in this research work for eight-term 3-D novel chaotic system. © Springer International Publishing AG 2017. All rights reserved.
Analysis of a rectifier circuit realized with a fractional-order capacitor

Authors
Freeborn T.J., Elwakil A., Psychalinos C.

Abstract
An analysis of a traditional rectifier circuit when a fractional-order capacitor with order $0 < \alpha < 1$ replaces the integer-order smoothing capacitor ($\alpha = 1$) is presented. Exploring the change in discharging behaviour that results from this replacement and the impacts on ripple voltage, nominal DC voltage, current, and power expressions used to describe the performance of this class of circuits. Further, the assumptions made for the analysis of the traditional circuit are explored from the fractional perspective to determine if they are still valid. © 2016 IEEE.
Year: 2017

Analytical solution for fractional derivative gas-flow equation in porous media

Authors
El Amin M.F., Radwan A.G., Sun S.

Abstract
In this paper, we introduce an analytical solution of the fractional derivative gas transport equation using the power-series technique. We present a new universal transform, namely, generalized Boltzmann change of variable which depends on the fractional order, time and space. This universal transform is employed to transfer the partial differential equation into an ordinary differential equation. Moreover, the convergence of the solution has been investigated and found that solutions are unconditionally converged. Results are introduced and discussed for the universal variable and other physical parameters such as porosity and permeability of the reservoir; time and space. © 2017 The Authors
AraVec: A set of Arabic Word Embedding Models for use in Arabic NLP

Authors
Soliman A.B., Eissa K., El-Beltagy S.R.

Abstract
Advancements in neural networks have led to developments in fields like computer vision, speech recognition and natural language processing (NLP). One of the most influential recent developments in NLP is the use of word embeddings, where words are represented as vectors in a continuous space, capturing many syntactic and semantic relations among them. AraVec is a pre-Trained distributed word representation (word embedding) open source project which aims to provide the Arabic NLP research community with free to use and powerful word embedding models. The first version of AraVec provides six different word embedding models built on top of three different Arabic content domains; Tweets, World Wide Web pages and Wikipedia Arabic articles. The total number of tokens used to build the models amounts to more than 3,300,000,000. This paper describes the resources used for building the models, the employed data cleaning techniques, the carried out preprocessing step, as well as the details of the employed word embedding creation techniques.
Biological inspired optimization algorithms for cole-impedance parameters identification

Authors

Abstract
This paper introduces new meta-heuristic optimization algorithms for extracting the parameters of the Cole-impedance model. It is one of the most important models providing best fitting with the measured data. The proposed algorithms inspired by nature are known as Flower Pollination Algorithm (FPA) and Moth-Flame Optimizer (MFO). The algorithms are tested over sets of both simulated and experimental data. The results are compared with other fitting algorithms such as the Non-linear least square (NLS) and Bacterial Foraging Optimization (BFO). The comparison showed a better fit in the sum of absolute error sense (SAE) which consolidate the effectiveness of these new algorithms in the extraction process. © 2017 Elsevier GmbH
Biomedical image encryption based on double-humped and fractional logistic maps

Authors

Abstract
This paper presents a secured highly sensitive image encryption system suitable for biomedical applications. The pseudo random number generator of the presented system is based on two discrete logistic maps. The employed maps are: the double humped logistic map as well as the fractional order logistic map. The mixing of the map parameters and the initial conditions $x_0$, offers a great variety for constructing more efficient encryption keys. Different analyses are introduced to measure the performance of the proposed encryption system such as: histogram analysis, correlation coefficients, MAE, NPCR as well as UACI measurements. The encryption system is proven to be highly sensitive to ±0.001% perturbation of the logistic maps parameters. The system is tested on medical images of knee MRI and a lung X-rays. © 2017 IEEE.
CFOA-Based fractional order simulated inductor

Authors
Khattab K.H., Madian A.H., Radwan A.G.

Abstract
In this paper, a generalized fractional-order form of the simulated inductor using a single current feedback operational amplifier (CFOA) and a fractional-order capacitor is introduced. Analytical expression of the equivalent fractional order inductor versus the circuit elements is achieved. Moreover, the effect of the parasitic impedance and the non-idealities of the CFOA are investigated analytically with numerical simulations and circuit equivalent. Circuit simulations are discussed using AD844 spice model to validate the theoretical study of the fractional-order inductor. Simulations show an extra degree of freedom in selecting the impedance value and the phase shift compared to the conventional realization. As an application, a fractional order low pass filter is simulated to verify the performance of the proposed circuit. © 2016 IEEE.
Chaos synchronisation of continuous systems via scalar signal

Authors

Abstract
By analyzing the issue of chaos synchronization in the literature, it can be noticed the lack of a general approach, which would enable any type of synchronization to be achieved. Similarly, there is the lack of a unified method for synchronizing both continuous-time and discrete-time systems via a scalar signal. This paper and the companion one [1] aim to bridge these two gaps by presenting a novel general unified framework to synchronize chaotic systems via a scalar signal. The framework, based on the concept of observer, enables any type of synchronization defined to date to be achieved for both continuous-time and discrete-time systems via a scalar signal. This paper focuses on continuous-time systems, while the companion paper [1] deals with discrete-time systems. Herein, the observer-based framework exploits a structural condition related to the uncontrollable eigenvalues of the error system. Several examples of different types of synchronization are illustrated, with the aim to show the capabilities of the approach. © 2017 IEEE.
Chaotic system modelling using a neural network with optimized structure

Authors
Lamamra K., Vaidyanathan S., Azar A.T., Salah C.B.

Abstract
In this work, the Artificial Neural Networks (ANN) are used to model a chaotic system. A method based on the Non-dominated Sorting Genetic Algorithm II (NSGA-II) is used to determine the best parameters of a Multilayer Perceptron (MLP) artificial neural network. Using NSGA-II, the optimal connection weights between the input layer and the hidden layer are obtained. Using NSGA-II, the connection weights between the hidden layer and the output layer are also obtained. This ensures the necessary learning to the neural network. The optimized functions by NSGA-II are the number of neurons in the hidden layer of MLP and the modelling error between the desired output and the output of the neural model. After the construction and training of the neural model, the selected model is used for the prediction of the chaotic system behaviour. This method is applied to model the chaotic system of Mackey-Glass time series prediction problem. Simulation results are presented to illustrate the proposed methodology. © Springer International Publishing AG 2017. All rights reserved.
Chaotic system modelling using a neural network with optimized structure

Authors
Lamamra K., Vaidyanathan S., Azar A.T., Ben Salah C.

Abstract
In this work, the Artificial Neural Networks (ANN) are used to model a chaotic system. A method based on the Non-dominated Sorting Genetic Algorithm II (NSGA-II) is used to determine the best parameters of a Multilayer Perceptron (MLP) artificial neural network. Using NSGA-II, the optimal connection weights between the input layer and the hidden layer are obtained. Using NSGA-II, the connection weights between the hidden layer and the output layer are also obtained. This ensures the necessary learning to the neural network. The optimized functions by NSGA-II are the number of neurons in the hidden layer of MLP and the modelling error between the desired output and the output of the neural model. After the construction and training of the neural model, the selected model is used for the prediction of the chaotic system behaviour. This method is applied to model the chaotic system of Mackey-Glass time series prediction problem. Simulation results are presented to illustrate the proposed methodology. © Springer International Publishing AG 2017.
Abstract

In the recent decades, applications of chaotic systems have flourished in various fields. Hence, there is an increasing demand on generalized, modified and novel chaotic systems. In this paper, we combine the general equation of jerk-based chaotic systems with simple scaled discrete chaotic maps. Numerical simulations of the properties of two systems, each with four control parameters, are presented. The parameters show interesting behaviors and dependencies among them. In addition, they exhibit controlling capabilities of the ranges of system responses, hence the size of the attractor diagram. Moreover, these behaviors and dependencies are analogous to those of the corresponding discrete chaotic maps. © 2017 IEEE.
Cloud computing security: Challenges & future trends

Authors
Radwan T., Azer M.A., Abdelbaki N.

Abstract
Cloud computing is one of the most trendy terminologies. Cloud providers aim to satisfy clients' requirements for computing resources such as services, applications, networks, storage and servers. They offer the possibility of leasing these resources rather than buying them. Many popular companies, such as Amazon, Google and Microsoft, began to enhance their services and apply the technology of cloud computing to provide cloud environment for their customers. Although there are lots of advantages in using a cloud-based system, some issues must be handled before organisations and individuals have the trust to deploy their systems in cloud computing. Security, privacy, power efficiency, compliance and integrity are among those important issues. In this paper, we focus on cloud computing along with its deployment and delivery models. A comparison between cloud computing with other computing models is presented, this is in addition to a survey on different major security issues, challenges and risks which currently pose threats to the cloud industry. Moreover, we discuss cloud security requirements and their importance for deployment and delivery models. Finally, we present cloud computing security future trends and research openings. ©2017 Inderscience Enterprises Ltd.
CMOS realization of all-positive pinched hysteresis loops

Authors
Maundy B.J., Elwakil A.S., Psychalinos C.

Abstract
Two novel nonlinear circuits that exhibit an all-positive pinched hysteresis loop are proposed. These circuits employ two NMOS transistors, one of which operates in its triode region, in addition to two first-order filter sections. We show the equivalency to a charge-controlled resistance (memristance) in a decremental state via detailed analysis. Simulation and experimental results verify the proposed theory. © 2017 B. J. Maundy et al.
Control and synchronization of fractional-order chaotic systems

Authors
Radwan A.G., Sayed W.S., Abd-El-Hafiz S.K.

Abstract
The chaotic dynamics of fractional-order systems and their applications in secure communication have gained the attention of many recent researches. Fractional-order systems provide extra degrees of freedom and control capability with integer-order differential equations as special cases. Synchronization is a necessary function in any communication system and is rather hard to be achieved for chaotic signals that are ideally aperiodic. This chapter provides a general scheme of control, switching and generalized synchronization of fractional-order chaotic systems. Several systems are used as examples for demonstrating the required mathematical analysis and simulation results validating it. The non-standard finite difference method, which is suitable for fractional-order chaotic systems, is used to solve each system and get the responses. Effect of the fractional-order parameter on the responses of the systems extended to fractional-order domain is considered. A control and switching synchronization technique is proposed that uses switching parameters to decide the role of each system as a master or slave. A generalized scheme for synchronizing a fractional-order chaotic system with another one or with a linear combination of two other fractional-order chaotic systems is presented. Static (time-independent) and dynamic (time-dependent) synchronization, which could generate multiple scaled versions of the response, are discussed. © Springer International Publishing AG 2017.
Control and synchronization of fractional-order chaotic systems

Authors
Radwan A.G., Sayed W.S., Abd-El-Hafiz S.K.

Abstract
The chaotic dynamics of fractional-order systems and their applications in secure communication have gained the attention of many recent researches. Fractional-order systems provide extra degrees of freedom and control capability with integer-order differential equations as special cases. Synchronization is a necessary function in any communication system and is rather hard to be achieved for chaotic signals that are ideally aperiodic. This chapter provides a general scheme of control, switching and generalized synchronization of fractional-order chaotic systems. Several systems are used as examples for demonstrating the required mathematical analysis and simulation results validating it. The non-standard finite difference method, which is suitable for fractional-order chaotic systems, is used to solve each system and get the responses. Effect of the fractional-order parameter on the responses of the systems extended to fractional-order domain is considered. A control and switching synchronization technique is proposed that uses switching parameters to decide the role of each system as a master or slave. A generalized scheme for synchronizing a fractional-order chaotic system with another one or with a linear combination of two other fractional-order chaotic systems is presented. Static (time-independent) and dynamic (time-dependent) synchronization, which could generate multiple scaled versions of the response, are discussed. © Springer International Publishing AG 2017. All rights reserved.
Control design approaches for parallel robot manipulators: A review

Authors
Azar A.T., Zhu Q., Khamis A., Zhao D.

Abstract
In this article, different control design approaches for parallel robot manipulators are presented with two distinguished classes of control strategies in the literature. These are the model-free control and the dynamic control strategy, which is mainly a model-based scheme, and is mostly the alternative when the control requirements are more stringent. The authors strongly believe that this paper will be helpful for researchers and engineers in the field of robotic systems. Copyright 2017 Inderscience Enterprises Ltd.
Abstract
This paper discusses the diffusion and reaction behaviors of catalyst pellets in the fractional-order domain as well as the case of nth-order reactions. Two generic models are studied to calculate the concentration of reactant in a porous catalyst in the case of a spherical geometric pellet and a flat-plate particle with different examples. A controlled Picard analytical method is introduced to obtain an approximated solution for these systems in both linear and nonlinear cases. This method can cover a wider range of problems due to the extra auxiliary parameter, which enhances the convergence and is suitable for higher-order differential equations. Moreover, the exact solution in the linear fractional-order system is obtained using the Mittag–Leffler function where the conventional solution is a special case. For nonlinear models, the proposed method gives matched responses with the homotopy analysis method (HAM) solutions for different fractional orders. The effect of fractional-order parameter on the dimensionless concentration of the reactant in a porous catalyst is analyzed graphically for different cases of order reactions and Thiele moduli. Moreover, the proposed method has been applied numerically for different cases to predict and calculate the dual solutions of a nonlinear fractional model when the reaction order $n = −1$. © 2017, Copyright © Taylor & Francis Group, LLC.
Cooperative D2D communication in downlink cellular networks with energy harvesting capability

Authors
Seif M., El-Keyi A., Seddik K.G., Nafie M.

Abstract
Device-to-Device (D2D) communications have been highlighted as one of the promising solutions to enhance spectrum utilization of LTE-Advanced networks. In this paper, we consider a D2D transmitter cooperating with a cellular network by acting as a relay to serve one of the cellular users. We consider the case in which the D2D transmitter is equipped with an energy harvesting capability. We investigate the trade-off between the amount of energy used for relaying and the energy used for decoding the cellular user data at the relaying node. We formulate an optimization problem to maximize the cellular user rate subject to a minimum rate requirement constraint for the D2D link. Moreover, we consider the case when receiving nodes are equipped with successive interference cancellation (SIC) capability and investigate the effect of using SIC on our proposed system performance. Finally, we show via numerical simulations the benefits of our cooperation-based system as compared to the non-cooperative scenario. © 2017 IEEE.
Cosmology episode of cybercrime against children in MENA: The case of Egypt

Authors
Saleh I.

Abstract
[No abstract available]
Cost-Effective Data Transfer for Mobile Health Care

Authors
Khazbak Y., Izz M., Elbatt T., Fahim A., Guirguis A., Youssef M.

Abstract
In this paper, we introduce the novel concept of cost-effective mobile health care which leverages the multiple wireless interfaces onboard most mobile phones today. First, we study the problem of uploading medical data using the 'least cost' radio interface. Toward this objective, we propose the wireless interface selection algorithm (WISA) which decides the wireless interface yielding the least cost, depending on the data size, modality, and quality of service (QoS). Second, we study using modeling and simulations, the problem of cost-effective medical advisory message dissemination (on the downlink) which gives rise to an interesting cost-delay trade-off when leveraging free short range phone-to-phone (P2P) communication. Finally, we build a proof-of-concept testbed, coined CellChek, which showcases the proposed WISA algorithm and demonstrates its operation using sample wireless-enabled medical devices, namely pulse oximeter and blood pressure monitor. The experimental results gathered using the prototype provide key insights into the system and the involved tradeoffs. The concepts explored in this paper along with the proposed schemes hold great promise for this emerging area of research that is of equal importance to developing and developed countries promising considerable cost savings. © 2007-2012 IEEE.
Decentralized coded caching in wireless networks: Trade-off between storage and latency

Authors
Girgis A.M., Ercetin O., Nafie M., Elbatt T.

Abstract
This paper studies the decentralized coded caching for a Fog Radio Access Network (F-RAN), whereby two edge-nodes (ENs) connected to a cloud server via fronthaul links with limited capacity are serving the requests of K users. We consider all ENs and users are equipped with caches. A decentralized content placement is proposed to independently store contents at each network node during the off-peak hours. After that, we design a coded delivery scheme in order to deliver the user demands during the peak-hours under the objective of minimizing the normalized delivery time (NDT), which refers to the worst case delivery latency. An information-theoretic lower bound on the minimum NDT is derived for arbitrary number of ENs and users. We evaluate numerically the performance of the decentralized scheme. Additionally, we prove the approximate optimality of the decentralized scheme for a special case when the caches are only available at the ENs. © 2017 IEEE.
Degrees of Freedom for the MIMO Multi-Way Relay Channel with Common and Private Messages

Authors
Salah M., El-Keyi A., Nafie M., Mohasseb Y.

Abstract
In this paper, we study the general multiple input multiple output (MIMO) multi-way relay channel, i.e., MIMO Y channel, with common and private messages. In this channel, K users exchange messages through a common relay. Each user transmits a private message to each user in addition to a common message to all the other users. The i th user and the relay are equipped with Mi and N antennas, respectively. First, we derive the degrees of freedom (DoF) region of the symmetric three-user MIMO Y channel, where Mi = M and i ∈ {1,2,3}. Due to the symmetry of the network, we focus on the case where the DoF of all private messages are equal and the DoF of all common messages are equal. In this case, the DoF region has two dimensions: the DoF of private messages and the DoF of common messages. We develop an outer bound on the DoF region based by using cut-set and one-sided genie bounds. We prove the achievability of the outer bound on the DoF region by using linear beamforming and signal space alignment (SSA) schemes. Second, based on our study of the DoF region of the symmetric channel, we define a weighted sum DoF metric that integrates all the network messages and weights the common messages by a factor of α. We study the weighted sum DoF maximization problem and show that sending common messages only is optimal when α exceeds 4/3. Next, we focus on the weighted sum DoF with α = 2 that represents the total number of received interference-free streams at the users. First, we show that the weighted sum DoF, with α = 2, of the MIMO Y channel with an arbitrary number of antennas is given by min {3N,2N+M3,N+M2+M3,2M2+2M3, M1+M2+M3}. Second, we study the weighted sum DoF, with α = 2, of the K-user case in the symmetric setting. We derive an outer bound on the weighted sum DoF using cut-set bounds, and show that the network has K min {N,M} weighted DoF. The achievability results are obtained by using SSA for network coding in the multiple access phase, and zero-forcing precoding in the broadcast phase. © 2016 IEEE.
Degrees of freedom in cached MIMO relay networks with multiple base stations

Authors
Hanna O.A., El-Keyi A., Nafie M.

Abstract
The ability of physical layer relay caching to increase the degrees of freedom (DoF) of a single cell was recently illustrated. In this paper, we extend this result to the case of multiple cells in which a caching relay is shared among multiple non-cooperative base stations (BSs). In particular, we show that a large DoF gain can be achieved by exploiting the benefits of having a shared relay that cooperates with the BSs. We first propose a cache-assisted relaying protocol that improves the cooperation opportunity between the BSs and the relay. Next, we consider the cache content placement problem that aims to design the cache content at the relay such that the DoF gain is maximized. We propose an optimal algorithm and a near-optimal low-complexity algorithm for the cache content placement problem. Simulation results show significant improvement in the DoF gain using the proposed relay-caching protocol. © 2017 IEEE.
Abstract
In this paper, we characterize the total degrees of freedom (DoFs) of the full-duplex asymmetric multiple-input multiple-output (MIMO) three-way channel. Each node has a separate-antenna full-duplex MIMO transceiver with a different number of antennas, where each antenna can be configured for either signal transmission or reception. We study this system under two message configurations; the first configuration is when each node has two unicast messages to be delivered to the two other nodes, while the second configuration is when each node has two unicast messages as well as one broadcast message to be delivered to the two other nodes. For each configuration, we first derive upper bounds on the total DoF of the system. Cut-set bounds in conjunction with genie-aided bounds are derived to characterize the achievable total DoF. Afterward, we analytically derive the optimal number of transmit and receive antennas at each node to maximize the total DoF of the system, subject to the total number of antennas at each node. Finally, the achievable schemes for each configuration are constructed. The proposed schemes are mainly based on zero-forcing and null-space transmit beamforming. We show that the derived outer and inner bounds on the total DoF are tight for each message configuration. © 1972-2012 IEEE.
**Year:** 2017

**Detecting and Integrating Multiword Expression into English-Arabic Statistical Machine Translation**

**Authors**
Ebrahim S., Hegazy D., Mostafa M.G.-H.M., El-Beltagy S.R.

**Abstract**
In this paper we introduce a new method for detecting a type of English Multiword Expressions (MWEs), which is phrasal verbs, into an English-Arabic phrase-based statistical machine translation (PBSMT) system. The detection starts with parsing the English side of the parallel corpus, detecting various linguistic patterns for phrasal verbs and finally integrate them into the En-Ar PBSMT system. In addition, the paper explores the effect of cliticizing specific words in English that have no Arabic equivalent. The results, which reported with the BLEU scores, showed that some patterns achieved significant improvements compared to other patterns and still the baseline achieves the highest score. This paper shows that, by detecting more linguistic patterns and integrating them into En-Ar SMT system, translation quality could be improved with other integration methods. Yet, the results show which path is worth to follow and clarifies the perspective that linguistic features are not handled properly in the statistically learned models. © 2017 The Author(s).
Developing a Greenometer for green manufacturing assessment

Authors
Salem A.H., Deif A.M.

Abstract
In this paper a toolbox (Greenometer) to assess the greenness level of manufacturing companies is proposed. The assessment approach is based on capturing the relative greenness position of any company among other industries from different sectors as well as within the same sector. The assessment was based on selected greenness attributes and their composing indicators at each of the two levels of the developed Greenometer. Geometric Mean Method (GMM) was adopted to be the generic assessment technique for cross industries greenness evaluation, while Data Envelopment Analysis (DEA) was employed to assess the greenness level of intra-industries layer. Three different industrial applications were used to demonstrate the applicability of the developed Greenometer. Results highlighted how the proposed tool can be a useful for manufacturing managers not only in understanding their green performance position at various levels, but also aiding them in their green transformation/improvement efforts. Specifically, the Greenometer assessment scores will help in setting plans through highlighting prioritized areas of required improvement as well as offering quantitative targets and tracking metrics along the transformation journey. © 2017 Elsevier Ltd
Distributed suffix array construction algorithms: Comparison of two algorithms

Authors
Metwally A.A., Kandil A.H., Abouelhoda M.

Abstract
The suffix array is an important indexing data structure for biological sequence analysis. The increasing size of genomic data necessitates the use of a computer cluster to speed up the computation. In this paper, we compare the performance of two distributed suffix array construction algorithms that can run on a computer cluster: The first is Futamura-Aluru-Kurtz algorithm and the second is Kulla-Sanders's. The performance of these two algorithms has not been compared earlier due to the lack of any available software and the difficulty of implementing them. In this paper, we answer a still open question about which algorithm would be better in practice, particularly for genomic data. We have implemented the two algorithms and made them available. The comparison results show that the Futamura-Aluru-Kurtz algorithm is more efficient in practice, despite the fact that the algorithm of Kulla-Sanders has better theoretical time complexity. © 2016 IEEE.
DyadChurn: Customer churn prediction using strong social ties

Authors
Abd-Allah M.N., El-Beltagy S.R., Salah A.

Abstract
The increase in mobile phone subscriptions in recent years, has led to near market saturation in the telecom industry. As a result, it has become harder for telecom providers to acquire new customers, and the need for retaining existing ones has become of paramount importance. Because of fierce competition between different telecom providers and because the ease of which customers can move from one provider to another, all telecom service providers suffer from customer churn. In this paper, we propose a dyadic based churn prediction model, DyadChurn, where customer churn is modeled through social influence that propagates in the telecom network over strong social ties. We propose a novel method for evaluating social tie strength between telecom customers. We then, incorporate strong social ties in an influence propagation model to predict the set of future potential churners. The evaluation of the proposed dyadic based churn prediction model has been done using a real dataset, from one of the largest telecom companies in Egypt. The experimental results showed that the "length of calls" between customers is the most effective attribute in predicting social influence that result in churning. The results also showed that strong social ties (as opposed to weak ties) were the most effective ties in determining churn. Using strong social ties only enhanced the prediction accuracy (in terms of the lift curve) by more than 20%, when compared to a diffusion model. © 2017 Association for Computing Machinery.
Dynamic proactive caching in relay networks

Authors
Hassan R.A., Mohamed A.M., Tadrous J., Nafie M., Elbatt T., Dlgham F.

Abstract
We investigate the performance of dynamic proactive caching in relay networks where an intermediate relay station caches content for potential future use by end users. A central base station proactively controls the cache allocation such that cached content remains fresh for consumption for a limited number of time slots called proactive service window. With uncertain user demand over multiple data items and dynamically changing wireless links, we consider the optimal allocation of relay stations cache to minimize the time average expected service cost. We characterize a fundamental lower bound on the cost achieved by any proactive caching policy. Then we develop an asymptotically optimal caching policy that attains the lower bound as the proactive caching window size grows. Our analytical findings are supported with numerical simulations to demonstrate the efficiency of the proposed relay-caching. © 2017 IFIP.
Elmore delay in the fractional order domain

Authors
Soltan A., Radwan A.G., Yakovlev A.

Abstract
Interconnect design has recently become one of the important factors that affect the circuit delay and performance especially in the deep submicron technology. The modelling of interconnects is typically based on using Elmore definitions of the delay time and rise time. So, a general formula for Elmore delay time and rise time in the fractional order domain are presented in this work. It is found from the new formulas of the delay time and rise time that these timing values could be controlled or tuned by the fractional orders. Hence, the fractional order can compensate for the components value. Furthermore, a case study of shunt compensation circuit is studied here to show the impact of the fractional orders on the delay time. The impact of the component values along with the fractional order on the new timing definition is studied using MATLAB analysis. © 2017 IEEE.
Experimental comparison of integer/fractional-order electrical models of plant

Authors

Abstract
In this paper, different integer and fractional-order models are studied from electrical point of view, these models are used to fit the measured impedance data for different types of fruits and vegetables. Experimental work is done on eight different models for six types of fruits to verify the best fitting model. Electric impedance is measured in the range of frequencies (200 mHz–200 Khz) using a non-destructive method, where the tissues are not damaged by electrode insertion. Moreover, two integer order models have been extended to the fractional order domain where data analysis and fitting are applied. The extra degrees of freedom of the fractional order models have enhanced the fitting parameters showing better accuracy. The double Cole Model has been found to be the best fit among different integer and fractional models based on root mean square error (RMSE). © 2017 Elsevier GmbH
Experimental demonstration of fractional-order oscillators of orders 2.6 and 2.7

Authors
Elwakil A.S., Agambayev A., Allagui A., Salama K.N.

Abstract
The purpose of this work is to provide an experimental demonstration for the development of sinusoidal oscillations in a fractional-order Hartley-like oscillator. Solid-state fractional-order electric double-layer capacitors were first fabricated using graphene-percolated P(VDF-TrFE-CFE) composite structure, and then characterized by using electrochemical impedance spectroscopy. The devices exhibit the fractional orders of 0.6 and 0.74 respectively (using the model $Z_C=R_s+1/(j\omega)\alpha C$), with the corresponding pseudocapacitances of approximately $93\text{nF}\text{sec}^{-0.4}$ and $1.5\text{nF}\text{sec}^{-0.26}$ over the frequency range 200kHz–6MHz ($R_s < 15\Omega$). Then, we verified using these fractional-order devices integrated in a Hartley-like circuit that the fractional-order oscillatory behaviors are of orders 2.6 and 2.74. © 2017 Elsevier Ltd
Year: 2017

Experimental digital forensics of subscriber identification module (SIM) Card

Authors
Abdelazim M.T., Abdelbaki N., Shosha A.F.

[No abstract available]
Feature selection via a novel chaotic crow search algorithm

Authors
Sayed G.I., Hassanien A.E., Azar A.T.

Abstract
Crow search algorithm (CSA) is a new natural inspired algorithm proposed by Askarzadeh in 2016. The main inspiration of CSA came from crow search mechanism for hiding their food. Like most of the optimization algorithms, CSA suffers from low convergence rate and entrapment in local optima. In this paper, a novel meta-heuristic optimizer, namely chaotic crow search algorithm (CCSA), is proposed to overcome these problems. The proposed CCSA is applied to optimize feature selection problem for 20 benchmark datasets. Ten chaotic maps are employed during the optimization process of CSA. The performance of CCSA is compared with other well-known and recent optimization algorithms. Experimental results reveal the capability of CCSA to find an optimal feature subset which maximizes the classification performance and minimizes the number of selected features. Moreover, the results show that CCSA is superior compared to CSA and the other algorithms. In addition, the experiments show that sine chaotic map is the appropriate map to significantly boost the performance of CSA. © 2017 The Natural Computing Applications Forum
Finite precision logistic map between computational efficiency and accuracy with encryption applications

Authors
Sayed W.S., Radwan A.G., Rezk A.A., Fahmy H.A.H.

Abstract
Chaotic systems appear in many applications such as pseudo-random number generation, text encryption, and secure image transfer. Numerical solutions of these systems using digital software or hardware inevitably deviate from the expected analytical solutions. Chaotic orbits produced using finite precision systems do not exhibit the infinite period expected under the assumptions of infinite simulation time and precision. In this paper, digital implementation of the generalized logistic map with signed parameter is considered. We present a fixed-point hardware realization of a Pseudo-Random Number Generator using the logistic map that experiences a trade-off between computational efficiency and accuracy. Several introduced factors such as the used precision, the order of execution of the operations, parameter, and initial point values affect the properties of the finite precision map. For positive and negative parameter cases, the studied properties include bifurcation points, output range, maximum Lyapunov exponent, and period length. The performance of the finite precision logistic map is compared in the two cases. A basic stream cipher system is realized to evaluate the system performance for encryption applications for different bus sizes regarding the encryption key size, hardware requirements, maximum clock frequency, NIST and correlation, histogram, entropy, and Mean Absolute Error analyses of encrypted images. © 2017 Wafaa S. Sayed et al.
Four-wing attractors in a novel chaotic system with hyperbolic sine nonlinearity

Authors
Wang Z., Volos C., Kingni S.T., Azar A.T., Pham V.-T.

Abstract
Chaotic systems generating multi-wing attractors have received considerable attention in the literature. In this work, we propose a novel three-dimensional chaotic system with hyperbolic sine nonlinearity. It is worth noting that the system is elegant and includes only one parameter. Despite its simple structure, the new system displays double-wing and four-wing chaotic attractors. By studying dynamics of the system, coexistence of limit cycles or chaotic attractors is discovered. The capable of the synchronization of new chaotic system is verified by using an adaptive control. Furthermore, an electronic circuit for implementing the system is reported to indicate its feasibility. © 2016 Elsevier GmbH
FPGA implementation of two fractional order chaotic systems

Authors

Abstract
This paper discusses the FPGA implementation of the fractional-order derivative as well as two fractional-order chaotic systems where one of them has controllable multi-scroll attractors. The complete hardware architecture of the Grünwald-Letnikov (GL) differ-integral is realized with different memory window sizes. As an application of the proposed circuit, a complete fractional-order FPGA implementation of Liu chaotic system is introduced with different fractional-orders. Moreover, a fractional-order controllable heart and V-shape multi-scrolls chaotic systems are verified in the case of symmetric and asymmetric cases. Different interesting attractors are realized under various parametric changes with distinct step sizes for different fractional-orders. To verify the chaotic behavior of many generating attractors, the Maximum Lyapunov Exponent (MLE) is calculated for such systems. The designs have been simulated using Xilinx ISE 14.5 and realized on Xilinx FPGA Virtex 5 XC5VLX50T. The achieved throughputs are: 4.4 Gbit/s for GL, 1.986 Gbit/s for Liu system, and 2.921 Gbit/s for V-Shape multi-scroll attractor. © 2017 Elsevier GmbH
FPGA realization of Caputo and Grünwald-Letnikov operators

Authors

Abstract
This paper proposes a hardware platform implementation on FPGA for two fractional-order derivative operators. The Grünwald-Letnikov and Caputo definitions are realized for different fractional orders. The realization is based on non-uniform segmentation algorithm with a variable lookup table. A generic implementation for Grünwald-Letnikov is proposed and a 32 bit Fixed Point Booth multiplier radix-4 is used for Caputo implementation. Carry look-ahead adder, multi-operand adder and booth multiplier are used to improve the performance and other techniques for area and delay minimization have been employed. A comparison between the two presented architectures is introduced. The proposed designs have been simulated using Xilinx ISE and realized on FPGA Xilinx virtex-5 XC5VLX50T. The total area of 2515 lookup tables is achieved for Caputo implementation, and maximum frequency of 54.11 MHz and 1498 slices are achieved for Grünwald-Letnikov architecture. © 2017 IEEE.
Fractional canny edge detection for biomedical applications

Authors
Elaraby W.S., Madian A.H., Ashour M.A., Farag I., Nassef M.

Abstract
This paper presents a comparative study of edge detection algorithms based on integer and fractional order differentiation. A performance comparison of the two algorithms has been proposed. Then, a soft computing technique has been applied to both algorithms for better edge detection. From the simulations, it shows that better performance is obtained compared to the classical approach. The noise performances of those algorithms are analyzed upon the addition of random Gaussian noise, as well as the addition of salt and pepper noise. The performance has been compared to peak signal to noise ratio (PSNR). From results, it is obtained that fractional edge detection with the fuzzy system has better performance. © 2016 IEEE.
Fractional controllable multi-scroll V-shape attractor with parameters effect

Authors

Abstract
This paper is an extension of V-shape multi-scroll butterfly attractor in the fractional-order domain. The system complexity is increased by the new dynamics introduced by the fractional operator which make it more suitable for random signal generator. The effect of system parameters on controlling the attractor shape is investigated and compared with the integer order attractor. Maximum Lyapunov exponent is calculated for both integer and fractional orders attractors to prove the complexity of fractional chaotic system using time series. © 2017 IEEE.
Fractional inverse generalized chaos synchronization between different dimensional systems

Authors
Ouannas A., Azar A.T., Ziar T., Vaidyanathan S.

Abstract
In this chapter, new control schemes to achieve inverse generalized synchronization (IGS) between fractional order chaotic (hyperchaotic) systems with different dimensions are presented. Specifically, given a fractional master system with dimension \( n \) and a fractional slave system with dimension \( m \), the proposed approach enables each master system state to be synchronized with a functional relationship of slave system states. The method, based on the fractional Lyapunov approach and stability property of integer-order linear differential systems, presents some useful features: (i) it enables synchronization to be achieved for both cases \( n < m \) and \( n > m \); (ii) it is rigorous, being based on theorems; (iii) it can be readily applied to any chaotic (hyperchaotic) fractional systems. Finally, the capability of the approach is illustrated by synchronization examples. © Springer International Publishing AG 2017.
Fractional inverse generalized chaos synchronization between different dimensional systems

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Abstract
In this chapter, new control schemes to achieve inverse generalized synchronization (IGS) between fractional order chaotic (hyperchaotic) systems with different dimensions are presented. Specifically, given a fractional master system with dimension $n$ and a fractional slave system with dimension $m$, the proposed approach enables each master system state to be synchronized with a functional relationship of slave system states. The method, based on the fractional Lyapunov approach and stability property of integer-order linear differential systems, presents some useful features: (i) it enables synchronization to be achieved for both cases $n < m$ and $n > m$; (ii) it is rigorous, being based on theorems; (iii) it can be readily applied to any chaotic (hyperchaotic) fractional systems. Finally, the capability of the approach is illustrated by synchronization examples. © Springer International Publishing AG 2017. All rights reserved.
Fractional order control and synchronization of chaotic systems

Authors
Azar A.T., Vaidyanathan S., Ouannas A.

Abstract
The book reports on the latest advances in and applications of fractional order control and synchronization of chaotic systems, explaining the concepts involved in a clear, matter-of-fact style. It consists of 30 original contributions written by eminent scientists and active researchers in the field that address theories, methods and applications in a number of research areas related to fractional order control and synchronization of chaotic systems, such as: fractional chaotic systems, hyperchaotic systems, complex systems, fractional order discrete chaotic systems, chaos control, chaos synchronization, jerk circuits, fractional chaotic systems with hidden attractors, neural network, fuzzy logic controllers, behavioral modeling, robust and adaptive control, sliding mode control, different types of synchronization, circuit realization of chaotic systems, etc. In addition to providing readers extensive information on chaos fundamentals, fractional calculus, fractional differential equations, fractional control and stability, the book also discusses key applications of fractional order chaotic systems, as well as multidisciplinary solutions developed via control modeling. As such, it offers the perfect reference guide for graduate students, researchers and practitioners in the areas of fractional order control systems and fractional order chaotic systems. © Springer International Publishing AG 2017. All rights reserved.
Year: 2017

Fractional order control and synchronization of chaotic systems

Authors
Azar A.T., Vaidyanathan S., Ouannas A.

Abstract
[No abstract available]
Fractional order four-phase oscillator based on double integrator topology

Authors

Abstract
This paper presents a generalization of Soliman's four-phase oscillator into the fractional-order domain. The extra degrees of freedom provided by the fractional-order parameters $\alpha$ and $\beta$ add more flexibility to the design of the circuit. The design procedure and equations of the proposed oscillator are presented and verified using Matlab and PSPICE. Also, the stability analysis for fractional order systems is studied for different cases of $\alpha$ and $\beta$. © 2017 IEEE.
Year: 2017

Fractional-order and memristive nonlinear systems: Advances and applications

Authors
Radwan A.G., Azar A.T., Vaidyanathan S., Munoz-Pacheco J.M., Ouannas A.

Abstract
[No abstract available]
Fractional-order DISPR model for the AIDS epidemiological dynamics

Authors

Abstract
Modeling epidemiological dynamics of AIDS infection is an indispensable method to track the spread of such fatal disease. In this paper, the Differential Infectivity and Staged Progression Model, DISP, is modified to include the possibility of recovery, hence the new proposed model is called the DISPR model. The DISPR model is also generalized to the fractional order domain to allow more flexibility. In order to compare, both models are tested on the same sample of population. The DISPR model is proved to be valid by predicting the same behavior of the DISP model and real epidemiology. Although, it leads to different estimated numbers of individuals from the DISP model, this result is reasonable due to the consideration of recovery possibility. © 2017 IEEE.
Fractional-order impedance transformation based on three port mutators

Authors
Soltan A., Soliman A.M., Radwan A.G.

Abstract
Due to the importance of the mutators for active circuit realizations, this paper investigates different three port mutator circuits that can be used to implement a floating impedance. The analytical equations that govern the proposed circuits as well as the necessary conditions under different configurations are introduced to realize positive and negative impedances. The proposed circuits are based on second generation current conveyors (CCII) and/or transconductance Amplifier (TA). Moreover, the fractional-order impedance transformation using these mutators are investigated showing the advantages of fractional-order parameters for extra design degrees of freedom. Circuit simulations using Advanced Design System (ADS) for the proposed circuits are made by using 0.25 CMOS technology from MOSIS to implement the active blocks. Also, practical models for the resistances and capacitances are included in the simulation to include the practical effects on the circuit performance. As an application, the proposed circuits are used to implement fractional order filters and oscillators to validate their reliability and the analytical discussion. © 2017 Elsevier GmbH
Fractional-order mathematical model for Chronic Myeloid Leukaemia

Authors
Fahmy S., El-Geziry A.M., Mohamed E., Abdelaty A.M., Radwan A.G.

Abstract
This paper is dedicated to develop a fractional order model of the rate of change of cancerous blood cells in Chronic Myeloid Leukaemia using fractional-order differential equations as well as tackling the factors that affect this rate and compare between them. The simulated cases (using MATLAB) prove that the proposed model is doable in terms of the variables positions in the equations and its effect on the overall population. Also, the effect of the Pactional order is investigated through three parameters sets and it has shown strong influence on the dynamic response. © 2017 IEEE.
Full implementation of a capacitance-to-digital converter system based on SAR logic and charge redistribution technique

Authors
Sakr A.S., Madian A.H., Ismail S.H.

Abstract
This paper demonstrates a low power 6-bit single-ended voltage-based Capacitance-to-Digital Converter (CDC) circuit based on a charge redistribution technique and Successive Approximation Register (SAR) logic operating at 370 kHz sampling rate. A proposed realization of a SAR logic control unit integrated with a low power comparator is introduced where the system blocks are entirely built on the transistor level. The system, which is fully automated with a universal clock signal, is tested for real time Cadence simulations using a 130nm model from which static and dynamic parameters are extracted. The average static and dynamic current consumption becomes in the order of 200μA using a 1.2V power supply. The tested specifications are compared with a similar CDC implementation and proved an overall enhancement and superiority on both power consumption and conversion rate performance metrics. © 2016 IEEE.
Further experimental evidence of the fractional-order energy equation in supercapacitors

Authors
Elwakil A.S., Allagui A., Freeborn T.J., Maundy B.J.

Abstract
Due to the dispersive porous nature of its material, carbon–carbon supercapacitors have a current–voltage relationship which is modeled by a fractional-order differential equation of the form \( i(t) = C \alpha [\text{Formula presented}] \) where \( \alpha \leq 1 \) is a dispersion coefficient and \( C \alpha \) is a pseudo-capacitance not measurable in Farads. Hence, the energy stored in a capacitor, known to equal \( CV^2/2 \) where \( C \) is the capacitance in Farad and \( V \) is the voltage applied, does not apply to a supercapacitor. In a recent work (Allagui et al., 2016), a fractional-order energy equation that enables the quantification of the energy stored in a supercapacitor when it is charged by a linear voltage ramp was derived. In addition, an effective capacitance (in proper Farad units) obtained from the time-domain analysis of the supercapacitor model under this type of charging was also derived. While some experimental results were given in Allagui et al. (2016), here we provide more experimental evidence of the applicability of the fractional-order energy equation using two commercial devices from two different vendors. We also show the effect of fast charging versus slow charging on the amount of energy stored in these supercapacitors. © 2017 Elsevier GmbH
Year: 2017

Fuzzy firefly clustering for tumour and cancer analysis

Authors
Nizar Banu P.K., Azar A.T., Hannah Inbarani H.

Abstract
Swarm intelligence represents a meta-heuristic approach to solve a wide variety of problems. Searching for similar patterns of genes is becoming very essential to predict the expression of genes under various conditions. Firefly clustering inspired by the behaviour of fireflies helps in grouping genes that behave alike. Contrasting hard clustering methodology, fuzzy clustering assigns membership values for every gene and predicts the possibility of belonging to every cluster. To distinguish highly expressed and suppressed genes, the research in this paper proposes an efficient fuzzy-firefly clustering by integrating the merits of firefly and fuzzy clustering. The proposed method is compared with other swarm optimisation based clustering algorithms. It is applied on five gene expression datasets. The clusters resulting from the proposed algorithm provide interpretations of different gene expression patterns present in the cancer datasets. Experimental results show the excellent performance of fuzzy-firefly clustering to separate co-expressed and co-regulated genes. © 2017 Inderscience Enterprises Ltd.
Year: 2017

Generalized dynamic switched synchronization between combinations of fractional-order chaotic systems

Authors
Sayed W.S., Henein M.M.R., Abd-El-Hafiz S.K., Radwan A.G.

Abstract
This paper proposes a novel generalized switched synchronization scheme among \( n \) fractional-order chaotic systems with various operating modes. Digital dynamic switches and dynamic scaling factors are employed, which offer many new capabilities. Dynamic switches determine the role of each system as a master or a slave. A system can either have a fixed role throughout the simulation time (static switching) or switch its role one or more times (dynamic switching). Dynamic scaling factors are used for each state variable of the master system. Such scaling factors control whether the master is a single system or a combination of several systems. In addition, these factors determine the generalized relation between the original systems from which the master system is built as well as the slave system(s). Moreover, they can be utilized to achieve different kinds of generalized synchronization relations for the purpose of generating new attractor diagrams. The paper presents a mathematical formulation and analysis of the proposed synchronization scheme. Furthermore, many numerical simulations are provided to demonstrate the successful generalized switched synchronization of several fractional-order chaotic systems. The proposed scheme provides various functions suitable for applications such as different master-slave communication models and secure communication systems. © 2017 Wafaa S. Sayed et al.
Year: 2017

Generalized family of fractional-order oscillators based on single CFOA and RC network

Authors
Said L.A., Radwan A.G., Madian A.H., Soliman A.M.

Abstract
This paper presents a generalized family of fractional-order oscillators based on single CFOA and RC network. Five RC networks are investigated with their general state matrix, and design equations. The general oscillation frequency, condition and the phase difference between the oscillatory outputs are introduced in terms of the fractional order parameters. They add extra degrees of freedom which in turn increase the design flexibility and controllability that is proved numerically. Spice simulations are introduced to validate the theoretical findings. © 2017 IEEE.
Year:  2017

Generalized fractional logistic map encryption system based on FPGA

Authors

Abstract
This paper introduces the design of a generalized fractional order logistic map suitable for pseudorandom number key generators and its application in an encryption system based on FPGA. The map is generalized through two parameters (a,b) where complete analysis of their effect on the map is detailed, which gives more control on the map chaotic regions. The vertical map and the zooming map presented in this paper are two special maps extracted from the generalized map with their detailed analysis. Not only the positive bifurcation, but also the negative side is discussed through this paper, covering the complete diagram. The specifications of the introduced special logistic maps are proved to be completely controlled through eight design problems with their Lyapunov exponent. As an application, these eight designs are used for the key generation to encrypt different images through a simple algorithm. The correlation coefficients (horizontal, vertical, and diagonal) of the encryption system proposed, as well as the response to differential attacks are calculated. The sensitivity analysis proves that the encryption algorithm develops high sensitivity to the fractional-order key, which appears from the wrong decryption with 0.001% change of any system parameter. The encryption system is implemented on a Virtex-5 FPGA, XC5VLX50T, with a maximum clock frequency equal to 58,358 MHz. © 2017 Elsevier GmbH
Generalized smooth transition map between tent and logistic maps

Authors
Sayed W.S., Fahmy H.A.H., Rezk A.A., Radwan A.G.

Abstract
There is a continuous demand on novel chaotic generators to be employed in various modeling and pseudo-random number generation applications. This paper proposes a new chaotic map which is a general form for one-dimensional discrete-time maps employing the power function with the tent and logistic maps as special cases. The proposed map uses extra parameters to provide responses that fit multiple applications for which conventional maps were not enough. The proposed generalization covers also maps whose iterative relations are not based on polynomials, i.e. with fractional powers. We introduce a framework for analyzing the proposed map mathematically and predicting its behavior for various combinations of its parameters. In addition, we present and explain the transition map which results in intermediate responses as the parameters vary from their values corresponding to tent map to those corresponding to logistic map case. We study the properties of the proposed map including graph of the map equation, general bifurcation diagram and its key-points, output sequences, and maximum Lyapunov exponent. We present further explorations such as effects of scaling, system response with respect to the new parameters, and operating ranges other than transition region. Finally, a stream cipher system based on the generalized transition map validates its utility for image encryption applications. The system allows the construction of more efficient encryption keys which enhances its sensitivity and other cryptographic properties. © 2017 World Scientific Publishing Company.
Year: 2017

Generalized synchronization of different dimensional integer-order and fractional order chaotic systems

Authors
Ouannas A., Azar A.T., Ziar T., Radwan A.G.

Abstract
In this work different control schemes are proposed to study the problem of generalized synchronization (GS) between integer-order and fractional order chaotic systems with different dimensions. Based on Lyapunov stability theory of integer-order differential systems, fractional Lyapunov-based approach and nonlinear controllers, different criterions are derived to achieve generalized synchronization. The effectiveness of the proposed control schemes are verified by numerical examples and computer simulations. © Springer International Publishing AG 2017. All rights reserved.
Year: 2017

Generalized synchronization of different dimensional integer-order and fractional
order chaotic systems

Authors
Ouannas A., Azar A.T., Ziar T., Radwan A.G.

Abstract
In this work different control schemes are proposed to study the problem of
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differential systems, fractional Lyapunov-based approach and nonlinear controllers,
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effectiveness of the proposed control schemes are verified by numerical examples and
Year: 2017

Hyperchaos and adaptive control of a novel hyperchaotic system with two quadratic nonlinearities

Authors
Vaidyanathan S., Azar A.T., Ouannas A.

Abstract
Liu-Su-Liu chaotic system (2007) is one of the classical 3-D chaotic systems in the literature. By introducing a feedback control to the Liu-Su-Liu chaotic system, we obtain a novel hyperchaotic system in this work, which has two quadratic nonlinearities. The phase portraits of the novel hyperchaotic system are displayed and the qualitative properties of the novel hyperchaotic system are discussed. We show that the novel hyperchaotic system has a unique equilibrium point at the origin, which is unstable. The Lyapunov exponents of the novel 4-D hyperchaotic system are obtained as $L_1 = 1.1097$, $L_2 = 0.1584$, $L_3 = 0$ and $L_4 = -14.1666$. The maximal Lyapunov exponent (MLE) of the novel hyperchaotic system is obtained as $L_1 = 1.1097$ and Lyapunov dimension as $D_L = 3.0895$. Since the sum of the Lyapunov exponents of the novel hyperchaotic system is negative, it follows that the novel hyperchaotic system is dissipative. Next, we derive new results for the adaptive control design of the novel hyperchaotic system with unknown parameters. We also derive new results for the adaptive synchronization design of identical novel hyperchaotic systems with unknown parameters. The adaptive control results derived in this work for the novel hyperchaotic system are proved using Lyapunov stability theory. Numerical simulations in MATLAB are shown to validate and illustrate all the main results derived in this work. © Springer International Publishing AG 2017.
Hyperchaos and adaptive control of a novel hyperchaotic system with two quadratic nonlinearities

Authors
Vaidyanathan S., Azar A.T., Ouannas A.

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Image encryption based on double-humped and delayed logistic maps for biomedical applications

Authors

Abstract
This paper presents a secured highly sensitive image encryption system suitable for biomedical applications. The pseudo random number generator of the presented system is based on two discrete logistic maps. The employed maps are: the one dimensional double humped logistic map as well as the two-dimensional delayed logistic map. Different analyses are introduced to measure the performance of the proposed encryption system such as: histogram analysis, correlation coefficients, MAE, NPCR as well as UACI measurements. The encryption system is proven to be highly sensitive to ±0.001% perturbation of the logistic maps parameters. The system is tested on medical images of palm print as well as Parkinson disease MRI images. © 2017 IEEE.
Impact of alignment algorithms on 16S metagenomics analysis

Authors
Mysara M., Ramakrishnan A., Shahin M., Monsieurs P.

Abstract
The development of high-throughput sequencing technologies has provided microbial ecologists with an efficient approach to assess bacterial diversity at an unseen depth. In the last year, various platforms have been used for such analysis particularly the Illumina MiSeq, 454 pyrosequencing GS FLX+ and PacBio sequencing platforms. However, analysing such high-throughput data is posing important computational challenges, requiring specialized bioinformatics solutions ending with clustering those sequences into Operational Taxonomic Units (OTUs). Individual algorithms grappling with each of those challenges and numerous efforts have been put to compare them. Nonetheless, there is a need to elucidate the effect of the alignment strategy and subsequently the distance calculation on the OTU-clustering. In this work, a comparative analysis between various alignment algorithms in respect to the produced OTUs is performed. These results suggest that multiple sequence alignment driven distances, particularly those incorporating the secondary structure, are more accurate than pairwise alignment approaches. Additionally, disregarding the computation burden, the de novo multiple sequence aligners are superior to reference based aligners.

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In silico identification of potential key regulatory factors in smoking-induced lung cancer

Authors
El-Aarag S.A., Mahmoud A., Hashem M.H., Abd Elkader H., Hemeida A.E., ElHefnawi M.

Abstract
Background: Lung cancer is a leading cause of cancer-related death worldwide and is the most commonly diagnosed cancer. Like other cancers, it is a complex and highly heterogeneous disease involving multiple signaling pathways. Identifying potential therapeutic targets is critical for the development of effective treatment strategies. Methods: We used a systems biology approach to identify potential key regulatory factors in smoking-induced lung cancer. We first identified genes that were differentially expressed between smokers with normal lungs and those with cancerous lungs, then integrated these differentially expressed genes (DEGs) with data from a protein-protein interaction database to build a network model with functional modules for pathway analysis. We also carried out a gene set enrichment analysis of DEG lists using the Kinase Enrichment Analysis (KEA), Protein-Protein Interaction (PPI) hubs, and KEGG (Kyoto Encyclopedia of Genes and Genomes) databases. Results: Twelve transcription factors were identified as having potential significance in lung cancer (CREB1, NUCKS1, HOXB4, MYCN, MYC, PHF8, TRIM28, WT1, CUX1, CRX, GABP, and TCF3); three of these (CRX, GABP, and TCF) have not been previously implicated in lung carcinogenesis. In addition, 11 kinases were found to be potentially related to lung cancer (MAPK1, IGF1R, RPS6KA1, ATR, MAPK14, MAPK3, MAPK4, MAPK8, PRKCZ, and INSR, and PRKAA1). However, PRKAA1 is reported here for the first time. MEPCE, CDK1, PRKCA, COPS5, GSK3B, BRCA1, EP300, and PIN1 were identified as potential hubs in lung cancer-associated signaling. In addition, we found 18 pathways that were potentially related to lung carcinogenesis, of which 12 (mitogen-activated protein kinase, gonadotropin-releasing hormone, Toll-like receptor, ErB, and insulin signaling; purine and ether lipid metabolism; adherens junctions; regulation of autophagy; snare interactions in vesicular transport; and cell cycle) have been previously identified. Conclusion: Our systems-based approach identified potential key molecules in lung carcinogenesis and provides a basis for investigations of tumor development as well as novel drug targets for lung cancer treatment. © 2017 The Author(s).
Innovative human-robot interaction for a robot tutor in biology game

Authors
Saleh A.A., Abdelbaki N.

Abstract
Robots nowadays, are introduced to many domains and fields. One of these fields is education. We introduce integrating robots and games in education. We have designed a humanoid robot tutoring biology. Our robot is interacting with a student to play a game to enhance and examine the student’s knowledge. In our game, we developed cognitive capabilities for the robot. We analyzed the features that both the robot and the game have to possess, and we developed a system for organ detection and recognition with the highest possible accuracy and lowest processing time. Our game introduces a multi-theme education rather than the nowadays existing subject oriented learning. Multi-theme learning, in our opinion, helps students digest different subjects and sciences concurrently and prepares them for problem solving environments having multiple inputs and considerations. © 2017 IEEE.
JSDES - An automated de-obfuscation system for malicious javascript

Authors
Abdelkhalek M., Shosha A.

Abstract
Malicious scripts used in web-based attacks have recently been reported as one of the top internet security threats. However, anti-malware solutions develop and integrate various techniques to defend against malicious scripts, attackers have been increasingly applying different counter techniques to hide their malicious intents and evade detection. One of the most popular techniques used is code obfuscation. In this research, an enhanced system is proposed to automate the process of de-obfuscating malicious JavaScript code. The proposed system was tested on real-world malicious JavaScript samples. Based on the analysis results, the cause of popularity of certain obfuscation techniques is identified. In addition, a set of improvements to the currently used malware detection techniques is proposed. © 2017 Association for Computing Machinery.
Year: 2017

Low-voltage commercial super-capacitor response to periodic linear-with-time current excitation: A case study

Authors
Elwakil A.S., Radwan A.G., Freeborn J.T., Allagui A., Maundy B.J., Fouda M.

Abstract
The response of a commercial super-capacitor to an applied periodic current excitation in the form of a triangular waveform is investigated in this study. This waveform has a linear-with-time variation which enables linear charging and discharging of the device. A model consisting of a linear resistance $R_s$ and a constant phase element is used to describe the super-capacitor impedance and expressions for the voltage across the device, the power, and stored energy are derived using concepts from fractional calculus. Experimental results are shown and an application of the study to super-capacitor parameter extraction is described. © The Institution of Engineering and Technology.
**Year:** 2017

**MC-GenomeKey: A multicloud system for the detection and annotation of genomic variants**

**Authors**
Elshazly H., Souilmi Y., Tonellato P.J., Wall D.P., Abouelhoda M.

**Abstract**
Background: Next Generation Genome sequencing techniques became affordable for massive sequencing efforts devoted to clinical characterization of human diseases. However, the cost of providing cloud-based data analysis of the mounting datasets remains a concerning bottleneck for providing cost-effective clinical services. To address this computational problem, it is important to optimize the variant analysis workflow and the used analysis tools to reduce the overall computational processing time, and concomitantly reduce the processing cost. Furthermore, it is important to capitalize on the use of the recent development in the cloud computing market, which have witnessed more providers competing in terms of products and prices.

Results: In this paper, we present a new package called MC-GenomeKey (Multi-Cloud GenomeKey) that efficiently executes the variant analysis workflow for detecting and annotating mutations using cloud resources from different commercial cloud providers. Our package supports Amazon, Google, and Azure clouds, as well as, any other cloud platform based on OpenStack. Our package allows different scenarios of execution with different levels of sophistication, up to the one where a workflow can be executed using a cluster whose nodes come from different clouds. MC-GenomeKey also supports scenarios to exploit the spot instance model of Amazon in combination with the use of other cloud platforms to provide significant cost reduction. To the best of our knowledge, this is the first solution that optimizes the execution of the workflow using computational resources from different cloud providers.

Conclusions: MC-GenomeKey provides an efficient multicloud based solution to detect and annotate mutations. The package can run in different commercial cloud platforms, which enables the user to seize the best offers. The package also provides a reliable means to make use of the low-cost spot instance model of Amazon, as it provides an efficient solution to the sudden termination of spot machines as a result of a sudden price increase. The package has a web-interface and it is available for free for academic use. © 2017 The Author(s).
Memcapacitor based charge pump

Authors

Abstract
This paper proposes a charge pump based on a charge controlled memcapacitor. The operation of the charge pump is investigated along with the mathematical analysis of the memcapacitor. Different implementations of charge pump are summarized. The proposed charge pump has the capability of driving low input voltage in range of 200mv and the capability of operating at the low frequencies which makes it suitable for biomedical applications. © 2017 IEEE.
Memristor and inverse memristor: Modeling, implementation and experiments

Authors
Fouda M.E., Radwan A.G., Elwakil A.

Abstract
Pinched hysteresis is considered to be a signature of the existence of memristive behavior. However, this is not completely accurate. In this chapter, we are discussing a general equation taking into consideration all possible cases to model all known elements including memristor. Based on this equation, it is found that an opposite behavior to the memristor can exist in a nonlinear inductor or a nonlinear capacitor (both with quadratic nonlinearity) or a derivative-controlled nonlinear resistor/transconductor which we refer to as the inverse memristor. We discuss the behavior of this new element and introduce an emulation circuit to mimic its behavior. Connecting the conventional elements with the memristor and/or with inverse memristor either in series or parallel affects the pinched hysteresis lobes where the pinch point moves from the origin and lobes’ area shrinks or widens. Different cases of connecting different elements are discussed clearly especially connecting the memristor and the inverse memristor together either in series or in parallel. New observations and conditions on the memristive behavior are introduced and discussed in detail with different illustrative examples based on numerical, and circuit simulations. © Springer International Publishing AG 2017.
Memristor-based data converter circuits

Authors

Abstract
This paper introduces data converter circuit based on memristors. A proposed Digital to Analog Converter (DAC) circuit based on non-overlapped input signals, which is suitable for common source connected transistors. Analytical formulas are introduced to relate the digital input with the analog output including the transistors dimension. In addition, PSpice simulations are performed to validate the theoretical analysis for several cases. Moreover, a modified circuit for 2-bit digital to analog converter is introduced where the input can be overlapped. One of the advantages of these designs that they are simple and area efficient. © 2016 IEEE.
Memristor-based pulse width modulator circuit

Authors

Abstract
This paper discusses the use of the memristor in one of the most important modulation techniques in communication field namely the pulse-width modulation. A fundamental two designs for memristor-based lead and trail PWM are discussed with mathematical analysis and PSPICE simulation results which show a great matching with the analytical formulation. Moreover, a third design which combine those two designs to generate a more accurate memristor-based center PWM is discussed with the appropriate analysis, numerical and PSPICE simulation results. The simulation results matches the theoretical analysis results and the proposed circuits enjoy simple design, small area and low power consumption. © 2016 IEEE.
MicroTarget: MicroRNA target gene prediction approach with application to breast cancer

Authors
Torkey H., Heath L.S., Elhefnawi M.

Abstract
MicroRNAs are known to play an essential role in gene regulation in plants and animals. The standard method for understanding microRNA-gene interactions is randomized controlled perturbation experiments. These experiments are costly and time consuming. Therefore, use of computational methods is essential. Currently, several computational methods have been developed to discover microRNA target genes. However, these methods have limitations based on the features that are used for prediction. The commonly used features are complementarity to the seed region of the microRNA, site accessibility, and evolutionary conservation. Unfortunately, not all microRNA target sites are conserved or adhere to exact seed complementary, and relying on site accessibility does not guarantee that the interaction exists. Moreover, the study of regulatory interactions composed of the same tissue expression data for microRNAs and mRNAs is necessary to understand the specificity of regulation and function. We developed MicroTarget to predict a microRNA-gene regulatory network using heterogeneous data sources, especially gene and microRNA expression data. First, MicroTarget employs expression data to learn a candidate target set for each microRNA. Then, it uses sequence data to provide evidence of direct interactions. MicroTarget scores and ranks the predicted targets based on a set of features. The predicted targets overlap with many of the experimentally validated ones. Our results indicate that using expression data in target prediction is more accurate in terms of specificity and sensitivity. Available at: https://bioinformatics.cs.vt.edu/~htorkey/microTarget. © 2017 World Scientific Publishing Europe Ltd.
Minimal two-transistor multifunction filter design

Authors
Maundy B.J., Elwakil A.S., Ozoguz S., Yildiz H.A.

Abstract
This paper presents a comprehensive method and analysis on the design of two-transistor multi-output filters where three possible functions are simultaneously available. Although two transistors are employed at its core, proper biasing does not require additional passive components. A total of thirteen valid second-order filters are reported, and several of them are experimentally tested using discrete transistors as well as simulated using Spectre in a BiCMOS process. A fully differential realization of a MOS-C band-pass filter, based on one of the structures found, is designed and then used to realize a fourth-order Chebyshev band-pass filter. Copyright © 2017 John Wiley & Sons, Ltd. Copyright © 2017 John Wiley & Sons, Ltd.
Modeling and analysis of fractional order DC-DC converter

Authors

Abstract
Due to the non-idealities of commercial inductors, the demand for a better model that accurately describe their dynamic response is elevated. So, the fractional order models of Buck, Boost and Buck-Boost DC-DC converters are presented in this paper. The detailed analysis is made for the two most common modes of converter operation: Continuous Conduction Mode (CCM) and Discontinuous Conduction Mode (DCM). Closed form time domain expressions are derived for inductor currents, voltage gain, average current, conduction time and power efficiency where the effect of the fractional order inductor is found to be strongly present. For example, the peak inductor current at steady state increases with decreasing the inductor order. Advanced Design Systems (ADS) circuit simulations are used to verify the derived formulas, where the fractional order inductor is simulated using Valsa Constant Phase Element (CPE) approximation and Generalized Impedance Converter (GIC). Different simulation results are introduced with good matching to the theoretical formulas for the three DC-DC converter topologies under different fractional orders. A comprehensive comparison with the recently published literature is presented to show the advantages and disadvantages of each approach. © 2017 ISA.
Year: 2017

Modelling of Cu2ZnSnSe4-CdS-ZnO thin film solar cell

Authors

Abstract
We present a device model for the Cu2ZnSnSe4-CdS-ZnO solar cell with a total area efficiency of 9.7% reported in 2013 (Brammertz et al 2013 Appl. Phys. Lett. 103 163904). The simulations were performed using SCAPS program. In the device model, we reproduce rigorously the full range of layers and device properties estimated experientially using various characterization techniques. We include in the device model barriers at the back contact and the absorber/buffer interfaces, the photo-doped CdS buffer layer and defect states at the CdS/ZnO interface. A perfect match with the electrical behaviors of the solar cell are obtained, including light and dark current voltage, quantum efficiency, open circuit voltage (V OC) versus temperature and capacitance measurements. We show as well that interface recombination does not have an impact on the V OC deficit but partially reduces the short circuit current and the fill factor and that the main electrical limitations are due to the presence of tail states and electrostatic potential fluctuations in the CZTSe material leading to a decrease in the band gap and an increase of radiative recombination by tow orders. © 2017 IOP Publishing Ltd.
Modelling supercapacitors leakage behaviour using a fractional-order model

Authors
Freeborn T.J., Allagui A., Elwakil A.

Abstract
A fractional-order circuit model is explored to represent the leakage/self-discharge behaviour of commercially available supercapacitors. This fractional order-model is composed of two elements, a fractional-order capacitor with impedance $Z = 1/C\alpha\sigma$ and a parallel resistance $R_p$, which set the discharge based on the time constant $\tau = (R_pC)1/\alpha$ and order $\alpha$. Self-discharging data was collected from a 3 F PowerStor, 1 F Panasonic, and 350 F Maxwell supercapacitors after being charged and left in a floating state while monitoring the device terminal voltage. The parameters for the fractional-order model that best fit the experimental data were extracted using a nonlinear least-squares optimization routine, yielding $\tau = 6.39$ Msec and $\alpha = 0.292$ for the PowerStor device, $\tau = 137.2$ Msec and $\alpha = 0.383$ for the Panasonic device and $\tau = 53.63$ Msec and $\alpha = 0.715$ for the Maxwell device. The MATLAB simulated responses using the extracted parameters show maximum relative errors $< 1.1\%$ compared to the experimental data. © 2017 IEEE.
New hybrid synchronisation schemes based on coexistence of various types of synchronisation between master-slave hyperchaotic systems

Authors
Ouannas A., Azar A.T., Vaidyanathan S.

Abstract
In this paper, we present new approaches to study the co-existence of some types of synchronisation between hyperchaotic dynamical systems. The paper first analyses, based on stability theory of linear continuous-time systems, the co-existence of the projective synchronisation (PS), the function projective synchronisation (FPS), the full state hybrid function projective synchronisation (FSHFPS) and the generalised synchronisation (GS) between general master and slave hyperchaotic systems. Successively, using Lyapunov stability theory, the coexistence of three different synchronisation types is proved, i.e., the inverse projective synchronisation (IPS), the inverse function projective synchronisation (IFPS), the inverse full state hybrid function projective synchronisation (IFSHFPS) and the inverse generalised synchronisation (IGS) are proved to co-exist between arbitrary master and slave systems. Finally, several numerical simulations of co-existence of synchronisation types are illustrated, with the aim to show the effectiveness of the approaches developed herein. Copyright © 2017 Inderscience Enterprises Ltd.
New Trends on Modeling, Design, and Control of Chaotic Systems

Authors
Munoz-Pacheco J.M., Volos C., Campos-Canton E., Taher Azar A., Pham V.-T., Radwan A.G.

Abstract
[No abstract available]
Nonlinear single-input single-output model-based estimation of cardiac output for normal and depressed cases

Authors

Abstract
Mental depression is associated with an increased risk of cardiovascular mortality, thus provisioning generic simple nonlinear mathematical models for normal and depressed cases using only heart rate (HR) or stroke volume (SV) as a single input to produce cardiac output (CO) as a single output instead of using both HR and SV as two inputs. The proposed models could be in the future an effective tool to investigate the effect of neuroleptic medication, especially depression, and it reduces the time of processing. Seventy-four depressed cases, 74 normal peers and autoregressive considered as a main role in the nonlinear discrete system identification are chosen to lie under investigation on the way to produce four simple nonlinear models. The first generic model using only HR as an input which generated from the depressed case number 62 produced minimum root-mean-square error (RMSE) of 0.0018 and when it is applied to the 74 depressed cases it produced average RMSE equal to 0.1978. Second, generic model using only HR as an input created from the normal case number 55 produced minimum RMSE of 0.0008 and average RMSE equal to 0.0572. The third generic model using only SV as an input which generated from the depressed case number 16 produced minimum RMSE of 0.0027 and when it is applied to the 74 depressed cases it produced average RMSE equal to 0.9405. Fourth generic model using only SV as an input created from the normal case number 58 produced minimum RMSE of 0.0019 and average RMSE equal to 1.0833. The four simple nonlinear models for depression and normal cases are succeeded to determine CO by using only one input such as HR or SV and could be a good contribution in the future to neuroleptic medications field especially depression while HR showed the minimum average RMSE. © 2017 The Natural Computing Applications Forum
Abstract
We characterize time and power allocations to optimize the sum-throughput of a Wireless Powered Communication Network (WPCN) with Non-Orthogonal Multiple Access (NOMA). In our setup, an Energy Rich (ER) source broadcasts wireless energy to several devices, which use it to simultaneously transmit data to an Access Point (AP) on the uplink. Differently from most prior works, in this paper we consider a generic scenario, in which the ER and AP do not coincide, i.e., are two separate entities. We study two NOMA decoding schemes, namely Low Complexity Decoding (LCD) and Successive Interference Cancellation Decoding (SICD). For each scheme, we formulate a sum-throughput optimization problem over a finite horizon. Despite the complexity of the LCD optimization problem, due to its non-convexity, we recast it into a series of geometric programs. On the other hand, we establish the convexity of the SICD optimization problem and propose an algorithm to find its optimal solution. Our numerical results demonstrate the importance of using successive interference cancellation in WPCNs with NOMA, and show how the energy should be distributed as a function of the system parameters. © 2017 IEEE.
On a simple approach for Q-S synchronisation of chaotic dynamical systems in continuous-time

Authors
Ouannas A., Azar A.T., Vaidyanathan S.

Abstract
In this paper, the problem of Q-S synchronisation for arbitrary dimensional chaotic dynamical systems in continuous-time is investigated. Based on nonlinear control method, we would like to present a constructive scheme to study the Q-S synchronisation between n-dimensional master chaotic system and m-dimensional slave chaotic system in arbitrary dimension. The new derived synchronisation result is proved using Lyapunov stability theory. In order to verify the effectiveness of the proposed method, our approach is applied to some typical chaotic systems and numerical simulations are given to validate the derived results. Copyright © 2017 Inderscience Enterprises Ltd.
On a simple approach for Q-S synchronisation of chaotic dynamical systems in continuous-time

Authors
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On inverse problem of generalized synchronization between different dimensional integer-order and fractional-order chaotic systems

Authors
Ouannas A., Azar A.T., Radwan A.G.

Abstract
Chaos is described as a unstable dynamic behavior with dependence on initial conditions. The control and synchronization of chaotic systems requires the knowledge of parameters in advance. Recently researcher's has been shifted from integer order chaotic system to fraction order chaotic system. In this work, based on the stability theory of integer-order linear systems and Lyapunov stability theory, we present some control schemes to achieve a new type of synchronization called inverse generalized synchronization between different dimensional integer and fractional-orders chaotic systems. The effectiveness of the proposed approaches are verified by two numerical examples. © 2016 IEEE.
On new fractional inverse matrix projective synchronization schemes

Authors
Ouannas A., Azar A.T., Ziar T., Vaidyanathan S.

Abstract
In this study, the problem of inverse matrix projective synchronization (IMPS) between different dimensional fractional order chaotic systems is investigated. Based on fractional order Lyapunov approach and stability theory of fractional order linear systems, new complex schemes are proposed to achieve inverse matrix projective synchronization (IMPS) between n-dimension and m-dimension fractional order chaotic systems. To validate the theoretical results and to verify the effectiveness of the proposed schemes, numerical applications and computer simulations are used. © Springer International Publishing AG 2017. All rights reserved.
On new fractional inverse matrix projective synchronization schemes

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On the analysis of current-controlled fractional-order memristor emulator

Authors

Abstract
In this paper, a current-controlled fractional-order memristor model and its emulator are proposed. The emulator is built using two second generation current conveyor (CCII) and fractional-order capacitor. It is shown that the effect of the fractional order is clearly noticeable in the circuit response. PSPICE simulations are introduced for different values of the fractional order showing noticeable variations of the pinched-loop hysteresis curves. The fractional order model shows wider frequency of operation and larger pinched loop hysteresis area than the integer one. © 2017 IEEE.
On the role of finite queues in cooperative cognitive radio networks with energy harvesting

Authors
Abd-Elmagid M.A., ElBatt T., Seddik K.G.

Abstract
This paper studies the problem of cooperative communications in cognitive radio networks where the secondary user is equipped with finite length relaying queue as well as finite length battery queue. The major hurdle towards fully characterizing the stable throughput region stems from the sheer complexity associated with solving the two-dimensional Markov Chain (MC) model for both finite queues. Motivated by this, we relax the problem and focus on two energy constrained systems, namely, finite battery queue with infinite relay queue and finite relay queue with infinite battery queue. We characterize the stable throughput regions for the two proposed simpler systems. For each proposed system, we investigate the maximum service rate of the cognitive node subject to stability conditions. Despite the complexity of the formulated optimization problems attributed to their non-convexity, we exploit the problems' structure to transform them into linear programs. Thus, we manage to solve them efficiently using standard known linear programming solvers. Our numerical results reveal interesting insights about the role of finite data queues as well as energy limitations on the network performance, compared to baselines with unlimited energy sources and infinite data queues. © 2017 IEEE.
Optical character recognition using deep recurrent attention model

Authors
Shaker M., ElHelw M.

Abstract
We address the problem of recognizing multi-digit numbers in optical character images. Classical approaches to solve this problem include separate localization, segmentation and recognition steps. In this paper, an integrated approach to multi-digit recognition from raw pixels to ultimate multi class labeling is proposed by using recurrent attention model based on a spatial transformer model equipped with LSTM to localize digits individually and a subsequent deep convolutional neural network for actual recognition. The proposed method is evaluated on the publicly available SVHN dataset where it achieves enhanced recognition accuracy per individual digits and in complete street numbers. Further evaluation on the cluttered MNIST dataset shows results comparable to state of the art techniques but with simple and computationally effective network architecture. © 2017 Association for Computing Machinery.
Optimization of energy-constrained wireless powered communication networks with heterogeneous nodes

Authors
Abd-Elmagid M.A., ElBatt T., Seddik K.G.

Abstract
In this paper, we generalize conventional time division multiple access (TDMA) wireless networks to a new type of wireless networks coined generalized wireless powered communication networks (g-WPCNs). Our prime objective is to optimize the design of g-WPCNs where nodes are equipped with radio frequency (RF) energy harvesting circuitries along with constant energy supplies. This constitutes an important step towards a generalized optimization framework for more realistic systems, beyond prior studies where nodes are solely powered by the inherently limited RF energy harvesting. Towards this objective, we formulate two optimization problems with different objective functions, namely, maximizing the sum throughput and maximizing the minimum throughput (maxmin) to address fairness. First, we study the sum throughput maximization problem, investigate its complexity and solve it efficiently using an algorithm based on alternating optimization approach. Afterwards, we shift our attention to the maxmin optimization problem to improve the fairness limitations associated with the sum throughput maximization problem. The proposed problem is generalized, compared to prior work, as it seamlessly lends itself to prior formulations in the literature as special cases representing extreme scenarios, namely, conventional TDMA wireless networks (no RF energy harvesting) and standard WPCNs, with only RF energy harvesting nodes. In addition, the generalized formulation encompasses a scenario of practical interest we introduce, namely, WPCNs with two types of nodes (with and without RF energy harvesting capability) where legacy nodes without RF energy harvesting can be utilized to enhance the system sum throughput, even beyond WPCNs with all RF energy harvesting nodes studied earlier in the literature. We establish the convexity of all formulated problems which opens room for efficient solution using standard techniques. Our numerical results show that conventional TDMA wireless networks and WPCNs with only RF energy harvesting nodes are considered as lower bounds on the performance of the generalized problem setting in terms of the maximum sum throughput and maxmin throughput. Moreover, the results reveal valuable insights and throughput-fairness trade-offs unique to our new problem setting. © 2017 Springer Science+Business Media, LLC.
Optimizing Cooperative Cognitive Radio Networks Performance with Primary QoS Provisioning

Authors
Elmahdy A.M., El-Keyi A., Elbatt T., Seddik K.G.

Abstract
We consider the problem of optimizing the performance of a cooperative cognitive radio user subject to constraints on the quality-of-service (QoS) of the primary user (PU). In particular, we design the probabilistic admission control parameter of the PU packets in the secondary user (SU) relaying queue and the randomized service parameter at the SU under non-work-conserving (non-WC) and WC cooperation policies. In the non-WC policy, two constrained optimization problems are formulated; the first problem is maximizing the SU throughput while the second problem is minimizing the SU average delay. In both problems, a constraint is imposed on the maximum allowable average delay of the PU. We show the equivalence of the two problems and develop a low-complexity line search algorithm to find the optimal parameters. Subsequently, the idea of optimizing the SU average delay is developed for the more complex WC policy, for its superior resource utilization and performance. Due to the sheer complexity of this optimization problem, we formulate another problem whose solution yields a suboptimal upper bound on the optimal SU delay. Afterwards, a practical WC-policy-based algorithm is designed in order to closely approach the optimal value of the SU delay. We show, through numerical results, that the proposed cooperation policies represent the best compromise between enhancing the SU QoS and satisfying the PU QoS requirements. Furthermore, the superior performance of the suboptimal WC policy over the non-WC policy is illustrated. Finally, the merits of the WC-policy-based algorithm are demonstrated through extensive simulations. © 1972-2012 IEEE.
A pre-encryption algorithm for passive ultra-high frequency (UHF) radio frequency identification (RFID) systems is described. The algorithm is based on advanced encryption standard (AES) as the core encryption technique with two extra steps; first step is random key generation and the second step is data randomization, which increase the immunity of the encryption process against attacks. The algorithm is implemented using C programming language and is used to encrypt and decrypt the user data of an UHF RFID passive tag. The algorithm is simple, easy to implement and does not require any hardware changes at the reader and tag sides. Moreover, it is difficult to break due to its multiple steps and randomness. The algorithm ensures secured communication for the passive UHF RFID system. © 2016 IEEE.
PREFACE

Authors
Shaalan K., El-Beltagy S.R.

[No abstract available]
Year: 2017

Preface

Authors
Azar A.T., Vaidyanathan S., Ouannas A.

Abstract
[No abstract available]
Abstract
In this paper we characterize the proactive diversity gain of a cognitive network with predictable primary and secondary requests. Network performance is analyzed under two proposed proactive service policies that preserve higher priority for the primary user. The first policy preserves the primary diversity bound as if there is no secondary user in the network, whereas the second policy boosts the secondary diversity with guaranteed higher primary diversity. For each policy, we derive diversity gain bounds for primary and secondary users. We show that the predictability of secondary requests can remarkably boost quality of service (QoS) of the secondary user compared to the previous literature when secondary requests are nonpredictable. We provide numerical simulations to validate our analytical findings and demonstrate performance merits. © 2016 IEEE.
**Proactive location-based scheduling of delay-constrained traffic over fading channels**

**Authors**
Girgis A.M., El-Keyi A., Nafie M., Gohary R.

**Abstract**
In this paper, proactive resource allocation based on user location for point-to-point communication over fading channels is introduced, whereby the source must transmit a packet when the user requests it within a deadline of a single time slot. We introduce a prediction model in which the source predicts the request arrival $T_p$ slots ahead, where $T_p$ denotes the prediction window (PW) size. The source allocates energy to transmit some bits proactively for each time slot of the PW with the objective of reducing the transmission energy over the non-predictive case. The requests are predicted based on the user location utilizing the prior statistics about the user requests at each location. We also assume that the prediction is not perfect. We propose proactive scheduling policies to minimize the expected energy consumption required to transmit the requested packets under two different assumptions on the channel state information at the source. In the first scenario, offline scheduling, we assume the channel states are known a-priori at the source at the beginning of the PW. In the second scenario, online scheduling, it is assumed that the source has causal knowledge of the channel state. Numerical results are presented showing the gains achieved by using proactive scheduling policies compared with classical (reactive) networks. Simulation results also show that increasing the PW size leads to a significant reduction in the consumed transmission energy even with imperfect prediction. © 2016 IEEE.
Quantitative dynamic taint analysis of privacy leakage in android Arabic apps

Authors
Youssef A., Shosha A.F.

Abstract
Android smartphones are ubiquitous all over the world, and organizations that turn profits out of data mining user personal information are on the rise. Many users are not aware of the risks of accepting permissions from Android apps, and the continued state of insecurity, manifested in increased level of breaches across all large organizations means that personal information is falling in the hands of malicious actors. This paper aims at shedding the light on privacy leakage in apps that target a specific demography, Arabs. The research takes into consideration apps that cater to specific cultural aspects of this region and identify how they could be abusing the trust given to them by unsuspecting users. Dynamic taint analysis is used in a virtualized environment to analyze top free apps based on popularity in Google Play store. Information presented highlights how different categories of apps leak different categories of private information. © 2017 Association for Computing Machinery.
Reactance-less RM relaxation oscillator using exponential memristor model

Authors
El-Naggar A.M., Fouda M.E., Madian A.H., Radwan A.G.

Abstract
Recently, the memristor based relaxation oscillators become an important topic in circuit theory where the reactive elements are replaced by memristor which occupies a very small area. In this paper, a design of memristor-based relaxation oscillator is introduced based on exponential memristor model. Unlike previously published oscillators which were built based on a simple memristor model, the exponential model is used, as a generalized model, to verify the concept of memristor based RM oscillator using a model that has electrical characteristic very close to the fabricated device. First, the effect of changing parameters of the memristor is illustrated using graphical analysis. Then, a reasonable range of values for the device parameters are selected to be suitable for the operation of the RM oscillator. The mathematical modeling of the memristor in the oscillator is introduced, in addition to the effect of changing the control voltage on the oscillation frequency. The design and simulations were carried out using Cadence Virtuoso. © 2016 IEEE.
Realizing fractional-order elements using CCII based mutators

Authors
Soltan A., Radwan A.G., Soliman A.M.

Abstract
Nowadays, impedance converter and inverter circuits are very vital for the fractional order circuit design. Mutators are one of the common circuits used for that purpose. So, two fractional order mutators are discussed in this work; the first one converts a resistance into a fractional order element. The second mutator family converts any fractional order element to a different fractional order element. Circuit simulations for the mutator circuits using Advanced Design System (ADS) are performed and proved that the circuits are able to achieve the required phase response. © 2016 IEEE.
Robust adaptive supervisory fractional order controller for optimal energy management in wind turbine with battery storage

Authors
Meghni B., Dib D., Azar A.T., Ghoudelbourk S., Saadoun A.

Abstract
To address the challenges of poor grid stability, intermittency of wind speed, lack of decision-making, and low economic benefits, many countries have set strict grid codes that wind power generators must accomplish. One of the major factors that can increase the efficiency of wind turbines (WTs) is the simultaneous control of the different parts in several operating area. A high performance controller can significantly increase the amount and quality of energy that can be captured from wind. The main problem associated with control design in wind generator is the presence of asymmetric in the dynamic model of the system, which makes a generic supervisory control scheme for the power management of WT complicated. Consequently, supervisory controller can be utilized as the main building block of a wind farm controller (offshore), which meets the grid code requirements and can increased the efficiency of WTs, the stability and intermittency problems of wind power generation.

This Chapter proposes a new robust adaptive supervisory controller for the optimal management of a variable speed turbines (VST) and a battery energy storage system (BESS) in both regions (II and III) simultaneously under wind speed variation and grid demand changes. To this end, the second order sliding mode (SOSMC) with the adaptive gain super-twisting control law and fuzzy logic control (FLC) are used in the machine side, BESS side and grid side converters. The control objectives are fourfold: (i) Control of the rotor speed to track the optimal value; (ii) Maximum Power Point Tracking (MPPT) mode or power limit mode for adaptive control; (iii) Maintain the DC bus voltage close to its nominal value; (iv) Ensure: a smooth regulation of grid active and reactive power quantity, a satisfactory power factor correction and a high harmonic performance in relation to the AC source and eliminating the chattering effect. Results of extensive simulation studies prove that the proposed supervisory control system guarantees to track reference signals with a high harmonic performance despite external disturbance uncertainties. © Springer International Publishing AG 2017.
Robust adaptive supervisory fractional order controller for optimal energy management in wind turbine with battery storage

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Robust control for asynchronous switched nonlinear systems with time varying delays

Authors
Azar A.T., Serrano F.E.

Abstract
In this article a novel robust controller for the control of switched nonlinear systems with asynchronous switching is proposed considering state delays. The proposed approach improves the actual methodologies found in literature in which the disturbance rejection properties of these two methodologies consider a disturbance equal to zero but the proposed robust controller considers any kind of disturbances that makes this strategy to surpass other similar methodologies. The main objective is that the robust controller stabilizes the studied system in matched and unmatched modes considering the dwell time in order to obtain an exponentially stable closed loop system. Another characteristic of the proposed control strategy is that a conmutative control law in both matched and unmatched cases is designed with a linear part, where the gain matrices for the linear part are obtained by linear matrix inequalities LMI’s along with a nonlinear controller part. abstract environment. © Springer International Publishing AG 2017.
Sensor Faults Detection and Estimation for a Dfig Equipped Wind Turbine

Authors
Abdelmalek S., Rezazi S., Azar A.T.

Abstract
Doubly Fed Induction Generator (DFIG) based on wind turbines demand a high degree of reliability and availability and they are characterized by expensive and safety critical maintenance work. This paper deals with a new strategy for detection and estimation of current sensor faults in the stator and rotor of a DFIG. First, a state space model of a DFIG is developed based on voltages and flux equations, which can be used in order to estimate states and to generate residuals by using a Luenberger observer. Then, the residuals results are exploited for faults detection and estimation. Finally, the effectiveness of the developed approach is validated through simulation tests performed by different faults scenarios. © 2017 The Authors. Published by Elsevier Ltd.
Year: 2017

Single and dual solutions of fractional order differential equations based on controlled Picard's method with Simpson rule

Authors
Semary M.S., Hassan H.N., Radwan A.G.

Abstract
This paper presents a semi-analytical method for solving fractional differential equations with strong terms like (exp, sin, cos,...). An auxiliary parameter is introduced into the well-known Picard's method and so called controlled Picard's method. The proposed approach is based on a combination of controlled Picard's method with Simpson rule. This approach can cover a wider range of integer and fractional orders differential equations due to the extra auxiliary parameter which enhances the convergence and is suitable for higher order differential equations. The proposed approach can be effectively applied to Bratu's problem in fractional order domain to predict and calculate all branches of problem solutions simultaneously. Also, it is tested on other fractional differential equations like nonlinear fractional order Sine-Gordon equation. The results demonstrate reliability, simplicity and efficiency of the approach developed. © 2017 University of Bahrain
Soil biochar amendment affects the diversity of nosZ transcripts: Implications for N2O formation

Authors

Abstract
Microbial nitrogen transformation processes such as denitrification represent major sources of the potent greenhouse gas nitrous oxide (N2O). Soil biochar amendment has been shown to significantly decrease N2O emissions in various soils. However, the effect of biochar on the structure and function of microbial communities that actively perform nitrogen redox transformations has not been studied in detail yet. To analyse the community composition of actively denitrifying and N2O-reducing microbial communities, we collected RNA samples at different time points from a soil microcosm experiment conducted under denitrifying conditions and performed Illumina amplicon sequencing targeting nirK, typical nosZ and atypical nosZ mRNA transcripts. Within 10 days, biochar significantly increased the diversity of nirK and typical nosZ transcripts and resulted in taxonomic shifts among the typical nosZ-expressing microbial community. Furthermore, biochar addition led to a significant increase in transcript production among microbial species that are specialized on direct N2O reduction from the environment. Our results point towards a potential coupling of biochar-induced N2O emission reduction and an increase in microbial N2O reduction activity among specific groups of typical and atypical N2O reducers. However, experiments with other soils and biochars will be required to verify the transferability of these findings to other soil-biochar systems. © 2017 The Author(s).
Stability analysis for multi-user cooperative cognitive radio network with energy harvesting

Authors
Amer R., El-Sherif A.A., Ebrahim H., Mokhtar A.

Abstract
This paper deals with stability analysis for cognitive cooperative system composed of one primary user and many secondary users with energy harvesting imposed at both primary and secondary users. Secondary users are grouped in a cluster with a cluster supervision block (CSB) controller which controls and synchronizes all the activities of the SU cluster. The secondary user cluster is equipped with a common relay queue for collaboration with the PU. Multiple SUs cooperate with one PU for its data transmission, getting mutual benefits for both users, such that, the PU exploits SUs' power and diversity provided by the multi-SU cluster to relay a fraction of its undelivered packets, and the SUs get more chances to access idle time slots. We investigate the maximum stable throughput of this system taking into account the effect of energy harvesting rates on the system performance. In such a scenario, the service rate of SUs’ queues depends on whether the PU’s queue is empty or not. To overcome the interaction between PU and SUs' queues, a dominant system approach is used to obtain an inner bound on the stable throughput region. Results reveal that, the non-cooperative system outperforms the cooperative system at low PU arrival rates with a small SU cluster size, while the cooperation benefits appear at higher PU arrival rates. For larger SU cluster size and higher SUs' energy harvesting rates, the cooperative system is the prevalent. © 2016 IEEE.
Stability analysis of a cognitive radio system with a dedicated relay

Authors
Kiwan D., El Sherif A., ElBatt T.

Abstract
In this paper, we characterize the stability region of cognitive radio networks with a dedicated relay node. In particular, we study this system under two different MAC protocols: perfect sensing and random access. In the perfect sensing protocol, the relay node and the secondary user access the medium only when the primary user is idle. In the random access protocol, both the relay and the secondary user randomly access the medium without sensing the state of the primary user. Towards this objective, we describe the system using a queuing theoretic model and formulate a constrained optimization problem to maximize the mean service rate of the secondary user while satisfying the stability conditions for all queues in the system. We compare the stability region of the dedicated relay system to the system with no relaying and the system in which the secondary user acts as a relay. Our numerical results reveal that the dedicated relay system outperforms the no relaying baseline system under the random access protocol. However, this is not the case in the perfect sensing protocol as the performance of the dedicated relay system compared to the no relaying system depends on the primary user's packet arrival rate. Moreover, results show that the secondary user relaying system outperforms the dedicated relay system due to the collisions introduced by the dedicated relay on the cognitive system. However, the secondary relaying system has its own challenges in terms of the standards allowing cooperation with the primary user in addition to the security and privacy issues involved. © 2017 IEEE.
Supercapacitor reciprocity and response to linear current and voltage ramps

Authors
Allagui A., Elwakil A.S., Freeborn T.J.

Abstract
The focus in supercapacitor research typically falls into one of two categories: (i) the rational design and engineering of electrode materials and electrolyte formulation to achieve high performance devices at competitive costs, and (ii) the modeling of their resulting behavior in response to constant-current charging/discharging, cyclic voltammetry or impedance spectroscopy. However, less work has been dedicated to new ways for charging these devices. In this work we show that charging a supercapacitor, modeled as a constant phase element with a series resistor, using a linear voltage ramp results in higher stored charge and higher effective capacitance value than when using a linear current ramp. This is despite the reciprocity of the device, as we proved analytically. The theoretical analysis and numerical simulations are in excellent agreement with the experimental results carried out on a commercial supercapacitor. The findings can be viewed as a step towards finding the optimum charging waveforms for these devices that would maximize their effective capacitance.

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Year: 2017

Three Fractional-Order-Capacitors-Based Oscillators with Controllable Phase and Frequency

Authors
Said L.A., Radwan A.G., Madian A.H., Soliman A.M.

Abstract
This paper presents a generalization of six well-known quadrature third-order oscillators into the fractional-order domain. The generalization process involves replacement of three integer-order capacitors with fractional-order ones. The employment of fractional-order capacitors allows a complete tunability of oscillator frequency and phase. The presented oscillators are implemented with three active building blocks which are op-Amp, current feedback operational amplifier (CFOA) and second generation current conveyor (CCII). The general state matrix, oscillation frequency and condition are deduced in terms of the fractional-order parameters. The extra degree of freedom provided by the fractional-order elements increases the design flexibility. Eight special cases including the integer case are illustrated with their numerical discussions. Three different phases are produced with fixed sum of $2\pi$ which can be completely controlled by fractional-order elements. A general design procedure is introduced to design an oscillator with a specific phase and frequency. Two general design cases are discussed based on exploiting the degrees of freedom introduced by the fractional order to obtain the required design. Spice circuit simulations with experimental results for some special cases are presented to validate the theoretical findings, © 2017 World Scientific Publishing Company.
Towards Efficient Online Topic Detection through Automated Bursty Feature Detection from Arabic Twitter Streams

Authors
Hammad M., El-Beltagy S.R.

Abstract
Detecting trending topics or events from Twitter is an active research area. The first step in detecting such topics focuses on efficiently capturing textual features that exhibit an unusual high rate of appearance during a specific timeframe. Previous work in this area has resulted in coining the term "detecting bursty features" to refer to this step. In this paper, TFIDF, entropy, and stream chunking are adapted to investigate a new technique for detecting bursty features from an Arabic Twitter stream. Experimental results comparing bursty features extracted from Twitter streams, to Twitter's trending Hashtags and headlines from local news agencies during the same time frame from which tweets were collected, show a great deal of overlap indicating that the presented algorithm is capable of detecting meaningful bursty features.
Variability of Cole-model bioimpedance parameters using magnitude-only measurements of apples from a two-electrode configuration

Authors
Freeborn T.J., Elwakil A.S., Maundy B.

Abstract
Electrical impedance measurements have been widely researched to monitor physiological changes in fruits and vegetables in a nondestructive manner. Recently, the parameters of the Cole bioimpedance model (R0, R1, C, and α), an equivalent circuit that is widely used to represent the electrical impedance of biological tissues, were extracted using techniques without direct impedance measurements. In this study, the variability of the Cole parameters extracted from magnitude-only measurements (from 200 Hz to 1 MHz) of apples in a two-electrode setup was examined to understand the impact of electrode placement on the parameters evaluated using this technique. Eight electrodes were placed around the center latitudinal line of apples to collect seven sets of measurements from four different varieties (Granny Smith, Fuji, Red Delicious, and Spartan). The Cole impedance parameters were extracted in MATLAB from the collected measurements using a nonlinear least squares fitting method. These extractions indicated that the parameters R0 and R1 had the highest variability based on the electrode location, whereas the dispersion coefficient (α) had the lowest variability. © 2017 Taylor & Francis Group, LLC.
Abstract
In this paper the variability of supercapacitor fractional-order model parameters are explored when extracted using a non-linear least squares optimization applied to their constant current discharging behaviour. The variability of parameters extracted 1000 different times applying the optimization process to multiple sets of simulated and experimental data are presented to validate this approach. The experimental results were collected from 4 samples of Panasonic EEC-SSR5H105 supercapacitors (1 F rating) acting as a secondary power source for an Arduino Uno system. Simulations using the average extracted parameters show less than 5% error compared to the experimental results, with all parameters from each sample also showing mean absolute deviations in the micro (10^-6) range for the majority of cases. © 2017 IEEE.
Vision capabilities for a humanoid robot tutoring biology

Authors
Saleh A.A., Abdelbaki N.

Abstract
Robots are expected to be the future solution in various fields. One of these fields is education. Teachers, students and robots have to work together to make this assumption true. For this, robots must have the adequate capabilities that can help them succeed. Vision of the robot is an essential tool that the robot uses to perform several tasks. Hence, it has to be taken into consideration, the steps and the expectations for this robot vision system to surpass at least the very basic skills. Detection, recognition, and localization are the basic skills that we are implementing in our experiment. To test our system we used the robot as a tutor in biology teaching and evaluating approach. © 2017 IEEE.
Voltage-controlled M-M relaxation Oscillator

Authors

Abstract
This paper discusses voltage-controlled M-M relaxation oscillator with analytical and circuit simulations. The introduced circuit has two different configurations based on the polarities of memristor; whether they are in the same direction or in the opposite direction. The Analytical formulas are function of the reference voltage such as the oscillation frequency and oscillation conditions for each case are derived with some numerical examples. The circuit simulations are introduced to validate the mathematical concepts as well as the effect of the reference voltage which can be used in frequency modulation application. A comparison between the two oscillators is presented versus different parameters. Finally, similar discussion based on asymmetric voltage controlled oscillator is introduced where different frequency ranges can be obtained. © 2016 IEEE.
3D surface reconstruction of retinal vascular structures

Authors
Malek J., Azar A.T.

Abstract
We propose in this paper, a three-dimensional surface reconstruction of a retinal vascular network from a pair of 2D retinal images. Our approach attempts to address the above challenges by incorporating an epipolar geometry estimation and adaptive surface modelling in a 3D reconstruction, using three steps: segmentation, 3D skeleton reconstruction and 3D surface modelling of vascular structures. The intrinsic calibration matrices are found via the solution of simplified Kruppa equations. A simple essential matrix based on a self-calibration method has been used for the 'fundus camera-eye' system. The used method has eventually produced vessel surfaces that could be fit for various applications, such as applications for computational fluid dynamics simulations and applications for real-time virtual interventional. Copyright © 2016 Inderscience Enterprises Ltd.
A computational flow model of oxygen transport in the retinal network

Authors
Malek J., Azar A.T.

Abstract
The retina's high oxygen demands and the retinal vasculature's relatively sparse nature are assumed to contribute to the retina's specific vulnerability to vascular diseases. This study has been designed to model the oxygen transport in physiologically realistic retinal networks. A computational fluid dynamics study has been conducted to investigate the effect of topological changes on the oxygen partial pressure distribution in retinal blood vessels. The Navier Stokes equations for blood flow and the mass transport equation for oxygen have been coupled and solved simultaneously for the laminar flow mass transfer problem. The mean oxygen saturation of a healthy eye has been 93% in retinal arterioles and 58% in venules. The arteriovenous difference has been 35%. For a patient with a central retinal vein occlusion (CRVO), the mean oxygen saturation has been 33%. The findings from the analysis are generally consistent with a lot of previous experimental measurements and clinical data available in the literature, demonstrating the efficiency of our model for predicting the oxygen distribution in the retinal networks. This paves the way for a new research and applications for simulating inaccessible cases from experimental studies. Copyright © 2016 Inderscience Enterprises Ltd.
A fast locking hybrid TDC-BB ADPLL utilizing proportional derivative digital loop filter and power gated DCO

Authors
Lotfy A., Ghoneima M., Abdel-Moneum M.

Abstract
A hybrid Time to Digital Converter (TDC) - Bang Bang (BB) All Digital Phase Locked Loop (ADPLL) architecture is proposed to optimize power, area, lock time, and design complexity. The Hybrid ADPLL architecture utilizes a low resolution two synthesizable Time to Digital Converters to achieve fast lock time, and then switches to a Bang-Bang like architecture once it is in the locked state. Such hybrid architecture enables the ADPLL to achieve lock time in less than 1 μ sec using an adaptive proportional derivative digital loop filter while consuming a power of 5.1 mW when locked at 4GHz with 1.37 ps rms period jitter. Additionally, The proposed ADPLL utilizes a novel power gated digitally controlled oscillator to power minimum number of transistors once the ADPLL is locked in a specific frequency band. The ADPLL occupies a total area of 85×150 μm2 when synthesized on TSMC 65nm. © 2016 IEEE.
A fractional-order dynamic PV model

Authors
Abdelaty A.M., Radwan A.G., Elwakil A., Psychalinos C.

Abstract
A dynamic model of Photo-Voltaic (PV) solar module is important when it is utilized in conjunction with switching circuits and in grid connected applications. In this paper, a fractional-order dynamical model of a PV source is introduced. The model includes both a fractional series inductor and a parallel capacitor which are in general of two different orders allowing for extra degrees of modeling freedom. An expression for the load current is derived and the step response is investigated for different orders. It is found that the nature of the connections has a dominant effect on the response in comparison with the nature of the PV itself. The abstract goes here. The length of the abstract should not exceed 150 words. © 2016 IEEE.
A fully integrated charge sharing active decap scheme for power supply noise suppression

Authors
Ammar A.M., Guindi R., Shih E., Tokunaga C., Tschanz J., Khellah M.

Abstract
Power supply noise has become a major challenge for proper operation of circuits with continuous scaling of CMOS technology along with supply voltage scaling. Conventional passive decoupling capacitors exhibit significant die area penalty resulting in a limited regulation effect. This paper presents a fully integrated charge-sharing-based active decap scheme for power supply noise suppression. The proposed idea is based on allocating a portion of the available passive decap to be used as an active decap that is charged up to a higher voltage and shares its boosted charge with the noisy rail upon droop detection. The proposed scheme uses a charge pump for providing the higher voltage node, as well as a detector circuit for droop detection. The system is implemented in 32 nm CMOS process, and achieves up to $\sim 47\%$ worst-case droop reduction with reduced ringing and settling time, at minimal area and power penalties. © 2015 IEEE.
A low frequency oscillator using a super-capacitor

Authors
Elwakil A.S., Allagui A., Maundy B.J., Psychalinos C.

Abstract
A low frequency relaxation oscillator is designed using a super-capacitor. An accurate analytical expression for the oscillation frequency is derived based on a fractional-order super-capacitor model composed of a resistance in series with a Constant Phase Element (CPE) whose pseudo-capacitance and dispersion coefficient are determined using impedance spectroscopy measurements. Experimental results confirm our theoretical analysis. © 2016 Elsevier GmbH. All rights reserved.
A mathematical model of an ideally threshold compensated rectifier for RF energy harvesting

Authors
Elgabry D.M., Aboudina M., Hegazi E.

Abstract
This paper introduces a mathematical model of an ideally threshold compensated rectifier for RF energy harvesting. The ideally compensation arrangement has been exploited to improve the rectifier's performance and overcome the limitation of rectifier's sensitivity which mainly depends on the threshold voltage of the rectifying devices (transistors). The model considers the conduction angle and the reverse current in deriving closed form analytical expressions for output dc voltage and efficiency. Using a 65-nm low leakage CMOS process with low-threshold transistors, 900-MHz multi-stages rectifiers were designed using both the proposed model and Cadence Virtuoso. The results of the model extremely match the simulation results using Cadence Virtuoso while running 100 times faster. © 2015 IEEE.
A novel framework for scalable video streaming over multi-channel multi-radio wireless mesh networks

Authors
Abdel-Aziz M.K., Zahran A.H., Elbatt T.

Abstract
In this paper, we study the problem of scalable videos multicast streaming over multi-channel multi-radio wireless mesh networks over a contention-based MAC, with the objective of maximizing the overall received videos quality. We propose a three-stage heuristic framework solution for the complex joint channel assignment, video quality selection and multicast routing problem. That framework is called Channel Assignment with Iterative Routing and Quality Selection (CAIRoQS), it is implemented using C and evaluated with NS2 using video traffic traces. Our performance evaluation shows noticeable improvement in both network and application level metrics in comparison to state of the art solutions, e.g., 23% improvement in the packet drop ratio mean. © 2016 ACM.
A proposed methodology to improve UVM-based test generation and coverage closure

Authors
Fathy K., Salah K., Guindi R.

Abstract
Verification architects need to make use of randomness supported by System Verilog and be able to define a generic path for the test to follow. This path represents a subset of features, and allows the test to randomly explore the design space to explore corners in depth. Setting up a test case for such designs requires a well-defined stimulus generation methodology. Off-the-shelf scenario libraries and a synchronization and scheduling process methodology for the parallel stimuli need to be reused across several test cases. In this paper, we define a methodology for creating test scenarios and making use of object oriented principles to build composite layered scenario sequences with a generic parallel stimuli synchronization process. We built our methodology as a generic library code to be reused in many designs. A recent memory controller design is used to demonstrate our methodology. The results of applying this methodology on test cases show enhancements on coverage closure and performance.

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Accurate harmonic phase tracking of tagged MRI using locally-uniform myocardium displacement constraint

Authors
ElDeeb S.M., Fahmy A.S.

Abstract
Harmonic phase (HARP) tracking is one of the most commonly used techniques for estimating the myocardium regional function from tagged cardiac Magnetic Resonance Imaging sequences. Nevertheless, tag fading and phase distortion can severely limit the tracking accuracy of the technique. In this work, we propose to modify the HARP tracking algorithm to impose a constraint of locally uniform displacement field while tracking the different myocardium points. A numerical contracting phantom and a dataset of 11 patients are used to study the performance of the proposed technique at the different cardiac phases, slices, and regions. The results show that the proposed method improves the tracking accuracy and the reliability of the conventional HARP technique. © 2016 IPEM
Accurate Prediction of Advanced Liver Fibrosis Using the Decision Tree Learning Algorithm in Chronic Hepatitis C Egyptian Patients

Authors
Hashem S., Esmat G., Elakel W., Habashy S., Abdel Raouf S., Darweesh S., Soliman M., ElHefnawi M., El-Adawy M.

Abstract
Background/Aim. Respectively with the prevalence of chronic hepatitis C in the world, using noninvasive methods as an alternative method in staging chronic liver diseases for avoiding the drawbacks of biopsy is significantly increasing. The aim of this study is to combine the serum biomarkers and clinical information to develop a classification model that can predict advanced liver fibrosis. Methods. 39,567 patients with chronic hepatitis C were included and randomly divided into two separate sets. Liver fibrosis was assessed via METAVIR score; patients were categorized as mild to moderate (F0-F2) or advanced (F3-F4) fibrosis stages. Two models were developed using alternating decision tree algorithm. Model 1 uses six parameters, while model 2 uses four, which are similar to FIB-4 features except alpha-fetoprotein instead of alanine aminotransferase. Sensitivity and receiver operating characteristic curve were performed to evaluate the performance of the proposed models. Results. The best model achieved 86.2% negative predictive value and 0.78 ROC with 84.8% accuracy which is better than FIB-4. Conclusions. The risk of advanced liver fibrosis, due to chronic hepatitis C, could be predicted with high accuracy using decision tree learning algorithm that could be used to reduce the need to assess the liver biopsy. © 2016 Somaya Hashem et al.
Achievable degrees of freedom on K-user MIMO multi-way relay channel with common and private messages

Authors
Salah M., El-Keyi A., Mohasseb Y., Nafie M.

Abstract
This paper investigates the achievable total degrees of freedom (DoF) of the MIMO multi-way relay channel that consists of K users, where each user is equipped with M antennas, and a decode-and-forward relay equipped with N antennas. In this channel, each user wants to convey K - 1 private messages to the other users in addition to a common message to all of them. Due to the absence of direct links between the users, communication occurs through the relay in two phases: a multiple access channel (MAC) phase and a broadcast (BC) phase. We derive cut-set bounds on the total DoF of the network, and show that the network has DoF less than or equal to K min {N, M}. Achievability of the upper bound is shown by using signal space alignment for network coding in the MAC phase, and zero-forcing precoding in the BC phase. We show that introducing the common messages besides the private messages leads to achieving higher total DoF than using the private messages only. © 2015 IEEE.
Aging effect on apples bio-impedance using AD5933

Authors
Bakr A.A., Radwan A.G., Madian A.H., Elwakil A.S.

Abstract
In this paper, the effect of the fruits aging on bio-impedance is experimentally studied. Bio-impedance analysis, as accurate and fast method is used to investigate and monitor group of apples properties during aging. This method provides an alternative method for investigating apples physical properties that are highly related to chemical properties. AD5933 impedance analyzer chip within the frequency range (5 KHz-100 KHz) and NI-ELVIS board within the frequency range (300 Hz-5 KHz) are used to investigate the changes in apple's properties during aging. According to experimental results, the observed changes in apples properties during aging can be highly related to bio-impedance changes. Different parameters as weight, Cole-Cole plot, impedance, and phase are discussed to investigate the aging effect. © 2016 IEEE.
An optimal linear system approximation of nonlinear fractional-order memristor-capacitor charging circuit

Authors
Semary M.S., Abdel Malek H.L., Hassan H.N., Radwan A.G.

Abstract
The analysis of nonlinear fractional-order circuits is a challenging problem. This is due to the lack of nonlinear circuit theorems and designs particularly in the presence of memristive elements. The response of a series connection of a simple resistor with fractional order capacitor and its analytical formulation in both charging and discharging phases is considered. The numerical simulation of fractional order HP memristor in series with a fractional order capacitor is also discussed. It is a demonstration of a simple nonlinear fractional-order memristive circuit in both charging and discharging cases. Furthermore, this paper introduces an approach to approximate nonlinear fractional-order memristive circuits by linear circuits using a minimax optimization technique. Hence, the new circuit can be analyzed using the conventional linear circuit theorems. The charging and discharging of a series fractional-order memristor with a fractional-order capacitor are discussed numerically. The effect of fractional-order parameters and memristor polarity are also investigated. Using a suitable optimization technique, an accurate approximation by a circuit that include a resistor and a fractional-capacitor is obtained for both charging and discharging cases. A great matching was observed between the frequency responses of the fractional-order nonlinear low pass filter based on fractional-order memristor and fractional-order capacitor and that of the optimized linear fractional order case. Similar matching is observed for the nonlinear and optimized cases when a periodic triangular waveform is applied using Fourier series expansion. © 2016 Elsevier Ltd. All rights reserved.
Analysis and realization of a switched fractional-order-capacitor integrator

Authors
Psychalinos C., Elwakil A., Maundy B., Allagui A.

Abstract
Using fractional calculus, we analyze a classical switched-capacitor integrator when a fractional-order capacitor is employed in the feed-forward path. We show that using of a fractional-order capacitor, significantly large time constants can be realized with capacitances in the feedback path much smaller in value when compared with a conventional switched-capacitor integrator. Simulations and experimental results using a commercial super-capacitor with fractional-order characteristics confirmed via impedance spectroscopy are provided. Copyright © 2016 John Wiley & Sons, Ltd. Copyright © 2016 John Wiley & Sons, Ltd.
Assessing leanness level with demand dynamics in a multi-stage production system

Authors
Ali R., Deif A.

Abstract
The purpose of this paper is to present a dynamic model to measure the degree of system's leanness under dynamic demand conditions using a novel integrated metric. The multi-stage production system model is based on a system dynamics approach. The leanness level is measured using a new developed integrated metric that combines efficiency, WIP performance as well as service level. The analysis includes design of experiment technique at the initial analysis to examine the most significant parameters impacting the leanness score and then followed by examining different dynamic demand scenarios. Two scenarios were examined: one focussed low demand variation with various means (testing the impact of demand volumes) while the second focussed on high demand variation with constant mean (testing the impact of demand variability). Findings - Results using the data from a real case study indicated that given the model parameters, demand rate has the highest impact on leanness score dynamics. The next phase of the analysis thus focussed on investigating the effect of demand dynamics on the leanness score. The analysis highlighted the different effects of demand variability and volumes on the leanness score and its different components leading to various demand and production management recommendations in this dynamic environment. Research limitations/implications - The presented lean management policies and recommendations are verified within the scope of similar systems to the considered company in terms of manufacturing settings and demand environment. Further research will be carried to extend the dynamic model to other dynamic manufacturing and service settings. Practical implications - The developed metric can be used not only to assess the leanness level of the systems which is very critical to lean practitioners but also can be used to track lean implementation progress. In addition, the presented analysis outlined various demand management as well as lean implementation policies that can improve the system leanness level and overall performance. Originality/value - The presented research develops a novel integrated metric and adds to the few literature on dynamic analysis of lean systems. Furthermore, the conducted analysis revealed some new aspects in understanding the relation between demand (variability and volume) and the leanness level of the systems. This will aid lean practitioners to set better demand and production management policies in today's dynamic environment as well as take better decisions concerning lean technology investments. © Emerald Group Publishing Limited.
Assessment of cardiac mass from tagged magnetic resonance images

Authors
Makram A.W., Khalifa A.M., El-Reawardy H., Fahmy A.S., Ibrahim E.-S.H.

Abstract
Purpose: Tagged and cine magnetic resonance imaging (tMRI and cMRI) techniques are used for evaluating regional and global heart function, respectively. Measuring global function parameters directly from tMRI is challenging due to the obstruction of the anatomical structure by the tagging pattern. The purpose of this study was to develop a method for processing the tMRI images to improve the myocardium-blood contrast in order to estimate global function parameters from the processed images.

Materials and methods: The developed method consists of two stages: (1) removing the tagging pattern based on analyzing and modeling the signal distribution in the image’s k-space, and (2) enhancing the blood-myocardium contrast based on analyzing the signal intensity variability in the two tissues. The developed method is implemented on images from twelve human subjects. Results: Ventricular mass measured with the developed method showed good agreement with that measured from gold-standard cMRI images. Further, preliminary results on measuring ventricular volume using the developed method are presented.

Conclusion: The promising results in this study show the potential of the developed method for evaluating both regional and global heart function from a single set of tMRI images, with associated reduction in scan time and patient discomfort. © 2015, Japan Radiological Society.
Asymmetric degrees of freedom of the full-duplex MIMO 3-way channel

Authors
Elmahdy A.M., El-Keyi A., Mohasseb Y., Elbatt T., Nafie M., Seddik K.G.

Abstract
In this paper, we characterize the asymmetric total degrees of freedom (DoF) of a multiple-input multiple-output (MIMO) 3-way channel. Each node has a separate-antenna full-duplex MIMO transceiver with a different number of antennas, where each antenna can be configured for either signal transmission or reception. Each node has two unicast messages to be delivered to the two other nodes. We first derive upper bounds on the total DoF of the system. Cut-set bounds in conjunction with genie-aided bounds are derived to characterize the achievable total DoF. Afterwards, we analytically derive the optimal number of transmit and receive antennas at each node to maximize the total DoF of the system, subject to the total number of antennas at each node. Finally, the achievable schemes are constructed. The proposed schemes are mainly based on zero-forcing and null-space transmit beamforming. © 2016 IEEE.
Charging and discharging $RC_\alpha$ circuit under Riemann-Liouville and Caputo fractional derivatives

Authors
Abdelaty A.M., Radwan A.G., Ahmed W.A., Faied M.

Abstract
In this paper, the effect of non-zero initial condition on the time domain responses of fractional-order systems using Caputo and Riemann-Liouville (RL) fractional definitions are discussed. Analytical formulas were derived for the step and square wave responses of fractional-order $RC_\alpha$ circuit under RL and Caputo operators for non-zero initial condition. Moreover, a simulation scheme for fractional state-space systems with non-zero initial condition is introduced. © 2016 IEEE.
Compact Wide Frequency Range Fractional-Order Models of Human Body Impedance against Contact Currents

Authors
Freeborn T.J., Elwakil A.S., Maundy B.

Abstract
Three circuit models using constant phase elements are investigated to represent the human body impedance against contact currents from 40 Hz to 110 MHz. The parameters required to represent the impedance are determined using a nonlinear least squares fitting (NLSF) applied to the averaged human body impedance dataset. The three fractional-order models with 4, 6, and 7 parameters are compared to an already existing integer-order, 11-parameter model. Simulations of the fractional-order models impedance are presented and discussed along with their limitations. © 2016 Todd J. Freeborn et al.
Comparative study of fractional filters for Alzheimer disease detection on MRI images

Authors
Ismail S.M., Radwan A.G., Madian A.H., Abu-Elyazeed M.F.

Abstract
This paper presents a comparative study of four fractional order filters used for edge detection. The noise performance of these filters is analyzed upon the addition of random Gaussian noise, as well as the addition of salt and pepper noise. The peak signal to noise ratio (PSNR) of the detected images is numerically compared. The mean square error (MSE) of the detected images as well as the execution time are also adopted as evaluation methods for comparison. The visual comparison of the filters capability in medical image edge detection is presented, that can help in the diagnosis of Alzheimer disease (AD) through magnetic resonance imaging (MRI) images. © 2016 IEEE.
Comparison and database development of four recent ASM3 model extensions

Authors
Mostafa N.G., Galal M.M., Radwan A.G., Rashed E.M.

Abstract
In the last decade, many Activated Sludge Model No. 3 (ASM3) extensions were proposed to adopt new concepts such as simultaneous storage and growth of heterotrophic organisms and two-step nitrification-denitrification processes. From these ASM3 model extensions, four are included in this study: ASM3 with two-step nitrification-denitrification, ASM3 for simultaneous autotrophic and heterotrophic storage-growth, ASM3 extension for two-step nitrification-denitrification, and ASM3 for simultaneous storage-growth and nitrification-denitrification. The four models are analyzed and compared to the original ASM3 model with respect to the modeling concepts adopted, the process kinetic rates modified, and the kinetic parameters and stoichiometric coefficients introduced. A new schematic representation of the modeling concepts concerning the organisms' activities is introduced. A database of all parameters and coefficients of the four considered model extensions is developed using a unified notation system to reduce effort and confusion of the future researchers using their values as initial calibration or guidance values. Finally, the four models and the original ASM3 model are implemented using the parameters' values from the developed database, then the simulation results are compared with actual field measurements. © 2016 American Society of Civil Engineers.
Computational identification of tissue-specific splicing regulatory elements in human genes from RNA-Seq Data

Authors
Badr E., ElHefnawi M., Heath L.S.

Abstract
Alternative splicing is a vital process for regulating gene expression and promoting proteomic diversity. It plays a key role in tissue-specific expressed genes. This specificity is mainly regulated by splicing factors that bind to specific sequences called splicing regulatory elements (SREs). Here, we report a genome-wide analysis to study alternative splicing on multiple tissues, including brain, heart, liver, and muscle. We propose a pipeline to identify differential exons across tissues and hence tissue-specific SREs. In our pipeline, we utilize the DEXSeq package along with our previously reported algorithms. Utilizing the publicly available RNA-Seq data set from the Human BodyMap project, we identified 28,100 differentially used exons across the four tissues. We identified tissue-specific exonic splicing enhancers that overlap with various previously published experimental and computational databases. A complicated exonic enhancer regulatory network was revealed, where multiple exonic enhancers were found across multiple tissues while some were found only in specific tissues. Putative combinatorial exonic enhancers and silencers were discovered as well, which may be responsible for exon inclusion or exclusion across tissues. Some of the exonic enhancers are found to be co-occurring with multiple exonic silencers and vice versa, which demonstrates a complicated relationship between tissue-specific exonic enhancers and silencers. © 2016 Badr et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.
Convolutional neural networks for deep feature learning in retinal vessel segmentation

Authors
Khalaf A.F., Yassine I.A., Fahmy A.S.

Abstract
Analysis of retinal vessels in fundus images provides a valuable tool for characterizing many retinal and systemic diseases. Accurate automatic segmentation of these vessels is usually required as an essential analysis step. In this work, we propose a new formulation of deep Convolutional Neural Networks that allows simple and accurate segmentation of the retinal vessels. A major modification in this work is to reduce the intra-class variance by formulating the problem as a Three-class problem that differentiates: large vessels, small vessels, and background areas. In addition, different sizes of the convolutional kernels have been studied and it was found that a combination of kernels with different sizes achieve the best sensitivity and specificity. The proposed method was tested using DRIVE dataset and it showed superior performance compared to several other state of the art methods. The segmentation sensitivity, specificity and accuracy were found to be 83.97%, 95.62% and 94.56% respectively. © 2016 IEEE.
Cooperation and underlay mode selection in cognitive radio network

Authors
Amer R., El-Sherif A.A., Ebrahim H., Mokhtar A.

Abstract
In this paper, we propose a technique for cooperation and underlay mode selection in cognitive radio networks. Hybrid spectrum sharing is assumed where the secondary user (SU) can access the primary user (PU) channel in two modes, underlay mode or cooperative mode with admission control. Overlay spectrum sharing allows the SU to occupy the spectrum only when the PU is idle. Cooperation (collaboration) occurs when the SU admits the PU's packet into a relay buffer to transmit in the subsequent timeslots, i.e. timeslots when no successful transmission from the PU source to the destination. In addition to accessing the channel in the overlay mode, secondary user is allowed to access the channel in the underlay mode by occupying the channel currently occupied by the primary user with small transmission power. It is proposed that the secondary user can exploit the underlay access only when the primary channel is at good transmission conditions or predicted to be in non-outage state. The destination sends a feedback message with the received SNR (channel quality status) to the PU source, which is overheard by the SU. The SU exploits the SNR feedback messages to build and update a belief function about the primary channel quality. The belief function leads the SU to select the best access mode each timeslot, underlay or cooperation. We characterize the maximum achievable throughput of our proposed hybrid spectrum sharing. By observing the simulation results, the proposed model attains noticeable improvement in the system performance in terms of maximum secondary user throughput than the conventional cooperation and noncooperation schemes. © 2016 IEEE.
Year: 2016

CRC: Collaborative research and teaching testbed for wireless communications and networks

Authors

Abstract
The validation of wireless communications research, whether it is focused on PHY, MAC or higher layers, can be done in several ways, each with its limitations. Simulations tend to be simplified. Equipping wireless labs requires funding and time. Remotely accessible testbeds present a good option to validate research. The existing testbeds have gone a long way in building the infrastructure for managing and operating themselves. Yet, there is still space to improve the administration of resources whether it is nodes, frequency spectrum or storage space. In this work, we present the Collaborative Radio Cloud (CRC), a wireless testbed that enables web/remote access to facilitate research experiments in the field of wireless communications and networks. CRC is built upon the contributions made by current testbeds and incorporates new features to improve the user experience and ameliorate the management of resources. It enables multiple simultaneous users to coexist in the testbed by enforcing an elaborate node isolation policy. Software dedicated to the enforcement of spectrum assignment was developed to further ensure the isolation between concurrent users. A tool that is capable of realizing a desired topology using gain control was developed. CRC also operates a scheduler that optimizes node assignment to maximize testbed utilization. Enhancements to disk image saving are being developed to reduce the required storage. Other than research, CRC targets contributing to the education of wireless communications and networks by providing experiments and a web interface dedicated to students and instructors. © 2016 ACM.
Design of a generalized bidirectional tent map suitable for encryption applications

Authors
Sayed W.S., Radwan A.G., Fahmy H.A.H.

Abstract
The discrete tent map is one of the most famous discrete chaotic maps that has widely-spread applications. This paper investigates a set of four generalized tent maps where the conventional map is a special case. The proposed maps have extra degrees of freedom which provide different chaotic characteristics and increase the design flexibility required for many applications. Mathematical analyses for generalized positive and mostly positive tent maps include: bifurcation diagrams relative to all parameters, effective range of parameters, bifurcation points. The maximum Lyapunov exponent (MLE) is also calculated to indicate chaotic behavior. Various scales of the bifurcation diagram are discussed for each generalized map as well as system responses versus the added parameters. © 2015 IEEE.
Detection of cardiac function abnormality from MRI images using normalized wall thickness temporal patterns

Authors
Wael M., Ibrahim E.-S.H., Fahmy A.S.

Abstract
Purpose. To develop a method for identifying abnormal myocardial function based on studying the normalized wall motion pattern during the cardiac cycle. Methods. The temporal pattern of the normalized myocardial wall thickness is used as a feature vector to assess the cardiac wall motion abnormality. Principal component analysis is used to reduce the feature dimensionality and the maximum likelihood method is used to differentiate between normal and abnormal features. The proposed method was applied on a dataset of 27 cases from normal subjects and patients. Results. The developed method achieved 81.5%, 85%, and 88.5% accuracy for identifying abnormal contractility in the basal, midventricular, and apical slices, respectively. Conclusions. A novel feature vector, namely, the normalized wall thickness, has been introduced for detecting myocardial regional wall motion abnormality. The proposed method provides assessment of the regional myocardial contractility for each cardiac segment and slice; therefore, it could be a valuable tool for automatic and fast determination of regional wall motion abnormality from conventional cine MRI images. © 2016 Mai Wael et al.
Double-sided bifurcations in tent maps: Analysis and applications

Authors
Sayed W.S., Radwan A.G., Fahmy H.A.H.

Abstract
The tent map is a piece-wise linear one-dimensional discrete map which could be implemented easily. In this paper, a signed system parameter is allowed leading to the appearance of bidirectional bifurcations. A set of proposed tent maps with different sign variations and a signed parameter are investigated where the conventional map is a special case. The proposed maps exhibit period doubling as a route to chaos with wider and alternating sign output ranges that could fit multiple applications. Based on the maximum achievable output range corresponding to maximum chaotic behavior, the responses are called: positive tent map, mostly positive tent map, negative tent map, and mostly negative tent map. Mathematical analysis and results for the proposed maps are presented including: effective ranges of control parameter and iterated variable, key-points of the bifurcation diagram. Chaotic properties of the maps are explored including time series, cobweb diagrams, and maximum Lyapunov exponent. © 2016 IEEE.
Early detection of hepatocellular carcinoma co-occurring with hepatitis C virus infection: A mathematical model

Authors

Abstract
AIM: To develop a mathematical model for the early detection of hepatocellular carcinoma (HCC) with a panel of serum proteins in combination with α-fetoprotein (AFP). METHODS: Serum levels of interleukin (IL)-8, soluble intercellular adhesion molecule-1 (sICAM-1), soluble tumor necrosis factor receptor II (sTNF-R II), proteasome, and β-catenin were measured in 479 subjects categorized into four groups: (1) HCC concurrent with hepatitis C virus (HCV) infection (n = 192); (2) HCV related liver cirrhosis (LC) (n = 96); (3) Chronic hepatitis C (CHC) (n = 96); and (4) Healthy controls (n = 95). The R package and different modules for binary and multi-class classifiers based on generalized linear models were used to model the data. Predictive power was used to evaluate the performance of the model. Receiver operating characteristic curve analysis over pairs of groups was used to identify the best cutoffs differentiating the different groups. RESULTS: We revealed mathematical models, based on a binary classifier, made up of a unique panel of serum proteins that improved the individual performance of AFP in discriminating HCC patients from patients with chronic liver disease either with or without cirrhosis. We discriminated the HCC group from the cirrhotic liver group using a mathematical model \((-11.3 + 7.38 \times \text{Prot} + 0.00108 \times \text{sICAM} + 0.2574 \times \beta\text{-catenin} + 0.01597 \times \text{AFP})\) with a cutoff of 0.6552, which achieved 98.8% specificity and 89.1% sensitivity. For the discrimination of the HCC group from the CHC group, we used a mathematical model \([-10.40 + 1.416 \times \text{proteasome} + 0.002024 \times \text{IL} + 0.004096 \times \text{sICAM-1} + (4.251 \times 10^{-4}) \times \text{sTNF} + 0.02567 \times \beta\text{-catenin} + 0.02442 \times \text{AFP}\) with a cutoff 0.744 and achieved 96.8% specificity and 89.7% sensitivity. Additionally, we derived an algorithm, based on a binary classifier, for resolving the multi-class classification problem by using three successive mathematical model predictions of liver disease status. CONCLUSION: Our proposed mathematical model may be a useful method for the early detection of different statuses of liver disease co-occurring with HCV infection. © 2016 Baishideng Publishing Group Inc. All rights reserved.
Effective capacity of delay-constrained cognitive radio links exploiting primary feedback

Authors
Anwar A.H., Seddik K.G., ElBatt T., Zahran A.H.

Abstract
In this paper, we study the effective capacity (EC) of cognitive radio (CR) networks operating under statistical quality-of-service (QoS) constraints in an attempt to support real-time applications at the secondary users (SUs). In particular, we analyze the performance gains, in terms of EC and average transmitted power, attributed to leveraging the primary user (PU) feedback overheard at the SU, at no additional complexity or hardware cost. We characterize the EC performance improvement for the SU, in the presence of a feedback-based sensing scheme, under the signal-to-interference-plus-noise ratio (SINR) interference and collision models. Toward this objective, we develop a Markov chain model for feedback-based sensing to compare the performance of a two-link network, a single secondary link, and a primary network abstracted to a single primary link, with and without primary-feedback exploitation. We prove that exploiting the primary feedback at the secondary transmitter improves the EC of the SU under the SINR interference model. On the other hand, interestingly, exploiting the PU feedback messages does not enhance the EC of the SU under the collision model. Nevertheless, exploiting the PU feedback reduces the SU average transmitted power under the two aforementioned models. Finally, we present numerical results, for plausible scenarios, that support our analytical findings. © 2015 IEEE.
Emulation of current excited fractional-order capacitors and inductors using OTA topologies

Authors
Tsirimokou G., Psychalinos C., Freeborn T.J., Elwakil A.S.

Abstract
A novel topology suitable for emulating fractional-order capacitors and inductors using current excitation is achieved using a fractional-order differentiator/integrator block and appropriately configured Operational Transconductance Amplifiers. The scheme is capable of emulating both fractional-order capacitors and fractional-order inductors without any modifications to its structure. This implementation allows for electronic tuning of the order, capacitance/inductance, and bandwidth of operation by modification of only the bias current. Post-layout simulation results of the impedance magnitude and phase confirm the correct emulated behavior of both fractional-order capacitors and inductors. Two examples highlight the applications of this topology in i) realizing a fractional-order bandpass filter and ii) emulating a Cole-impedance model for biological applications. For both examples the characteristics of each circuit are validated in simulation. © 2016 Elsevier Ltd
Year: 2016

**Enabling cloud business by QoS roadmap**

**Authors**
Hussein S.

**Abstract**
Day after day, global economy becomes tougher. It is a fact in which Cloud Computing business gets impacted the most. When it comes to cost, Cloud Computing is the most attractive paradigm for IT solutions. It is because Cloud Computing relaxes cost constraints. This relaxing enables Cloud Customers to operate their business through Cloud Computing under such economic pressure. On the other side, Cloud Computing solutions should deliver IT services at the agreed and acceptable Quality of Service levels. This moves the economic challenges from Cloud Customer premises to Cloud Provider premises. Accordingly, Cloud Providers are in dire need to deliver high quality levels using less resources and IT equipment. Therefore, Cloud Provider management and decision makers need to optimize their Cloud resources. This can be achieved by paying their great attention to critical resources. Listing and extracting these critical resources is the new challenge which takes place. Thus, our contribution allows Cloud Provider management and decision makers to focus on certain resources to guarantee the needed quality levels of delivery. Our proposed roadmap lists Cloud elements in certain order, each according to its importance and priority. © Springer International Publishing Switzerland 2016.
Energy-Aware Cooperative Wireless Networks with Multiple Cognitive Users

Authors
Ashour M., Butt M.M., Mohamed A., ElBatt T., Krunz M.

Abstract
In this paper, we study and analyze cooperative cognitive radio networks with arbitrary number of secondary users (SUs). Each SU is considered a prospective relay for the primary user (PU) besides having its own data transmission demand. We consider a multi-packet transmission framework that allows multiple SUs to transmit simultaneously because of dirty-paper coding. We propose power allocation and scheduling policies that optimize the throughput for both PU and SU with minimum energy expenditure. The performance of the system is evaluated in terms of throughput and delay under different opportunistic relay selection policies. Toward this objective, we present a mathematical framework for deriving stability conditions for all queues in the system. Consequently, the throughput of both primary and secondary links is quantified. Furthermore, a moment generating function approach is employed to derive a closed-form expression for the average delay encountered by the PU packets. Results reveal that we achieve better performance in terms of throughput and delay at lower energy cost as compared with equal power allocation schemes proposed earlier in the literature. Extensive simulations are conducted to validate our theoretical findings. © 2016 IEEE.
Features selection for building an early diagnosis machine learning model for Parkinson's disease

Authors
Soliman A.B., Fares M., Elhefnawi M.M., Al-Hefnawy M.

Abstract
In this work, different approaches were evaluated to optimize building machine learning classification models for the early diagnosis of the Parkinson disease. The goal was to sort the medical measurements and select the most relevant parameters to build a faster and more accurate model using feature selection techniques. Decreasing the number of features to build a model could lead to more efficient machine learning algorithm and help doctors to focus on what are the most important measurements to take into account. For feature selection we compared the Filter and Wrapper techniques. Then we selected a good machine learning algorithm to detect which technique could help us by calculate the crossover scores for each technique. This research is based on a dataset which was created by Athanasius Tsanas and Max Little of the University of Oxford, in collaboration with 10 medical centers in the US and Intel Corporation. This target of these medical measurements is to find the Unified Parkinson's disease rating scale (UPDRS) which is the most commonly used scale for clinical studies of Parkinson's disease. © 2016 IEEE.
FPGA realization of ALU for mobile GPU

Authors
Tolba M.F., Madian A.H., Radwan A.G.

Abstract
Arithmetic Logic Unit (ALU) is the most important component of processors. All arithmetic and logical computations are performed inside the ALU. This paper presents the design and the implementation of the ALU. The design is based on Approximated Precision Shader and Look-Up Table (LUT) multiplier. The lookup table, Wallace tree, and Carry Look-ahead Adder (CLA) are used in combination to speed up the multiplier operation. The proposed ALU is designed using Verilog and verified using Xilinx Virtex-5 XC5VLX30 FPGA. © 2016 IEEE.
Fractional Order Oscillator Design Based on Two-Port Network

Authors
Said L.A., Radwan A.G., Madian A.H., Soliman A.M.

Abstract
In this paper, a general analysis of the generation for all possible fractional order oscillators based on two-port network is presented. Three different two-port network classifications are used with three external single impedances, where two are fractional order capacitors and a resistor. Three possible impedance combinations for each classification are investigated, which give nine possible oscillators. The characteristic equation, oscillation frequency and condition for each presented topology are derived in terms of the transmission matrix elements and the fractional order parameters $\alpha$ and $\beta$. Mapping between some cases is also illustrated based on similarity in the characteristic equation. The use of fractional order elements $\alpha$ and $\beta$ adds extra degrees of freedom, which increases the design flexibility and frequency band, and provides extra constraints on the phase difference. Study of four different active elements, such as voltage-controlled current source, gyrator, op-amp-based network, and second-generation current-conveyor-based network, serve as a two-port network is presented. The general analytical formulas of the oscillation frequency and condition as well as the phase difference between the two oscillatory outputs are derived and summarized in tables for each designed oscillator network. A comparison between fractional order oscillators with their integer order counterparts is also illustrated where some designs cannot work in the integer case. Numerical Spice simulations and experimental results are given to validate the presented analysis. © 2015, Springer Science+Business Media New York.
Fractional-order Fitzhugh-Nagumo and Izhikevich neuron models

Authors
Armanyos M., Radwan A.G.

Abstract
This paper studies the famous Fitzhugh-Nagumo and Izhikevich neuron models in the fractional-order domain. Generalization of the integer models into the fractional-order domain providing a wider scope understanding of the neuron systems. The fractional Fitzhugh-Nagumo circuit model and the state space equations are introduced. Different fractional orders are studied as an example. Numerical solutions of the systems are given using non-standard finite difference scheme together with Grunwald-Letnikov discretization technique which is computationally efficient and accurate. The two models are compared and their behaviors are investigated at different fractional orders. © 2016 IEEE.
Year: 2016

Fractional-order inverting and non-inverting filters based on CFOA

Authors
Said L.A., Radwan A.G., Madian A.H., Soliman A.M.

Abstract
This paper introduces a study to generalize the design of a continuous time filters into the fractional order domain. The study involves inverting and non-inverting filters based on CFOA where three responses are extracted which are high-pass, band-pass and low-pass responses. The proposed study introduces the generalized formulas for the transfer function of each response with different fractional orders. The fractional-order filters enhance the design flexibility and controllability due to the extra degree of freedom provided by the fractional order parameters. The general fundamentals of these filters are presented by calculating the cutoff frequency equation. Different numerical solutions for the generalized fractional order filters are introduced. Stability discussion is presented for different fractional order cases. Spice simulations results are introduced to validate the theoretical findings. © 2016 IEEE.
Fractional-order multi-phase oscillators design and analysis suitable for higher-order PSK applications

Authors
Fouda M.E., Soltan A., Radwan A.G., Soliman A.M.

Abstract
Recently, multi-phase oscillator design witnesses a lot of progress in communication especially phase shift keying based systems. Yet, there is a lack in design multi-phase oscillator with different fractional phase shifts. Thus, in this paper, a new technique to design and analyze a multi-phase oscillator is proposed. The proposed procedure is built based on the fractional-order elements or constant phase elements in order to generate equal or different phase shifts. The general characteristics equation for any oscillator is studied to derive expressions for the oscillation conditions and oscillation frequency. Also, stability analysis is introduced to guarantee the oscillation. Then, different examples of oscillators for equal and different phase shifts are introduced with their simulations. © 2016, Springer Science+Business Media New York.
Fractional-order mutual inductance: Analysis and design

Authors
Soltan A., Radwan A.G., Soliman A.M.

Abstract
This paper introduces for the first time the generalized concept of the mutual inductance in the fractional-order domain where the symmetrical and unsymmetrical behaviors of the fractional-order mutual inductance are studied. To use the fractional mutual inductance in circuit design and simulation, an equivalent circuit is presented with its different conditions of operation. Also, simulations for the impedance matrix parameters of the fractional mutual inductance equivalent circuit using Advanced Design System and MATLAB are illustrated. The Advanced Design System and MATLAB simulations of the double-tuned filter based on the fractional mutual inductance are discussed. A great matching between the numerical analysis and the circuit simulation appears, which confirms the reliability of the concept of the fractional mutual inductance. Also, the analysis of the impedance matching using the fractional-order mutual inductance is introduced. © 2015 John Wiley & Sons, Ltd.
Fractional-order oscillator based on single CCII

Authors
Said L.A., Radwan A.G., Madian A.H., Soliman A.M.

Abstract
This paper presents a generalization of well-known phase shift oscillator based on single CCII into the fractional order domain. The general state matrix, characteristic equation and design equations are presented. The general oscillation frequency, condition and the phase difference between the oscillatory outputs are introduced in terms of the fractional order parameters. These parameters add extra degrees of freedom which in turn increase the design flexibility and controllability. Numerical discussion of five special cases is investigated including the integer case. Spice simulations and experimental results are introduced to validate the theoretical findings with stability discussion. © 2016 IEEE.
Fractional-order synchronization of two neurons using Fitzhugh-Nagumo neuron model

Authors
Armanyos M., Radwan A.G., Madian A.H.

Abstract
This paper studies the synchronization of two coupled neurons using Fitzhugh-Nagumo model in the fractional-order domain. In general, studying systems in the fractional-order domain provides a wider scope view of their behavior. When the neuron is generalized into the fractional-order domain, the normal behaviors displayed in the integer case change. Furthermore, two neurons display various synchronization patterns. The neurons' fractional-order system is solved using non-standard finite difference scheme together with Grunwald-Letnikov discretization. © 2016 IEEE.
Fractional-Order Two-Port Networks

Authors
Fouda M.E., Elwakil A.S., Radwan A.G., Maundy B.J.

Abstract
We introduce the concept of fractional-order two-port networks with particular focus on impedance and admittance parameters. We show how to transform a $2 \times 2$ impedance matrix with fractional-order impedance elements into an equivalent matrix with all elements represented by integer-order impedances; yet the matrix rose to a fractional-order power. Some examples are given. © 2016 M. E. Fouda et al.
Fundamentals of fractional-order LTI circuits and systems: number of poles, stability, time and frequency responses

Authors
Semary M.S., Radwan A.G., Hassan H.N.

Abstract
This paper investigates some basic concepts of fractional-order linear time invariant systems related to their physical and non-physical transfer functions, poles, stability, time domain, frequency domain, and their relationships for different fractional-order differential equations. The analytical formula that calculates the number of poles in physical and non-physical s-plane for different orders is achieved and verified using many practical examples. The stability contour versus the number of poles in the physical s-plane for different fractional-order systems is discussed in addition to the effect of the non-physical poles on the steady state responses. Moreover, time domain responses based on Mittag-Leffler functions for both physical and non-physical transfer functions are discussed for different cases, which confirm the stability analysis. Many fractional-order linear time invariant systems based on fractional-order differential equations have been discussed numerically in both time and frequency domains to validate the previous fundamentals. Copyright © 2016 John Wiley & Sons, Ltd. Copyright © 2016 John Wiley & Sons, Ltd.
Generalized synchronization involving a linear combination of fractional-order chaotic systems

Authors
Sayed W.S., Radwan A.G., Abd-El-Hafiz S.K.

Abstract
In this paper, a generalized scheme for synchronizing a fractional order chaotic system with another one or with a linear combination of two other fractional order chaotic systems is presented. Static (time-independent) or dynamic (time-dependent) synchronization that could generate multiple scaled versions of the response is discussed for some fractional order continuous chaotic systems based on differential equations. Non-Standard finite difference method suitable for fractional order chaotic systems is used to solve each system and get the responses. Analysis in the generalized fractional order case is presented, as well as results of simulations that match the corresponding analysis for different values of fractional order parameters. © 2016 IEEE.
Year: 2016

Guest Editorial: Fractional-Order Circuits and Systems: Theory, Design, and Applications

Authors
Psychalinos C., Elwakil A.S., Radwan A.G., Biswas K.

[No abstract available]
Year: 2016

Hermite polynomials in the fractional order domain suitable for special filters design

Authors

Abstract
Due to the importance of its integer order counterpart in many mathematical and engineering fields, the fractional order Hermite polynomials are studied in this paper. A fractional variation of the well known Hermite differential equation is introduced based on Caputo fractional operator. The proposed equation is solved using fractional Taylor power series method and the convergence is verified using truncated series for different values of the parameters. The condition for fractional polynomial solution is obtained and the first four polynomials are scaled using an appropriate scaling factor. The fractional order Hermite filter based on these polynomials is introduced through its magnitude response as one possible application. © 2016 IEEE.
Year: 2016

Image encryption algorithms using non-chaotic substitutions and permutations

Authors

Abstract
This paper presents substitution and/or permutation symmetric-key encryption algorithms based on non-chaotic generators. While the substitution algorithm is based on fractals with delay and multiplexer elements, permutations are achieved via a chess-based algorithm. A comparison of four different cases; substitution-only, permutation-only, substitution-permutation and permutation-substitution; is introduced taking into consideration their encryption analysis results and sensitivity. Three different standard images; Lena, pepper and airplane; are tested for each algorithm to validate the comparisons. Moreover, a comparison between the encryption key for each algorithm is presented. Each algorithm is evaluated using standard analyses such as histogram distributions, correlation coefficients between pixels, differential attack measures, Mean Square Error (MSE), entropy, sensitivity analyses and the 15 statistical tests of the National Institute of Standards and Technology (NIST) SP-800-22 test suite. © 2016 IEEE.
Improved estimation of the cardiac global function using combined long and short axis MRI images of the heart

Authors
El-Rewaidy H., Fahmy A.S.

Abstract
Background: Estimating the left ventricular (LV) volumes at the different cardiac phases is necessary for evaluating the cardiac global function. In cardiac magnetic resonance imaging, accurate estimation of the LV volumes requires the processing a relatively large number of parallel short-axis cross-sectional images of the LV (typically from 9 to 12). Nevertheless, it is inevitable sometimes to estimate the volume from a small number of cross-sectional images, which can lead to a significant reduction of the volume estimation accuracy. This usually encountered when a number of cross-sectional images are excluded from analysis due to patient motion artifacts. In some other cases, the number of image acquisitions is reduced to accommodate patients who cannot withstand long scan times or multiple breath-holds. Therefore, it is required to improve the accuracy of estimating the LV volume from a reduced number of acquisitions.

Methods: In this work, we propose a method for accurately estimating the LV volume from a small number of images. The method combines short-axis (SAX) and long axis (LAX) cross sectional views of the heart to accurately estimate the LV volumes. In this method, the LV is divided into a set of consecutive chunks and a simple geometric model is then used to calculate the volume of each chunk. Validation and performance evaluation of the proposed method is achieved using real MRI datasets (25 patients) in addition to CT-based phantoms of human hearts.

Results: The results show a better performance of the proposed method relative to the other available techniques. It is shown that, at the same number of cross-sectional images, the volume calculation error is significantly lower than that of current methods. In addition, the experiments show that the results of the proposed model are reproducible despite variable orientations of the imaged cross-sections.

Conclusion: A new method for calculating the LV volume from a set of SAX and LAX MR images has been developed. The proposed method is based on fusing the SAX and LAX segmented contours to accurately estimate the LV volume from a small number of images. The method was tested using simulated and real MRI datasets and the results showed improved accuracy of estimating the LV volume from small number of images. © 2016 El-Rewaidy and Fahmy.
In silico design and experimental validation of sirnas targeting conserved regions of multiple hepatitis c virus genotypes

Authors

Abstract
RNA interference (RNAi) is a post-transcriptional gene silencing mechanism that mediates the sequence-specific degradation of targeted RNA and thus provides a tremendous opportunity for development of oligonucleotide-based drugs. Here, we report on the design and validation of small interfering RNAs (siRNAs) targeting highly conserved regions of the hepatitis C virus (HCV) genome. To aim for therapeutic applications by optimizing the RNAi efficacy and reducing potential side effects, we considered different factors such as target RNA variations, thermodynamics and accessibility of the siRNA and target RNA, and off-target effects. This aim was achieved using an in silico design and selection protocol complemented by an automated MysiRNA-Designer pipeline. The protocol included the design and filtration of siRNAs targeting highly conserved and accessible regions within the HCV internal ribosome entry site, and adjacent core sequences of the viral genome with high-ranking efficacy scores. Off-target analysis excluded siRNAs with potential binding to human mRNAs. Under this strict selection process, two siRNAs (HCV353 and HCV258) were selected based on their predicted high specificity and potency. These siRNAs were tested for antiviral efficacy in HCV genotype 1 and 2 replicon cell lines. Both in silico-designed siRNAs efficiently inhibited HCV RNA replication, even at low concentrations and for short exposure times (24h); they also exceeded the antiviral potencies of reference siRNAs targeting HCV. Furthermore, HCV353 and HCV258 siRNAs also inhibited replication of patient-derived HCV genotype 4 isolates in infected Huh-7 cells. Prolonged treatment of HCV replicon cells with HCV353 did not result in the appearance of escape mutant viruses. Taken together, these results reveal the accuracy and strength of our integrated siRNA design and selection protocols. These protocols could be used to design highly potent and specific RNAi-based therapeutic oligonucleotide interventions. © 2016 ElHefnawi et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.
Lightweight authentication protocol deployment over FlexRay

Authors
Mousa A.R., NourElDeen P., Azer M., Allam M.

Abstract
In-vehicle network security is becoming a major concern for the automotive industry. Although there is significant research done in this area, there is still a significant gap between research and what is actually applied in practice. Controller area network (CAN) gains the most concern of community but little attention is given to FlexRay. Many signs indicate the approaching end of CAN usage and starting with other promising technologies. FlexRay is considered one of the main players in the near future. We believe that migration era is near enough to change our mindset in order to supply industry with complete and mature security proposals with FlexRay. This changing mindset is important to fix the lagging issue appeared in CAN between research and industry. Then, we provide a complete migration of CAN authentication protocol towards FlexRay shows the availability of the protocol over different technologies. © 2016 ACM.
Low pass filter design based on fractional power chebyshev polynomial

Authors

Abstract
This paper introduces the design procedure for the low pass filter based on Chebyschev polynomials of fractional power of any order. The filter order is considered in intervals of width two. Only the first two intervals are considered along with their pole locus produced by varying the filter order and the magnitude response. A general formula for constructing the filter from its s-plane poles is suggested. Numerical analysis and circuit simulations using MATLAB and Advanced Design System (ADS) based on the proposed design procedure are presented. Good matching between the circuit simulation and the numerical analysis is obtained which proves the reliability of the proposed design procedure. © 2015 IEEE.
Maximizing USRP N210 SDR transfer rate by offloading modulation to the onboard FPGA

Authors
Hanna S.S., El-Sherif A.A., Elnainay M.Y.

Abstract
One of the challenges of the design of Software Defined Radios (SDR) is to maintain a high level of reconfigurability without sacrificing data rates. In this paper, we consider the USRP N210, which is an SDR kit made by Ettus Research. It consists of an FPGA connected to an RF front-end. The USRP is operated by a host computer where most of the processing is done while the FPGA is used mainly to control the RF front-end, manage communication with the host, and convert sample rates. The maximal rate supported by the USRP hardware can not be practically achieved due to the bottleneck in the data transfer between the host and USRP and the limited computational ability of the computer. To deal with this problem, we implement a modulator and demodulator in the FPGA of the USRP. The proposed system is capable of processing data at the maximum sample rate supported by the hardware. This is accomplished by transferring only raw data between host and USRP, reducing transfer rate by up to 64 times; thus, bypassing the host transfer bottleneck. Additionally, offloading some of the processing to the FPGA makes communication at the maximum rate achievable with an off the shelf computer. An evaluation of the performance of the suggested system from the communication perspective is performed. We also showcase the system's ability to work at the maximum sample rate supported by the USRP. © 2016 IEEE.

Authors
El Shafie A., Khattab T., El-Keyi A., Nafie M.

Abstract
In this paper, we investigate the impact of cooperation between a secondary transmitter-receiver pair and a primary transmitter on the maximum stable throughput of the primary-secondary network. Each transmitter, either primary or secondary, has a buffer for storing its own traffic. In addition to its own buffer, the secondary transmitter has a buffer for storing a fraction of the undelivered primary packets due to channel impairments. Moreover, the secondary destination has a relaying queue (buffer) for storing a fraction of the undelivered primary packets. In our proposed cooperative system, the secondary transmitter and the secondary destination increase the spectrum availability for the secondary packets by relaying the unsuccessfully transmitted packets of the primary transmitter. We consider two multiple-access strategies to be used by the secondary transmitter and the secondary destination to utilize the silence sessions of the primary transmitter. Numerical results demonstrate the gains of our proposed cooperative system over the noncooperation case and the systems when the secondary transmitter is the only cooperating node in the network. © 2016 IEEE.
MDAC: A new reputation system for misbehavior detection and control in ad hoc networks

Authors
Azer M.A., Saad N.G.E.-D.

Abstract
Reputation systems are an emerging area of research in ad-hoc networks. They have been introduced as a security solution for nodes' misbehaving problem. A reputation system should cope with any kind of misbehavior. It enables honest nodes to make fair decisions about their neighbors. This may encourage nodes to behave well and cooperate in order to avoid being penalized or isolated. In this paper, we propose a new reputation system for Misbehavior Detection And Control in ad hoc Networks (MDAC). It aims to overcome some of the unsolved issues of other reputation systems, and it is customizable for any ad hoc network. Robustness, stability, and fairness are all primary aspects of a successful reputation system. MDAC adopts a strategy of specific information sharing and collection in order to minimize traffic overhead, and also to override the false reports from nodes about each other. The reputation system's structure is presented, and the new features of the proposed approach are discussed. MDAC's functionality has been tested and evaluated through simulations compared to the OCEAN-DSR protocol. © 2015 IEEE.
Modified kinetic-hydraulic UASB reactor model for treatment of wastewater containing biodegradable organic substrates

Authors
El-Seddik M.M., Galal M.M., Radwan A.G., Abdel-Halim H.S.

Abstract
This paper addresses a modified kinetic-hydraulic model for up-flow anaerobic sludge blanket (UASB) reactor aimed to treat wastewater of biodegradable organic substrates as acetic acid based on Van der Meer model incorporated with biological granules inclusion. This dynamic model illustrates the biomass kinetic reaction rate for both direct and indirect growth of microorganisms coupled with the amount of biogas produced by methanogenic bacteria in bed and blanket zones of reactor. Moreover, the pH value required for substrate degradation at the peak specific growth rate of bacteria is discussed for Andrews' kinetics. The sensitivity analyses of biomass concentration with respect to fraction of volume of reactor occupied by granules and up-flow velocity are also demonstrated. Furthermore, the modified mass balance equations of reactor are applied during steady state using Newton Raphson technique to obtain a suitable degree of freedom for the modified model matching with the measured results of UASB Sanhour wastewater treatment plant in Fayoum, Egypt. © IWA Publishing 2016.
Multi-reader RFID tag identification using bit tracking (MRTI-BT)

Authors
Fahim A., Elbatt T.

Abstract
In this paper we study the problem of tag identification in multi-reader RFID systems. In particular, we propose a novel solution to the reader-to-reader collisions and tag collisions in multi-reader systems, using the concept of bit tracking [1]. Towards this objective, we propose the multi-reader RFID tag identification using bit tracking (MRTI-BT) algorithm which allows concurrent tag identification, by neighboring RFID readers, as opposed to time-consuming scheduling. First, MRTI-BT identifies tags exclusive to different RFIDs, concurrently. Second, the concept of bit tracking and the proposed parallel identification property are leveraged to reduce the identification time compared to the state-of-the-art. Our simulation results exhibit considerable performance improvement with 113% reduction in the identification time, on the average, compared to Season [2]. © 2016 IEEE.
Year: 2016

NileTMRG at SemEval-2016 task 5: Deep convolutional neural networks for aspect category and sentiment extraction

Authors
Khalil T., El-Beltagy S.R.

Abstract
This paper describes our participation in the SemEval-2016 task 5, Aspect Based Sentiment Analysis (ABSA). We participated in two slots in the sentence level ABSA (Subtask 1) namely: aspect category extraction (Slot 1) and sentiment polarity extraction (Slot 3) in English Restaurants and Laptops reviews. For Slot 1, we applied different models for each domain. In the restaurants domain, we used an ensemble classifier for each aspect which is a combination of a Convolutional Neural Network (CNN) classifier initialized with pretrained word vectors, and a Support Vector Machine (SVM) classifier based on the bag of words model. For the Laptops domain, we used only one CNN classifier that predicts the aspects based on a probability threshold. For Slot 3, we incorporated domain and aspect knowledge in one ensemble CNN classifier initialized with fine-tuned word vectors and used it in both domains. In the Restaurants domain, our system achieved the 2nd and the 3rd places in Slot 1 and Slot 3 respectively. However, we ranked the 8th in Slot 1 and the 5th in Slot 3 in the Laptops domain. Our extended experiments show our system could have ranked 2nd in the Laptops domain in Slot 1 and Slot 3, had we followed the same approach we followed in the Restaurants domain in slot 1 and trained each domain separately in Slot 3. © 2016 Association for Computational Linguistics.
NileTMRG at SemEval-2016 Task 7: Deriving prior polarities for Arabic sentiment terms

Authors
El-Beltagy S.R.

Abstract
This paper presents a model that was developed to address SemEval Task 7: "Determining Sentiment Intensity of English and Arabic Phrases", with focus on 'Arabic Phrases'. The goal of this task is to determine the degree to which some given term is associated with positive sentiment. The underlying premise behind the model that we have adopted is that determining the context (positive or negative) in which a term usually occurs can determine its strength. Since the focus is on Twitter terms, Twitter was used to collect tweets for each term for which a strength value was to be derived. An Arabic sentiment analyzer, was then used to assign a polarity to each of these tweets, thus defining their context. We then experimented with normalized point wise mutual information with and without linear regression to assign intensity scores to input terms. The output of the model that we've adopted ranked at two out of the three presented systems for this task with a Kendall score of 0.475. © 2016 Association for Computational Linguistics.
NileULex: A phrase and word level sentiment lexicon for Egyptian and modern standard Arabic

Authors
El-Beltagy S.R.

Abstract
This paper presents NileULex, which is an Arabic sentiment lexicon containing close to six thousands Arabic words and compound phrases. Forty five percent of the terms and expressions in the lexicon are Egyptian or colloquial while fifty five percent are Modern Standard Arabic. The development of the presented lexicon has taken place over the past two years. While the collection of many of the terms included in the lexicon was done automatically, the actual addition of any term was done manually. One of the important criterions for adding terms to the lexicon, was that they be as unambiguous as possible. The result is a lexicon with a much higher quality than any translated variant or automatically constructed one. To demonstrate that a lexicon such as this can directly impact the task of sentiment analysis, a very basic machine learning based sentiment analyser that uses unigrams, bigrams, and lexicon based features was applied on two different Twitter datasets. The obtained results were compared to a baseline system that only uses unigrams and bigrams. The same lexicon based features were also generated using a publicly available translation of a popular sentiment lexicon. The experiments show that usage of the developed lexicon improves the results over both the baseline and the publicly available lexicon.
Nonlinear time-series analysis of current signal in cathodic contact glow discharge electrolysis

Authors
Allagui A., Rojas A.E., Bonny T., Elwakil A.S., Abdelkareem M.A.

Abstract
In the standard two-electrode configuration employed in electrolytic process, when the control dc voltage is brought to a critical value, the system undergoes a transition from conventional electrolysis to contact glow discharge electrolysis (CGDE), which has also been referred to as liquid-submerged micro-plasma, glow discharge plasma electrolysis, electrode effect, electrolytic plasma, etc. The light-emitting process is associated with the development of an irregular and erratic current time-series which has been arbitrarily labelled as "random," and thus dissuaded further research in this direction. Here, we examine the current time-series signals measured in cathodic CGDE configuration in a concentrated KOH solution at different dc bias voltages greater than the critical voltage. We show that the signals are, in fact, not random according to the NIST SP. 800-22 test suite definition. We also demonstrate that post-processing low-pass filtered sequences requires less time than the native as-measured sequences, suggesting a superposition of low frequency chaotic fluctuations and high frequency behaviors (which may be produced by more than one possible source of entropy). Using an array of nonlinear time-series analyses for dynamical systems, i.e., the computation of largest Lyapunov exponents and correlation dimensions, and reconstruction of phase portraits, we found that low-pass filtered datasets undergo a transition from quasi-periodic to chaotic to quasi-hyper-chaotic behavior, and back again to chaos when the voltage controlling-parameter is increased. The high frequency part of the signals is discussed in terms of highly nonlinear turbulent motion developed around the working electrode. © 2016 Author(s).
Abstract
We consider a cognitive radio system that consists of primary user, secondary user, and their destinations. The secondary user has a relaying capability, i.e., it transmits the relayed packets from the primary user. Unlike most of the previous works that restrict the secondary user to transmit only in the idle time slots, we assume that the secondary user interferes on the primary user with certain probability that is optimized to maximize the stable throughput of the secondary network under certain level of quality of service constraints for the primary one. We show how significantly our proposed scheme improves the performance of the secondary user and increases the maximum stable throughput of the primary user over the traditional cooperative policies that restrict the secondary user to exploit only the periods of silence of the primary user. © 2016 IEEE.
Abstract
This paper proposes two measures for the evaluation of permutation techniques used in image encryption. First, a general mathematical framework for describing the permutation phase used in image encryption is presented. Using this framework, six different permutation techniques, based on chaotic and non-chaotic generators, are described. The two new measures are, then, introduced to evaluate the effectiveness of permutation techniques. These measures are (1) Percentage of Adjacent Pixels Count (PAPC) and (2) Distance Between Adjacent Pixels (DBAP). The proposed measures are used to evaluate and compare the six permutation techniques in different scenarios. The permutation techniques are applied on several standard images and the resulting scrambled images are analyzed. Moreover, the new measures are used to compare the permutation algorithms on different matrix sizes irrespective of the actual parameters used in each algorithm. The analysis results show that the proposed measures are good indicators of the effectiveness of the permutation technique. © 2016 Elsevier Ltd. All rights reserved.
On Board Evaluation System for Advanced Driver Assistance Systems

Authors
Taie M.A., Elhelw M.

Abstract
The evaluation of Advanced Driver Assistance Systems (ADAS including driver assistance and active safety) has increasing interest from authorities, industry and academia. AsPeCSS active safety project concludes that good results in a laboratory test for active safety system design does not necessarily equate to an effective system in real traffic conditions. Moreover, many ADAS assessment projects and standards require physical testing on test tracks (dummy vehicles, pedestrian mannequins), which are expensive and limit testing capabilities. This research presents a conceptual framework for on-board evaluation (OBE) of ADAS, which can be used as a cost effective evaluation in real-life traffic conditions. OBE shall monitor, record, analyze and report both internal behavior and external environment (external objects list and video stream) of ADAS under evaluation (ADASUE). Furthermore, OBE performs white box testing and black box testing (evaluates overall vehicle's actions during hazards and evaluates functionalities and performance of ADASUE according to predefined test scenarios (e.g. ISO 22178 active safety test protocols)). In order to test that ADASUE is able to detect environmental hazards within adequate response time, a supplementary sub-system of the OBE called hazard detection unit (HDU) is proposed. HDU uses some active safety systems to verify that hazards are detected by ADASUE. Some well-known machine learning (ML) algorithms are used in HDU implementation. The trigger to start evaluation using OBE is based on warnings from HDU, ADASUE itself and connected vehicles. Experiments are performed using an ADAS simulation tool. Finally, results are presented to demonstrate the potential of proposed system. © Copyright 2016 SAE International.
On optimal policies in full-duplex wireless powered communication networks

Authors
Abd-Elmagid M.A., Biason A., Elbatt T., Seddik K.G., Zorzi M.

Abstract
The optimal resource allocation scheme in a full-duplex Wireless Powered Communication Network (WPCN) composed of one Access Point (AP) and two wireless devices is analyzed and derived. AP operates in a full-duplex mode and is able to broadcast wireless energy signals in downlink and receive information data in uplink simultaneously. On the other hand, each wireless device is assumed to be equipped with Radio-Frequency (RF) energy harvesting circuitry which gathers the energy sent by AP and stores it in a finite capacity battery. The harvested energy is then used for performing uplink data transmission tasks. In the literature, the main focus so far has been on slot-oriented optimization. In this context, all the harvested RF energy in a given slot is also consumed in the same slot. However, this approach leads to sub-optimal solutions because it does not take into account the Channel State Information (CSI) variations over future slots. Differently from most of the prior works, in this paper we focus on the long-term weighted throughput maximization problem. This approach significantly increases the complexity of the optimization problem since it requires to consider both CSI variations over future slots and the evolution of the batteries when deciding the optimal resource allocation. We formulate the problem using the Markov Decision Process (MDP) theory and show how to solve it. Our numerical results emphasize the superiority of our proposed full-duplex WPCN compared to the half-duplex WPCN and reveal interesting insights about the effects of perfect as well as imperfect self-interference cancellation techniques on the network performance. © 2016 IEEE.
On optimizing cooperative cognitive user performance under primary QoS constraints

Authors
Elmahdy A.M., El-Keyi A., Elbatt T., Seddik K.G.

Abstract
We study the problem of optimizing the performance of cognitive radio users with opportunistic real-Time applications subject to primary users quality-of-service (QoS) constraints. Two constrained optimization problems are formulated; the first problem is maximizing the secondary user throughput while the second problem is minimizing the secondary user average delay, subject to a common constraint on the primary user average delay. In spite of the complexity of the optimization problems, due to their non-convexity, we transform the first problem into a set of linear programs and the second problem into a set of quasiconvex optimization problems. We prove that both problems are equivalent with identical feasible sets and optimal solutions. We show, through numerical results, that the proposed cooperation policy represents the best compromise between enhancing the secondary users QoS and satisfying the primary users QoS requirements. © 2016 IEEE.
On the coexistence of a primary user with an energy harvesting secondary user: A case of cognitive cooperation

Authors
Shafie A.E., Khattab T., El-Keyi A., Nafie M.

Abstract
In this paper, we consider a cognitive scenario where an energy harvesting secondary user shares the spectrum with a primary user. The secondary source helps the primary source in delivering its undelivered packets during periods of silence of the primary source. The primary source has a queue for storing its data packets, whereas the secondary source has two data queues: a queue for storing its own packets and the other for storing the fraction of the undelivered primary packets accepted for relaying. The secondary source is assumed to be a battery-based node, which harvests energy packets from the environment. In addition to its data queues, the secondary user has an energy queue to store the harvested energy packets. The secondary energy packets are used for primary packets decoding and data packets transmission. More specifically, if the secondary energy queue is empty, the secondary source can neither help the primary source nor transmit a packet from the data queues. The energy queue is modeled as a discrete-time queue with Markov arrival and service processes. Because of the interaction of the queues, we provide inner and outer bounds on the stability region of the proposed system. We investigate the impact of the energy arrival rate on the stability region. Numerical results show the significant gain of cooperation. © 2014 John Wiley & Sons, Ltd.
On the degrees of freedom region of the $M \times N$ Interference Channel

Authors
Khalil M., Khattab T., El-Keyi A., Nafie M.

Abstract
In this paper, the K-user MIMO interference channel is considered. The asymmetric DoF region for the channel is studied. The asymmetric DoF represent the set of all achievable DoF combinations \{d_1, d_2, ..., d_K\}. For the three user channel, two cases are presented, the first is when all transmitters and receivers have equal number of antennas $M$, the other is when each transmitter has $M$ antennas, while each receiver has $N$ antennas. For the K user channel, we extend our achievable scheme for the $M \times N$ case. It is assumed that the channel coefficients are constant and known to all transmitters and receivers. The region of the achievable DoF tuple $(d_1; d_2; ..., d_K)$ is presented. © 2016 IEEE.
On The Optimization of Fractional Order Low-Pass Filters

Authors

Abstract
This paper presents three different optimization cases for normalized fractional order low-pass filters (LPFs) with numerical, circuit and experimental results. A multi-objective optimization technique is used for controlling some filter specifications, which are the transition bandwidth, the stop band frequency gain and the maximum allowable peak in the filter pass band. The extra degree of freedom provided by the fractional order parameter allows the full manipulation of the filter specifications to obtain the desired response required by any application. The proposed mathematical model is further applied to a case study of a practical second-generation current conveyor (CCII)-based fractional low-pass filter. Circuit simulations are performed for two different fractional order filters, with orders 1.6 and 3.6, with cutoff frequencies 200 and 500 Hz, respectively. Experimental results are also presented for LPF of 4.46 kHz cutoff frequency using a fabricated fractional capacitor of order 0.8, proving the validity of the proposed design approach. © 2016, Springer Science+Business Media New York.
Optimal energy allocation for delay-constrained traffic over fading multiple access channels

Authors
Girgis A.M., El-Keyi A., Nafie M.

Abstract
In this paper, we consider a multiple-access fading channel where N users transmit to a single base station (BS) within a limited number of time slots. We assume that each user has a fixed amount of energy available to be consumed over the transmission window. We derive the optimal energy allocation policy for each user that maximizes the total system throughput under two different assumptions on the channel state information. First, we consider the offline allocation problem where the channel states are known a priori before transmission. We solve a convex optimization problem to maximize the sum-throughput under energy and delay constraints. Next, we consider the online allocation problem, where the channels are causally known to the BS and obtain the optimal energy allocation via dynamic programming when the number of users is small. We also develop a suboptimal resource allocation algorithm whose performance is close to the optimal one. Numerical results are presented showing the superiority of the proposed algorithms over baseline algorithms in various scenarios. © 2016 IEEE.
Parameterized test patterns methodology for layout design rule checking verification

Authors
Tantawy M., Guindi R., Dessouky M., Al-Imam M.

Abstract
Design rules verification is an essential stage in the Process Design Kit (PDK) release for any fab. Since achieving high yield is the target of any fab, the design rules should ensure this. Design rules violations happening after fabrication lead to disastrous results on the mask sets as well as increased cost and delayed schedules. Here comes the importance of verifying these design rules and making sure that they represent the process in a manner that achieves a high yield and detects design rules issues early on. The verification process consumes 60% of the release cycle and the most time consuming step in the process is the Design rules checking (DRC) verification. Advanced technology nodes introduced stricter design rules as well as new design techniques, which added more complexity to the design rules development and verification. This paper presents a novel flow for automating the most time consuming part of the (DRC) rule decks verification, which is test cases creation and allows users to enhance the quality of the verification process and increase the testing coverage as well. And eventually reduces the time consumed in verification to 26% of what it was using conventional verification methods. © 2015 IEEE.
Power and energy analysis of fractional-order electrical energy storage devices

Authors
Fouda M.E., Elwakil A.S., Radwan A.G., Allagui A.

Abstract
Characterizing and modeling electrical energy storage devices is essential for their proper integration in larger systems. However, basic circuit elements, i.e. resistors, inductors, and capacitors, are not well-suited to explain their complex frequency-dependent behaviors. Instead, fractional-order models, which are based on non-integer-order differential equations in the time-domain and include for instance the constant phase element (CPE), are mathematically more fit to this end. Here, the electrical power and energy of fractional-order capacitance and inductance are derived in both steady-state and transient conditions, and verified using a number of commercial supercapacitors and fractional-order coils. A generalized expression for the energy stored in a supercapacitor/fractional-order inductor is derived and found to depend on the capacitance/inductance and the dispersion coefficient of the device, as well as on the properties of the applied voltage waveform. © 2016 Elsevier Ltd.
Reevaluation of Performance of Electric Double-layer Capacitors from Constant-current Charge/Discharge and Cyclic Voltammetry

Authors
Allagui A., Freeborn T.J., Elwakil A.S., Maundy B.J.

Abstract
The electric characteristics of electric-double layer capacitors (EDLCs) are determined by their capacitance which is usually measured in the time domain from constant-current charging/discharging and cyclic voltammetry tests, and from the frequency domain using nonlinear least-squares fitting of spectral impedance. The time-voltage and current-voltage profiles from the first two techniques are commonly treated by assuming ideal S s C behavior in spite of the nonlinear response of the device, which in turn provides inaccurate values for its characteristic metrics. In this paper we revisit the calculation of capacitance, power and energy of EDLCs from the time domain constant-current step response and linear voltage waveform, under the assumption that the device behaves as an equivalent fractional-order circuit consisting of a resistance R s in series with a constant phase element (CPE(Q, α), with Q being a pseudocapacitance and α a dispersion coefficient). In particular, we show with the derived (R s, Q, α)-based expressions, that the corresponding nonlinear effects in voltage-time and current-voltage can be encompassed through nonlinear terms function of the coefficient α, which is not possible with the classical R s C model. We validate our formulae with the experimental measurements of different EDLCs. © 2016 The Author(s).
Remote Diagnosis, Maintenance and Prognosis for Advanced Driver Assistance Systems Using Machine Learning Algorithms

Authors
Taie M.A., Moawad E.M., Diab M., ElHelw M.

Abstract
New challenges and complexities are continuously increasing in advanced driver assistance systems (ADAS) development (e.g. active safety, driver assistant and autonomous vehicle systems). Therefore, the health management of ADAS’ components needs special improvements. Since software contribution in ADAS’ development is increasing significantly, remote diagnosis and maintenance for ADAS become more important. Furthermore, it is highly recommended to predict the remaining useful life (RUL) for the prognosis of ADAS’ safety critical components; e.g. (Ultrasonic, Cameras, Radar, LIDAR). This paper presents a remote diagnosis, maintenance and prognosis (RDMP) framework for ADAS, which can be used during development phase and mainly after production. An overview of RDMP framework’s elements is explained to demonstrate how/when this framework is connected to database servers and remote analysis servers. Moreover, Sensors fusion is used in RDMP to detect some sensor failures and even to predict their RUL. Additionally, some well-known machine learning algorithms (MLA) are used to predict RUL of ADAS’ components, and different types of input attributes to these MLA are proposed for some basic ADAS’ components. MLA use training data set, which shall be constructed ideally from actual records reported remotely by RDMP (Prognosis Analysis and Self-Learning System). However, initial dataset before production of the vehicle can be created from ADAS laboratory tests (e.g. Assessments on test tracks), ADAS simulation and theoretical analytical methods. Also, experiments of using the proposed RDMP in some ADAS’ components (Sensor fusion and Braking system as ADAS actuator) are presented. Summary, conclusion with proven results and future work are explained. Copyright © 2016 SAE International.
Year: 2016

Review of the missing mechanical element: Memdamper

Authors
Fouda M.E., Radwan A.G., Elwakil A.S., Nawayseh N.K.

Abstract
In this paper, the analogy between electrical and mechanical quantities is reviewed. Based on this analogy, there is a missing link between displacement and momentum. This missing link corresponds to the link between the charge and flux which represents the memristor. This link is still missing between the mechanical quantities. In this work, we shed the light on this missing mechanical element. We introduce the mathematical relation which links displacement and momentum. Two main types of missing relations are discussed. © 2015 IEEE.
RF energy harvesting in wireless networks with HARQ

Authors
Zohdy M., Elbatt T., Nafie M., Ercetin O.

Abstract
In this paper, we consider a class of wireless powered communication networks using data link layer hybrid automatic repeat request (HARQ) protocol to ensure reliable communications. In particular, we analyze the trade-off between accumulating mutual information and accumulating RF energy at the receiver of a point-to-point link using HARQ with incremental redundancy over a Rayleigh fading channel. The transmitter is assumed to have a constant energy source while the receiver relies, solely, on the RF energy harvested from the received signal. First, we target the optimal time switching (TS) policy in order to maximize the probability of successful decoding within a fixed number of re-transmissions, in the absence of CSI information at the receiver. Towards this objective, we cast the problem as a finite time-horizon dynamic programming problem. However, motivated by the sheer complexity of the problem attributed to the continuous state space, we characterize the optimal solution for a discrete version of the problem. Second, we propose a simple greedy algorithm and compare its performance to the optimal and a non-causal lower bound. Third, when CSI is available at the receiver, we introduce a heuristic TS policy which is shown to have a performance superior to the greedy policy and close to that of the lower bound. Finally, the numerical results exhibit the merits of the proposed heuristic and greedy algorithms, approaching the lower bound, for a variety of scenarios. © 2016 IEEE.
Segmentation of the right ventricle in MRI images using a dual active shape model

Authors
El-Rewaidy H., Ibrahim E.-S., Fahmy A.S.

Abstract
Active shape models (ASM) showed to have potential for segmenting the right ventricle (RV) in cardiac magnetic resonance images (MRIs). Nevertheless, the large variability and complexity of the RV shape do not allow for concisely capturing all possible shape variations among patients and anatomical cross-sections. Noticeably, the latter increases the number of iterations required to converge to a proper solution and reduces the segmentation accuracy. In this study, the authors propose a new ASM framework that can model the RV shape in short-axis cardiac MRI images. In this framework, the RV contour is split into two simpler segments, septal (SP) and free wall, whose shape variations are independently modelled using two separate (dual) ASM models. The contour splitting is done at the location of the RV insertion points into the SP wall. Further, instead of using the conventional Procrustes method, the RV contours are aligned using the Bookstein coordinate transformation, which uses the RV insertion points as landmarks to linearly align the RV contours. The results from a dataset of 14 patients show that the proposed framework outperforms the conventional ASM framework and can model complex RV shape variation with more accuracy and in less iteration steps. © The Institution of Engineering and Technology 2016.
Year: 2016

Series and parallel circuit models containing memristors and inverse memristors

Authors
Fouda M.E., Radwan A.G., Elwakil A.S.

Abstract
In this paper, we propose a single equation that can be used to describe a circuit that contains series or parallel-connected R, L, C and memristor components in addition to a new element called inverse memristor M. Connecting these elements either series or parallel affects the pinched hysteresis lobes where the pinch point moves from the origin and lobes area shrinks or widens. Different cases of connecting different elements have been discussed clearly especially connecting memristor and inverse memristor together either series or parallel gives new response and behavior which can be used describe some physical devices. Finally, some cases of parallel-connected elements is verified using SPICE simulations. © 2015 IEEE.
Year: 2016

Sparse spectrum sensing in infrastructure-less cognitive radio networks via binary consensus algorithms

Authors
Seif M., Elbatt T., Seddik K.G.

Abstract
Compressive Sensing has been utilized in Cognitive Radio Networks (CRNs) to exploit the sparse nature of the occupation of the primary users. Also, distributed spectrum sensing has been proposed to tackle the wireless channel problems, like node or link failures, rather than the common 'centralized approach' for spectrum sensing. In this paper, we propose a distributed spectrum sensing framework based on consensus algorithms where SU nodes exchange their binary decisions to take global decisions without a fusion center to coordinate the sensing process. Each SU will share its decision with its neighbors, and at every new iteration each SU will take a new decision based on its current decision and the decisions it receives from its neighbors; in the next iteration, each SU will share its new decision with its neighbors. We show via simulations that the detection performance can tend to the performance of majority-rule Fusion Center based CRNs. © 2016 IEEE.
Abstract
The porous nature of the electrode material in supercapacitors and the apparent conductivity of the electrolyte cause their impedance to show a complex frequency-dependent behavior, which in turn makes it incorrect to treat them as ideal capacitors, even at a frequency of a few millihertz. This is particularly crucial if the intended application requires a configuration that uses stacked supercapacitor banks, in which errors in defining the metrics of the individual components accumulate. Although manufacturers provide supercapacitor ratings under DC only, by using a detailed impedance spectroscopy study of all possible series and parallel combinations of two different commercial 1 Farad carbon–carbon supercapacitors, we show that these nominal DC capacitances are not suitable to evaluate the equivalent capacitance. Instead, by using a model that consists of a series resistance and a constant-phase element, we employed a real, effective capacitance (in proper Farad units) suitable for direct application. This effective capacitance can be used to define the frequency-dependent quality factor of a supercapacitor and enables the easy calculation of series and parallel associations of identical or different devices. © 2016 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim
Energy harvesting (EH) is a promising technology for realizing energy-efficient wireless networks. In this paper, we utilize the ambient RF energy, particularly interference from neighboring transmissions, to replenish the batteries of the EH enabled nodes. However, RF energy harvesting imposes new challenges into the analysis of wireless networks. Our objective in this paper is to investigate the performance of a slotted Aloha random access wireless network consisting of two types of nodes, namely Type I, which has unlimited energy supply and Type II, which is solely powered by an RF energy harvesting circuit. The transmissions of a Type I node are recycled by a Type II node to replenish its battery. We characterize an inner bound on the stable throughput region under half-duplex and full-duplex energy harvesting paradigms as well as for the finite capacity battery case. Additionally, we analyze the case where RF energy harvesting serves as a backup for an unlimited energy source. We present numerical results that validate our analytical results, and demonstrate their utility for the analysis of the exact system. © 2016 IEEE.
Switched active control synchronization of three fractional order chaotic systems

Authors

Abstract
This paper discusses the continuous effect of fractional order parameter on two chaotic systems. Switched synchronization of three different fractional order chaotic systems is presented as an extension for synchronizing two different systems using active control. The proposed technique, which is based on the switching parameters and the scaling factors that control the choices of master and slave systems, is explained. The NonStandard Finite Difference method is used for the numerical solution of the fractional order master and slave systems. Four cases and many numeric simulations are presented to validate the concept for various combinations of the parameters. © 2016 IEEE.
Symmetric encryption algorithms using chaotic and non-chaotic generators: A review

Authors

Abstract
This paper summarizes the symmetric image encryption results of 27 different algorithms, which include substitution-only, permutation-only or both phases. The cores of these algorithms are based on several discrete chaotic maps (Arnold's cat map and a combination of three generalized maps), one continuous chaotic system (Lorenz) and two non-chaotic generators (fractals and chess-based algorithms). Each algorithm has been analyzed by the correlation coefficients between pixels (horizontal, vertical and diagonal), differential attack measures, Mean Square Error (MSE), entropy, sensitivity analyses and the 15 standard tests of the National Institute of Standards and Technology (NIST) SP-800-22 statistical suite. The analyzed algorithms include a set of new image encryption algorithms based on non-chaotic generators, either using substitution only (using fractals) and permutation only (chess-based) or both. Moreover, two different permutation scenarios are presented where the permutation-phase has or does not have a relationship with the input image through an ON/OFF switch. Different encryption-key lengths and complexities are provided from short to long key to persist brute-force attacks. In addition, sensitivities of those different techniques to a one bit change in the input parameters of the substitution key as well as the permutation key are assessed. Finally, a comparative discussion of this work versus many recent research with respect to the used generators, type of encryption, and analyses is presented to highlight the strengths and added contribution of this paper. © 2015.
Synthesis of non-aggregated nicotinic acid coated magnetite nanorods via hydrothermal technique

Authors
Attallah O.A., Girgis E., Abdel-Mottaleb M.M.S.A.

Abstract
Non-aggregated magnetite nanorods with average diameters of 20-30 nm and lengths of up to 350 nm were synthesized via in situ, template free hydrothermal technique. These nanorods capped with different concentrations (1, 1.5, 2 and 2.5 g) of nicotinic acid (vitamin B3); possessed good magnetic properties and easy dispersion in aqueous solutions. Our new synthesis technique maintained the uniform shape of the nanorods even with increasing the coating material concentration. The effect of nicotinic acid on the shape, particle size, chemical structure and magnetic properties of the prepared nanorods was evaluated using different characterization methods. The length of nanorods increased from 270 nm to 350 nm in nicotinic acid coated nanorods. Goethite and magnetite phases with different ratios were the dominant phases in the coated samples while a pure magnetite phase was observed in the uncoated one. Nicotinic acid coated magnetic nanorods showed a significant decrease in saturation magnetization than uncoated samples (55 emu/g) reaching 4 emu/g in 2.5 g nicotinic acid coated sample. The novel synthesis technique proved its potentiality to prepare coated metal oxides with one dimensional nanostructure which can function effectively in different biological applications. © 2015 Elsevier B.V. All rights reserved.
Synthesizable SVA protocol checker generation methodology based on TDML and VCD file formats

Authors
Kayed M.O., Abdelsalam M., Guindi R.

Abstract
System Verilog Assertions (SVA) is widely used by hardware designers and verification engineers to apply Assertion Based Verification (ABV) methodology on their hardware designs. However, the complexity in understanding different protocol standards in general and JEDEC memory protocol standards in specific imposes numerous difficulties on designers and verification engineers when translating design specifications into SVA. This motivated us to devise new techniques that can be used to automatically generate SVA for DDR memory protocols with no ambiguity when capturing design requirements from JEDEC standards. Moreover, the proposed assertions generation methods generate "synthesizable SVA", hence allowing hardware designers and verification engineers to use the generated assertions to check the functionality of their design implementation on hardware emulation platforms. The viability and the potential of our work are demonstrated with an Industrial case study using JEDEC LPDDR3 Memory Protocol Standard. © 2016 IEEE.
Tailored super magnetic nanoparticles synthesized via template free hydrothermal technique

Authors
Attallah O.A., Girgis E., Abdel-Mottaleb M.M.S.A.

Abstract
Magnetite nanoparticles of controlled shape and dimensions were synthesized using a modified hydrothermal technique. The influence of different synthesis conditions on the shape, size (length and diameter), structure and magnetic properties of the prepared nanoparticles is presented. The mineral phases, the morphologies, size distribution of the resulting magnetic nanoparticles and their magnetic properties were characterized using different characterization methods. We designed magnetite nanoparticles with different morphologies (nanospheres, nanorods, nanocubes and hexagons) and with improved saturation magnetization reaching 90 emu/g. © 2015 Elsevier B.V. All rights reserved.
The case for docker in multicloud enabled bioinformatics applications

Authors
Ali A.A., El-Kalioby M., Abouelhoda M.

Abstract
The introduction of next generation sequencing technologies did not bring only huge amounts of biological data but also highly sophisticated and versatile analysis workflows and systems. These new challenges require reliable and fast deployment methods over high performance servers in the local infrastructure or in the cloud. The use of virtualization technology has provided an efficient solution to overcome the complexity of deployment procedures and to provide a safe personalized execution box. However, the performance of applications running in virtual machines is worse than that of those running on the native infrastructure. Docker is a lightweight alternative to the usual virtualization technology achieving notable better performance. In this paper, we explore the use case scenarios for using Docker to deploy and execute sophisticated bioinformatics tools and workflows, with a focus on the sequence analysis domain. We also introduce an efficient implementation of the package elasticHPC-Docker to enable creation of a docker-based computer cluster in the private cloud and in commercial clouds like Amazon and Google. We demonstrate by experiments that the use of elasticHPC-Docker is efficient and reliable in both private and commercial clouds. © Springer International Publishing Switzerland 2016.
Topography realization using gain control for wireless testbeds

Authors
Hanna S.S., Seddik K.G., El-Sherif A.A.

Abstract
Wireless testbeds present a convenient and cost effective option for researchers in communications to validate their work. The main drawback of these testbeds is their reliance on nodes with fixed placement; this limits experimenters ability to test protocols that depend on a complex connectivity between the nodes such as relaying. In this work, we present a way to overcome this limitation; this method attempts to realize a given topology between a set of nodes by adjusting each node's transmit power and receive gain in a manner to connect and disconnect the links between the nodes as desired. We start by expressing the topology realization as an optimization problem using two different forms. The topology realized is dependent on some characteristics of radio-frequency (RF) hardware. Hence, we evaluate theses parameters for a specific platform. A computer evaluation for the two formulations is carried out, followed by a real world experiment to validate the proposed method. During this experiment, the values of gains required to realize a given topology are calculated, then tested using hardware. © 2016 ACM.
Two-port two impedances fractional order oscillators

Authors
Said L.A., Radwan A.G., Madian A.H., Soliman A.M.

Abstract
This paper presents a study for general fractional order oscillator based on two port network where two topologies of oscillator structure with two impedances are discussed. The two impedances are chosen to be fractional elements which give four combinations for each topology. The general oscillation frequency, condition and the phase difference between the two oscillatory outputs are deduced in terms of the transmission matrix parameter of a general two port network. As a case study: two different networks are presented which are op-amp based circuit and non-ideal gyrator circuit. The oscillation parameters for each case have been derived, and discussed numerically using Matlab. Spice simulations are presented for some cases to validate the proposed idea. Experimental results for the op-amp network are introduced to validate the reliability of the presented oscillator. The extra degree of freedom provided by the fractional order parameter enables the oscillation frequency band to cover from small Hz to hundreds MHz which is suitable range for most of measuring applications. © 2016 Elsevier Ltd
Universities' third mission activities: Case study from Egypt

Authors
El-Katatny M.G., Awny M.M.

Abstract
Universities are essential constituents in the socio-economic development, as proposed by the Triple Helix Model presented by Loet Leydesdorff and Henry Etzkowitz in the 1990s. Innovation is an important element related to the socio-economic development. On the other hand, a university can foster innovation by being the main source of knowledge and technological advancements. In the late 20th century, the concept of Entrepreneurial University evolved. This concept revolves around the universities that include socio-economic development as its third mission beside their basic two missions, namely: teaching and research. This third mission can be defined as a range of activities involving the university's interaction with the community and the usage of its capabilities outside the academic environment. Being a developing country, Egypt needs to improve its global competitiveness through developing its economic and social status. With the tremendous speed of technological advancements and the emergence of knowledge economy, the need for improvement necessitates the reformation of the Egyptian higher education system in order to meet the current and future needs of the Egyptian community. Such reforms can help create a new holistic understanding of the universities' role. This research is an assessment based on the perspectives of universities' professors regarding the third mission role as applied to three large Egyptian governmental universities. The assessment of this role can help in the reformation of the Egyptian higher education system. The assessment evaluates the existence of some pre-conditions for the universities' to achieve their third mission. It also evaluates the role of the universities' main actors and the universities' link with their partners. The current status of the third mission activities, filtered from literature, is analyzed in depth. The research is a qualitative type of research using multiple case studies. The chosen study sample is from the faculties of Electrical Engineering in the aforementioned three Egyptian governmental universities. The methodology involves semi-structured interviews with the universities' professors and a research funding agency to gather the required data. The research results are concluded by grouping and summarizing the common strengths and obstacles facing the universities in developing their third mission role. Some initiatives taken towards developing the universities' third mission role are also discussed. Lastly, a list of recommendations is proposed for developing such role. The development of the universities' third mission role is believed to contribute positively to the Egyptian socio-economic development.
Unsupervised data driven taxonomy learning

Authors
Hosny M.M., El-Beltagy S.R., Allam M.E.

Abstract
The ability to effectively organize textual information is a big challenge in intelligent text processing. With the increase in the amount of textual data being generated, this task is becoming more and more essential. In this paper we present an unsupervised computer-aided tool for automatically building classification schemes and taxonomies for enhancing the process of automated text classification. The tool utilizes the Wikipedia knowledge base and its categorization system to achieve its goal. Validation of the tool was done using a subset of a large language dataset obtained from the Google moderator series (Egypt 2.0) idea bank. The output of the tool was evaluated by comparing the similarity between the results obtained automatically from the tool, and those manually annotated by three different human evaluators, verifying the effectiveness of the tool. The tool showed effectiveness with a precision of 88.6% and recall of 81.2%. © 2015 IEEE.
Using network coding to achieve the capacity of deterministic relay networks with relay messages

Authors
Zewail A.A., Mohasseb Y., Nafie M., El Gamal H.

Abstract
In this paper, we derive the capacity of the deterministic relay networks with relay messages. We consider a network that consists of five nodes, four of which can only communicate via the fifth one. However, the fifth node is not merely a relay as it may exchange private messages with the other network nodes. First, we develop an upper bound on the capacity region based on the notion of a single-sided genie. In the course of the achievability proof, we also derive the deterministic capacity of a four-user relay network (without private messages at the relay). The capacity achieving schemes use a combination of two network coding techniques: the simple ordering scheme and detour scheme. In the simple ordering scheme, we order the transmitted bits at each user such that the bi-directional messages will be received at the same channel level at the relay, while the basic idea behind the detour scheme is that some parts of the message follow an indirect paths to their respective destinations. This paper, therefore, serves to show that user cooperation and network coding can enhance throughput, even when the users are not directly connected to each other. Finally, we make a conjecture about the capacity region of the general K-node relay network with relay messages. Copyright © 2016 John Wiley & Sons, Ltd. Copyright © 2016 John Wiley & Sons, Ltd.
Utilization of appropriate technologies for a real "competitive Egypt"

Authors
Azzam M., Sami N., Khalil T.

Abstract
Egypt has experienced a remarkable deterioration with respect to competitiveness since the Arab Spring in 2011. According to World Economic Forum's (WEF) report, Egypt's Global Competitiveness Index (GCI) was 81 out of 139 in 2011. The Country's GCI dropped to 116 out of 140 in 2015. This was mainly due to the political and economic instability that Egypt has come across over the past four years. Over the last few decades, the creation and utilization of technologies have played a critical role to improve the life quality of people, advance economies, and open new horizons for individuals, businesses, and even nations around the world. Furthermore, the world is experiencing nowadays unprecedented technology disruption that has triggered an enormous change; a change that is fueled by ongoing nonstop innovation and substantial evolution in the means people employ technology. Consequently, nations, individuals and businesses not only need to be aware of that, but also need to be ready, in order to be competitive in a connected and competitive world. Therefore, competitiveness becomes the name of the game for the nations, individuals and businesses. Without focus and disruptive strategy and implementation plans, it would be difficult to have a real competitive Egypt. Thus, the paper examines how Egypt could build its competitiveness pyramid by utilizing appropriate technologies to advance on the global competitiveness ladder and realize its growth potential; technologies that are matching the country's capabilities and resources. The approach used in the paper is based on thorough analysis of the reports issued by international and Egyptian institutions in the areas of competitiveness and sustainable socioeconomic development, desk research, and interviews with key personnel in the government, Business Representative Organizations (BROs), NGOs and private sector, in addition to youth, startups and entrepreneurs. Based on that approach, the paper draws a model for building ecosystems and clusters on the local governorates level, as each governorate has its own characteristic, competitiveness readiness, competitive edge, competences, and socioeconomic circumstances. A model that is considering the appropriate technologies needed to increase the competitiveness readiness on the local governorates’ level, as well as, advancing and connecting the local business communities, youth, entrepreneurs and startups to seize the new opportunities that would be developed. Moreover, the paper highlights the Critical Success Factors (CSF) for such model. That's why, each governorate or region would form an economic hub by itself, based on the previously mentioned notion. Eventually, these local ecosystems, clusters and economic hubs would be interconnected and integrated for serving the ultimate objective of increasing Egypt's GCI. The paper sets an example that can be deployed in similar economies, based on the proper definition of local competences, and building sustainable economic hubs, which are utilizing appropriate technologies and engaging the developed workforce in connected clusters and business
communities.
Abstract
Arabic Twitter Sentiment Analysis has been gaining a lot of attention lately with supervised approaches being exploited widely. However, to date, there has not been an experimental study that examines how different configurations of the Bag of Words model, text representation scheme, can affect various supervised machine learning methods. The goal of the presented work is to do exactly that. Specifically, this work examines which configurations work best for each of three machine learning approaches that have shown good results when applied on the task of sentiment analysis, namely: Support Vector Machines, Compliment Naïve Bayes, and Multinomial Naïve Bayes. Experimenting with different datasets has shown that each of these classifiers has a Bag of Words configuration in conjunction with which, it consistently performs best. It also showed that some features are dataset dependent. © 2015 IEEE.
2T2M memristor-based memory cell for higher stability RRAM modules

Authors
Shaarawy N., Ghoneima M., Radwan A.G.

Abstract
This paper introduces a novel 2T2M memristor based memory cell which offers higher stability and noise margins than previous works. The proposed 2T2M RRAM module is similar to conventional 6T SRAM module in terms of delay and number of interface pins. However, the predicted area of the proposed 2T2M RRAM cell is significantly lower compared to the CMOS based 6T SRAM cell, and is also expected to consume lower energy. The nonvolatile characteristics of the cell make it more attractive for nonvolatile random access memory design. Write, read and repeated read operations of the proposed 2T2M RRAM cell are briefly explained. A complete RRAM module array based on the proposed 2T2M cell is designed, and the schematic details of the IO circuit is shown. A comparison between the proposed 2T2M cell and previous works is presented. © 2015 IEEE.
A Bilevel Traffic Data Extraction Procedure via Cellular Phone Network for Intercity Travel

Authors
Basyoni Y., Talaat H.

Abstract
The absence of traffic surveillance infrastructure, in many developing countries, hinders any efforts for dealing with the daily witnessed traffic chaos. The use of the cellular phone (CP) network data for traffic data collection is a promising option for large-scale coverage, given a high CP penetration rate. This article presents a bilevel procedure for the extraction of classified vehicular traffic counts for different vehicle types, in a given roadway segment, for intercity travel. The bilevel procedure operates in an offline setting, independent from any secondary traffic surveillance system. At the first level, cellular phones on board the same vehicle are clustered using a "data swarm clustering" algorithm. At the second level, a genetic fuzzy classifier (GFC) is used for vehicles classification. The development and testing of the proposed procedure was conducted using a traffic/CP simulation platform. At the development phase, the swarm-based clustering algorithm achieved 93% clustering accuracy (vehicle count accuracy). At the second level, the fuzzy classifier successfully classified around 85% of the vehicles. The procedure was further evaluated using a microsimulation model of a major travel corridor in the Greater Cairo Region, Egypt. Superior performance was achieved, at the clustering level, with an accuracy of 97.6%. The revealed accuracy demonstrates the efficiency of the developed procedure for extracting unclassified vehicular counts from CP data. At the classification level, accuracy was reduced to 70.6 ± 11.5%. Achieved classification results are promising from a conceptual perspective. Nevertheless, further investigation is crucial for enhanced classification performance and robustness. Copyright © 2015 Taylor & Francis Group, LLC.
A hybrid approach for extracting arabic persons’ names and resolving their ambiguity from twitter

Authors
Zayed O.H., El-Beltagy S.R.

Abstract
Tweets offer a novel way of communication that enables users all over the world to share real-time news and ideas. The massive amount of tweets, generated regularly by Arabic speakers, has resulted in a growing interest in building Arabic named entity recognition (NER) systems that deal with the informal colloquial Arabic. The unique characteristics of the Arabic language make Arabic NER a challenging task, which, the informal nature of tweets further complicates. The majority of previous works addressing Arabic NER were concerned with formal modern standard Arabic (MSA). Moreover, taggers and parsers were often utilized to solve the ambiguity problem of Arabic persons’ names. Although, previously developed approaches perform well on MSA text, they are not suited for colloquial Arabic. This paper introduces a hybrid approach to extract Arabic persons’ names from tweets in addition to a way to resolve their ambiguity using context bigram patterns. The introduced approach attempts not to use any language-dependent resources. Evaluation of the presented approach shows a 7% improvement in the F-score over the best reported result in the literature. © Springer International Publishing Switzerland 2015.
Education is the most important sector influencing development of nations. The experience of the USA, several European countries, and more recently of South Korea, India and China are but few examples of the positive influence gained from attention to education on economic growth and improvement of the standards of living. All components of the education system chain from preschool to primary, secondary, tertiary and graduate education are important. Higher education, however, can provide greater value added particularly when combined with research and innovation. Research universities have a significant role to play in this regard particularly if combined with an entrepreneurial culture. Research entrepreneurial universities not only participate in education and dissemination of knowledge but also create knowledge and innovations. They give special attention to technology transfer and entrepreneurship with direct impact on economic return and development. Developing countries and in particular African countries face many challenges that must be addressed without delay. These include education, health care, transportation, logistics, security, information and communication, energy, water supplies, environment and many more. Research entrepreneurial universities consider these challenges as fertile opportunities to tackle through relevant curricula, research and technology transfer. This paper presents a model of a new university established recently in Egypt called Nile University (NU). This model can be a useful one for similar effort in Africa and many developing countries. The author relies on personal experience gained in establishing the University in Egypt where he serves as founding president. The model is an independent, nonprofit research and entrepreneurial institution of higher learning. The university conceptual design is based on the management of technology philosophy for development and wealth creation. The university philosophy in Education, research and focus on graduate education is explained. The emphasis on entrepreneurship education and promotion qualifies it to be a truly entrepreneurial university. Copyright © 2015 by the President of Nile University.
Abstract
System Verilog Assertions (SVA) is widely used by hardware designers and verification engineers to apply Assertion Based Verification (ABV) methodology on their hardware designs. However, the ambiguity of design specifications specified by different protocol standards in general and JEDEC memory protocol standards in specific imposes numerous difficulties on designers and verification engineers when translating design specifications into SVA. This motivated us to find a simple way to capture design specifications from JEDEC standard and automatically generate SVA that can be used as checkers for DDR memory protocols. In this paper, we propose a new method to capture design specifications using a timing diagram tool that documents the captured design specifications in a Timing Diagram Mark up Language (TDML) based format and generate SVA from the TDML document. The viability and the potential of our work are demonstrated with an Industrial case study using JEDEC LPDDR3 Memory Protocol Standard. © 2015 IEEE.
A secure and privacy-preserving event reporting scheme for vehicular Ad Hoc networks

Authors
Rabieh K., Mahmoud M.M.E.A., Azer M., Allam M.

Abstract
In vehicular ad hoc networks, vehicles should report events to warn the drivers of unexpected hazards on the roads. While these reports can contribute to safer driving, vehicular ad hoc networks suffer from various security threats; a major one is Sybil attacks. In these attacks, an individual attacker can pretend as several vehicles that report a false event. In this paper, we propose a secure event-reporting scheme that is resilient to Sybil attacks and preserves the privacy of drivers. Instead of using asymmetric key cryptography, we use symmetric key cryptography to decrease the computation overhead. We propose an efficient pseudonym generation technique. The vehicles receive a small number of long-term secrets to compute pseudonyms/keys to be used in reporting the events without leaking private information about the drivers. In addition, we propose a scheme to identify the vehicles that use their pool of pseudonyms to launch Sybil attacks without leaking private information to road side units. We also study a strong adversary model assuming that attackers can share their pool of pseudonyms to launch colluding Sybil attacks. Our security analysis and simulation results demonstrate that our scheme can detect Sybil attackers effectively with low communication and computation overhead. © 2015 John Wiley & Sons, Ltd.
Alternate versus simultaneous relaying in MIMO cellular relay networks: A degrees of freedom study

Authors
Salah A., El-Keyi A., Nafie M.

Abstract
In this paper, a two-hop cellular relay network consisting of two source-destination pairs equipped with M antennas is considered where each source is assisted by two decode-and-forward relays operating in half-duplex mode and the relays are equipped with N antennas. The DoF of the system is investigated for both simultaneous and alternate relaying configurations. For each relay configuration, an outer bound on the degrees of freedom (DoF) is developed. A new achievable scheme is proposed that meets the upper bound on the maximum DoF for all values of M and N except for \( M < N < \frac{5M}{2} \). © 2014 IEEE.
An information-theoretic model for knowledge sharing in opportunistic social networks

Authors
Elsherief M., Elbatt T., Zahran A., Helmy A.

Abstract
In this paper we establish fundamental limits on the performance of knowledge sharing in opportunistic social networks. In particular, we introduce a novel information-theoretic model to characterize the performance limits of knowledge sharing policies. Towards this objective, we first introduce the notions of knowledge gain and its upper bound, knowledge gain limit, per user. Second, we characterize these quantities for a number of network topologies and sharing policies. This work constitutes a first step towards defining and characterizing the performance limits and tradeoffs associated with knowledge sharing in opportunistic social networks. Finally, we present numerical results characterizing the cumulative knowledge gain over time and its upper bound, using publicly available smartphone data. The results confirm the key role of the proposed model to motivate future research in this ripe area of research as well as new knowledge sharing policies. © 2015 IEEE.
Analytical Markov model for slotted ALOHA with opportunistic RF energy harvesting

Authors
Ibrahim A.M., Ercetin O., Elbatt T.

Abstract
In this paper, we investigate the performance of an ALOHA random access wireless network consisting of nodes with and without RF energy harvesting capability. We develop and analyze a Markov model for the system when nodes with RF energy harvesting capability are infinitely backlogged. Our results indicate that the network throughput is improved when the conventional nodes are underloaded. On the contrary, when all types of nodes have finite backlogs, we numerically demonstrate that the network throughput and delay are improved when the overall system is overloaded. We show that there exists a trade-off between energy efficiency and delay, and we determine the optimal number of energy harvesting nodes in a network maximizing the energy efficiency while satisfying a given delay requirement. © 2015 IEEE.
Automatic localization of the left ventricle in cardiac MRI images using deep learning

Authors
Emad O., Yassine I.A., Fahmy A.S.

Abstract
Automatic localization of the left ventricle (LV) in cardiac MRI images is an essential step for automatic segmentation, functional analysis, and content based retrieval of cardiac images. In this paper, we introduce a new approach based on deep Convolutional Neural Network (CNN) to localize the LV in cardiac MRI in short axis views. A six-layer CNN with different kernel sizes was employed for feature extraction, followed by Softmax fully connected layer for classification. The pyramids of scales analysis was introduced in order to take account of the different sizes of the heart. A publically-available database of 33 patients was used for learning and testing. The proposed method was able it localize the LV with 98.66%, 83.91% and 99.07% for accuracy, sensitivity and specificity respectively. © 2015 IEEE.
Boundary Dynamics of Memcapacitor in Voltage-Excited Circuits and Relaxation Oscillators

Authors
Fouda M.E., Radwan A.G.

Abstract
This paper discusses the boundary dynamics of the charge-controlled memcapacitor for Joglekar’s window function that describes the nonlinearities of the memcapacitor’s boundaries. A closed form solution for the memcapacitance is introduced for general doping factor \( p \). The derived formulas are used to predict the behavior of the memcapacitor under different voltage excitation sources showing a great matching with the circuit simulations. The effect of the doping factor \( p \) on the time domain response of the memcapacitor has been studied as compared to the linear model using the proposed formulas. Moreover, the generalized fundamentals such as the saturation time of the memcapacitor are introduced, which play an important role in many control applications. Then the boundary dynamics under sinusoidal excitation are used as a basis to analyze any periodic signal by Fourier series, and the results have been verified using PSPICE simulations showing a great matching. As an application, two configuration of resistive-less memcapacitor-based relaxation oscillators are proposed and closed form expressions for oscillation frequency and conditions for oscillation are derived in presence of nonlinear model. The proposed oscillator is verified using PSPICE simulation showing a perfect matching. © 2015, Springer Science+Business Media New York.
Building large arabic multi-domain resources for sentiment analysis

Authors
ElSahar H., El-Beltagy S.R.

Abstract
While there has been a recent progress in the area of Arabic Sentiment Analysis, most of the resources in this area are either of limited size, domain specific or not publicly available. In this paper, we address this problem by generating large multi-domain datasets for Sentiment Analysis in Arabic. The datasets were scrapped from different reviewing websites and consist of a total of 33K annotated reviews for movies, hotels, restaurants and products. Moreover we build multi-domain lexicons from the generated datasets. Different experiments have been carried out to validate the usefulness of the datasets and the generated lexicons for the task of sentiment classification. From the experimental results, we highlight some useful insights addressing: the best performing classifiers and feature representation methods, the effect of introducing lexicon based features and factors affecting the accuracy of sentiment classification in general. All the datasets, experiments code and results have been made publicly available for scientific purposes. © Springer International Publishing Switzerland 2015.
Cardiac MRI view classification using autoencoder

Authors
Shaker M.S., Wael M., Yassine I.A., Fahmy A.S.

Abstract
The growing interest of using cardiac Magnetic Resonance Imaging (MRI) to assess the heart function and structure results in creating huge cardiac image databases. Due to the lack of standard meta-data description of the images, content-based classification of the cardiac images is essential to manage such databases. In particular, cardiac view classification is becoming an important stage for medical image analysis; efficient content-based retrieval as well as CAD systems. The major challenge in such classification lies in the large variability in image appearance caused by variation of patient-specific geometry, heart deformations, and disease conditions. In this work, a fully automated view classification of cardiac MRI images is presented. The method uses the autoencoder system for automatic feature extraction from a training dataset. A softmax classifier is used to determine the view from the selected features. Several autoencoder systems have been investigated in order to select the most suitable architecture for the problem. The results show that the proposed method outperforms current systems with orientation classification accuracy for Cine, SENC and Tagged MRI Imaging sequences was 96.7 %, 91.98 %, 100 % respectively. © 2014 IEEE.
Censoring has been proposed to be utilized in wireless distributed detection networks with a fusion center to enhance network performance in terms of error probability in addition to the well-established energy saving gains. In this paper, we further examine the employment of censoring in infrastructure-less cognitive radio networks, where nodes employ binary consensus algorithms to take global decisions regarding a binary hypothesis test without a fusion center to coordinate such a process. We show analytically - and verify by simulations - that censoring enhances the performance of such networks in terms of error probability and convergence times. Our protocol shows performance gains up to 46.6% in terms of average error probability over its conventional counterpart, in addition to performance gains of about 48.7% in terms of average energy expenditure and savings up to 50% in incurred transmission overhead. © 2015 IEEE.
Cognitive Radio Networks with Probabilistic Relaying: Stable Throughput and Delay Tradeoffs

Authors
Ashour M., El-Sherif A.A., ElBatt T., Mohamed A.

Abstract
This paper studies fundamental throughput and delay tradeoffs in cognitive radio systems with cooperative secondary users. We focus on randomized cooperative policies, whereby the secondary user (SU) serves either its own queue or the primary users (PU) relayed packets queue with certain service probability. The proposed policy opens room for trading the PU delay for enhanced SU delay, and vice versa, depending on the application QoS requirements. Towards this objective, the system's stable throughput region is characterized. Furthermore, the moment generating function approach is employed and generalized for our system to derive closed-form expressions for the average packet delay for both users. The accuracy of these expressions is validated through simulations. Analytical and simulation results reveal that the service probability can steer the system into prioritizing PU's traffic at the expense of SU's QoS, or vice versa, independently from the admission probability. Alternatively, the ability of the admission probability to control the throughput and delay at the PU or the SU depends on the selected value for the service probability as well as the channel conditions. Finally, it is shown how the service and admission probabilities could be used to achieve the desired QoS level to both PU and SU. © 2015 IEEE.
Year: 2015

Computer-aided analysis of fluorescein angiograms using colour leakage maps

Authors
Magdy E., Ibrahim M., Nguyen Q.D., Fahmy A.S.

Abstract
Fundus fluorescein angiography (FFA) is a standard screening and diagnosis technique for several retinal diseases. The analysis of FFA images is performed qualitatively by skilled observers, and thus is vulnerable to inter- and intra-observer variability. In this study, the authors present a method for computer-aided analysis of FFA images. The method is based on generating quantitative colour fluorescein leakage maps (FLM) that mimic the thickness maps generated by the optical coherence tomography (OCT). Results from 64 patients show strong correlation between the FLM and OCT thickness maps ($r = 0.8$). The method was found to be reproducible and robust to variability in the image acquisition times. © The Institution of Engineering and Technology 2015.
Cooperative Q-learning techniques for distributed online power allocation in femtocell networks

Authors
Saad H., Mohamed A., ElBatt T.

Abstract
In this paper, we address the problem of distributed interference management of femtocells that share the same frequency band with macrocells using distributed multi-agent Q-learning. We formulate and solve two problems representing two different Q-learning algorithms, namely, femto-based distributed and sub-carrier-based distributed power controls using Q-learning (FBDPC-Q and SBDPC-Q). FBDPC-Q is a multi-agent algorithm that works on a global basis, for example, deals with the aggregate macrocell and femtocell capacities. Its complexity increases exponentially with the number of sub-carriers in the system. Also, it does not take into consideration the sub-carrier macrocell capacity as a constraint. To overcome these problems, SBDPC-Q is proposed, which is a multi-agent algorithm that works on a sub-carrier basis, for example, sub-carrier macrocell and femtocell capacities. Each of FBDPC-Q and SBDPC-Q works in three different learning paradigms: independent (IL), cooperative (CL), and weighted cooperative (WCL). IL is considered the simplest form for applying Q-learning in multi-agent scenarios, where all the femtocells learn independently. CL and WCL are the proposed schemes in which femtocells share partial information during the learning process in order to strike a balance between practical relevance and performance. We prove the convergence of the CL paradigm when used in the FBDPC-Q algorithm. We show via simulations that the CL paradigm outperforms the IL paradigm in terms of the aggregate femtocell capacity, especially in networks with large number of femtocells and large number of power levels. In addition, we propose WCL to address the CL limitations. Finally, we evaluate the robustness and scalability of both FBDPC-Q and SBDPC-Q, against several typical dynamics of plausible wireless scenarios (fading, path loss, random activity of femtocells, etc.). We show that the CL paradigm is the most scalable to large number of femtocells and robust to the network dynamics compared with the IL and WCL paradigms. Copyright © 2014 John Wiley & Sons, Ltd.
This paper presents a study of fractional order oscillators based on current feedback operational amplifiers (CFOA). Two general cases have been discussed for the oscillation frequency and condition with the use of two fractional order elements of different orders. Design procedure for the two general cases is illustrated with numerical discussions. Circuit simulations for some special cases are presented to validate the theoretical findings. The simulations have been done using Ad844 commercial CFOA model © 2014 IEEE.
Design of Positive, Negative, and Alternating Sign Generalized Logistic Maps

Authors
Sayed W.S., Radwan A.G., Fahmy H.A.H.

Abstract
The discrete logistic map is one of the most famous discrete chaotic maps which has widely spread applications. This paper investigates a set of four generalized logistic maps where the conventional map is a special case. The proposed maps have extra degrees of freedom which provide different chaotic characteristics and increase the design flexibility required for many applications such as quantitative financial modeling. Based on the maximum chaotic range of the output, the proposed maps can be classified as positive logistic map, mostly positive logistic map, negative logistic map, and mostly negative logistic map. Mathematical analysis for each generalized map includes bifurcation diagrams relative to all parameters, effective range of parameters, first bifurcation point, and the maximum Lyapunov exponent (MLE). Independent, vertical, and horizontal scales of the bifurcation diagram are discussed for each generalized map as well as a new bifurcation diagram related to one of the added parameters. A systematic procedure to design two-constraint logistic map is discussed and validated through four different examples. © 2015 Wafaa S. Sayed et al.
Dynamic Bayesian Networks for EEG motor imagery feature extraction

Authors
Elasuty B., Eldawlatly S.

Abstract
Dynamic Bayesian Networks (DBNs) are efficient graphical tools that could be used to detect causal relationships in multivariate systems. Here, we utilize DBNs to infer causality among electroencephalography (EEG) electrodes during a motor imagery task. We inferred the causal relationships between EEG electrodes during each of right and left hands imagery movements from 9 different subjects. We demonstrate how using the inferred connectivity as a feature enhances the discrimination among right and left hands imagery movements compared to using traditional band power features. Our analysis reveals a distinctive connectivity pattern manifested by an increase in the number of incoming connections to the right hemisphere motor area compared to the left hemisphere during right hand imagery movements. This pattern is reversed during left hand imagery movements. © 2015 IEEE.
Effective area spectral efficiency for wireless communication networks with interference management

Authors
Omri A., Hasna M.O., Nafie M.

Abstract
In this paper, we introduce a new metric, namely, effective area spectral efficiency (EASE), to quantify the spectral efficiency as well as the spatial properties of point-to-point transmission systems and decode and forward (DF) relaying communications networks with interference management. For each transmission mode, we derive a closed-form expression for the maximum transmission range under Rayleigh fading environment. Based on the maximum transmission range, we define and derive the average affected area and the average ergodic capacity. We then introduce the EASE expression to quantify the spatial spectral utilization efficiency. For DF relaying, the EASE metric is based on a newly introduced index, namely, source relay communication index (SRCndx). SRCndx is used to validate the communication possibility between a source and a relay for given transmission parameters in a given environment and provides information about the necessity of using relaying communications. Through mathematical analysis and numerical examples, we show that the EASE metric provides a new perspective on the design of wireless transmissions, especially the transmission power selection process. © 2015, Omri et al.
Effective area spectral efficiency metric for decode-and-forward cooperative wireless communications

Authors
Omri A., Hasna M.O., Nafie M.

Abstract
In this paper, we introduce a new metric, namely: effective area spectral efficiency (EASE), to quantify the spectral efficiency as well as the spatial properties of decoding and forward (DF) relaying wireless communications networks with interference management. The EASE metric is based on the average affected area, the average ergodic capacity, and a new introduced index, namely: source relay communication index (SRCndx). We derive a closed-form expression for the maximum transmission range under Rayleigh fading environment. Based on the maximum transmission range, we define and derive the average affected area and the average ergodic capacity for DF relaying communications system. The SRCndx is used to validate the communication possibility between a source and a relay for given transmission parameters in a given environment, and provides information about the necessity of using relaying communications. We then introduce the EASE expression to quantify the spatial spectral utilization efficiency. Through mathematical analysis and numerical examples, we show that the EASE metric provides a new perspective on the design and optimization of wireless transmissions, especially the transmission power selection process. © 2015 IEEE.
Effective capacity and delay optimization in cognitive radio networks

Authors
Abdel-Malek M., Seddik K., Elbatt T., Mohasseb Y.

Abstract
In this paper, we study the fundamental trade-off between delay-constrained primary and secondary users in cognitive radio networks. In particular, we characterize and optimize the trade-off between the secondary user (SU) effective capacity and the primary user (PU) average packet delay. Towards this objective, we employ Markov chain models to quantify the SU effective capacity and average packet delay in the PU queue. Afterwards, we formulate two constrained optimization problems to maximize the SU effective capacity subject to an average PU delay constraint. In the first problem, we use the spectrum sensing energy detection threshold as the optimization variable. In the second problem, we extend the problem and optimize also over the transmission powers of the SU. Interestingly, these complex non-linear problems are proven to be quasi-convex and, hence, can be solved efficiently using standard optimization tools. The numerical results reveal interesting insights about the optimal performance compared to the unconstrained PU delay baseline system. © Institute for Computer Sciences, Social Informatics and Telecommunications Engineering 2015.
Efficient spectrum access strategies for cognitive networks with general idle time statistics

Authors
Shabara Y., Zahran A.H., Elbatt T.

Abstract
In this paper we study the problem of secondary user channel access in cognitive radio networks. In particular, we address the problem of deciding the secondary user sensing vs. transmission at any point of time, assuming the availability of the primary user idle time statistics. Towards this objective, we make the following contributions. First, unlike prior work, we assume unconstrained general idle time distribution for the primary user under secondary user imperfect sensing and imperfect collision detection. Second, we propose a novel approach grounded in reliability theory to analyze the time based activity of the primary user. Finally, motivated by the sheer complexity of the problem, we propose three heuristic schemes for deciding the secondary user sensing/transmission actions at any point of time. We conduct computer simulations to evaluate the performance of the proposed schemes and compare them to the traditional per-packet sensing/transmission scheme and to each other. Our numerical results reveal that, for an experimentally verified idle time distribution in heterogeneous network activity, at least one of our proposed schemes can achieve 27% throughput increase and down to 3.85%, under different QoS requirements for the PU. Also we show through simulations that our heuristic schemes are very close to optimal, when the optimal scheme can be applied. © 2015 IEEE.
Energy-efficient cooperative relaying protocol for full-duplex cognitive radio users and delay-aware primary users

Authors
El Shafie A., Khattab T.

Abstract
This paper considers a network in which a primary user (PU) may cooperate with a cognitive radio (CR) user for transmission of its data packets. The PU is assumed to be a buffered terminal operating in a time-slotted fashion. We develop an energy-efficient protocol that involves cooperation and coordination between primary and secondary users. To satisfy certain quality-of-service requirements, users share time slot duration and frequency bandwidth. Moreover, the secondary user (SU) may leverage the primary feedback channel. The proposed protocol is designed such that the secondary rate is maximized and the primary queueing delay is maintained less than the queueing delay in case of non-cooperative PU. In addition, the proposed protocol guarantees the stability of the primary queue and maintains the average energy emitted by the CR user below a certain predefined value that depends on the application. The proposed protocol provides more robust and potentially continuous service for SUs compared to the conventional practice in cognitive networks where SUs transmit in the spectrum holes and silence sessions of the PUs. We include primary source burstiness and sensing errors to the analysis of the proposed cooperative cognitive protocol. Numerical results show the beneficial gains of the cooperative protocol in terms of SU rate and PU throughput, PU queueing delay, and PU average energy savings. © 2015 IEEE.
English-Arabic statistical machine translation: State of the art

Authors
Ebrahim S., Hegazy D., Mostafa M.G.M., El-Beltagy S.R.

Abstract
This paper presents state of the art of the statistical methods that enhance English to Arabic (En-Ar) Machine Translation (MT). First, the paper introduces a brief history of the machine translation by clarifying the obstacles it faced; as exploring the history shows that research can develop new ideas. Second, the paper discusses the Statistical Machine Translation (SMT) method as an effective state of the art in the MT field. Moreover, it presents the SMT pipeline in brief and explores the En-Ar MT enhancements that have been applied by processing both sides of the parallel corpus before, after and within the pipeline. The paper explores Arabic linguistic challenges in MT such as: orthographic, morphological and syntactical issues. The purpose of surveying only En-Ar translation direction in the SMT is to help transferring the knowledge and science to the Arabic language and spreading the information to all who are interested in the Arabic language. © Springer International Publishing Switzerland 2015.
Error analysis of fundus image registration using quadratic model transformation

Abstract

Based registration of retinal images proved to be very successful especially for minimally overlapping images. The most commonly used transformation method uses a quadratic model to represent the geometry of the retinal surface. Although this model has been used for more than one decade, there is no literature that studies the model errors for abnormal eye geometries. In this work, we present a study of the registration errors of the quadratic model in case of diseased eyes. The study includes two basic models of the retinal surface for eyes suffering from: myopia; and retinal diseases (e.g. age related macular degeneration). In addition, real datasets of age related macular degeneration (AMD) patients have been used to quantify the registration error. The simulation results show that the average error can be as high as 13 pixels at extreme conditions of myopia and retinal diseases. For real datasets with typical disease conditions, the error was found to be 2.6 pixels. © 2014 IEEE.
Fractional order oscillators based on operational transresistance amplifiers

Authors
Said L.A., Radwan A.G., Madian A.H., Soliman A.M.

Abstract
In this paper, a general analysis of the fractional order operational transresistance amplifiers (OTRA) based oscillator is presented and validated through eight different circuits which represent two classifications according to the number of OTRAs. The general analytical formulas of the oscillation frequency, condition as well as the phase difference are illustrated for each case and summarized in tables. One of the advantages of the fractional-order circuit is the extra degrees of freedom added from the fractional-order parameters. Moreover, different special cases \( \alpha = \beta \neq 1, \beta \neq \alpha = 1, \alpha \neq \beta = 1 \) are investigated where the conventional case \( \alpha = \beta = 1 \) is included in all of them. Also, the effect of the fractional order parameter on the phase difference between the two oscillator outputs is presented which increases the design flexibility and controllability. The effect of the non-ideal characteristics associated with OTRA on the presented oscillator is also studied. A comparison between the fractional order oscillators with their integer order counterpart is also presented to verify the advantages of the added fractional order parameters. Numerical and spice simulations are given to validate the presented analysis. © 2015 Elsevier GmbH.
Fractional order oscillators with single non-zero transmission matrix element

Authors
Said L.A., Radwan A.G., Madian A.H., Soliman A.M.

Abstract
This paper presents a study of fractional order oscillator design based on a matrix. The presented oscillator consists of a general two port network and three impedances. Only two port with single element in its transmission matrix is discussed which gives four possible networks. Different combinations for one element have been investigated. The impedances associated with the studied networks are series or parallel connection of resistors in addition to fractional order capacitors. The characteristic equation, oscillation frequency and condition for each combination are introduced. Numerical discussions of the presented oscillators with Spice simulations are presented to validate the theoretical findings. © 2015 IEEE.
This paper presents the analysis for allocating the system poles and hence controlling the system stability for KHN and Sallen–Key fractional order filters. The stability analysis and stability contours for two different fractional order transfer functions with two different fractional order elements are presented. The effect of the transfer function parameters on the singularities of the system is demonstrated where the number of poles becomes dependent on the transfer function parameters as well as the fractional orders. Numerical, circuit simulation, and experimental work are used in the design to test the proposed stability contours. © 2014, Springer Science+Business Media New York.
Full-duplex cooperative cognitive radio networks

Authors
Elazzouni S., Ercetin O., El-Keyi A., Elbatt T., Nafie M.

Abstract
In this paper, we study the impact of a full-duplex secondary node on a cognitive cooperative network with Multipacket Reception (MPR) capabilities at the receivers. Motivated by recent schemes that make full-duplex communication feasible, we study a model with one primary and one secondary transmitter-receiver pair, where the secondary transmitter is able to relay primary unsuccessful packets. Cooperation between primary and secondary users has been previously shown to be beneficial for the primary and the secondary users in terms of stable throughput. Our model assumes an imperfect full-duplex secondary node that can transmit and receive simultaneously, cancelling self-interference to a certain extent. Furthermore, we assume that the secondary transmitter chooses between cooperating with the primary user and transmitting secondary packets probabilistically according to some optimized probabilities that depend on both the channels in the network and the state of the primary user. We determine these probabilities by formulating a constrained optimization problem with the secondary throughput as the objective function and the stability of the primary queues as constraints. Using the dominant system approach, we show that the optimization problem has a quasi-concave structure, to which the optimal solution can be easily found. Using Numerical results, we characterize the cases where the full-duplex capability is beneficial to the system, namely, we show that the full-duplex secondary node greatly increases both the secondary throughput and the primary maximum stable throughput in channels with receivers that have strong MPR capability. © 2015 IFIP.
Year: 2015

Generalized delayed logistic map suitable for pseudo-random number generation

Authors

Abstract
This paper presents the generalization of a delayed version of the logistic map. The effect of the added two general parameters is studied, which offers the option of having three different maps. The dynamic behavior of the vertical, zooming and the general map is analyzed. The study of the fixed points, stability ranges and bifurcation diagram of the delayed logistic map at hand is detailed in this work. The flow of the system behavior from stability to chaos is also presented with its transient response as well as its phase plane portraits. Moreover, using the general parameters, the option of designing any specific map is validated by some design examples, which makes it more optimal for any specific applications. The added general parameters offer increased randomness with controllability of the map design, making it more suitable for pseudo-random sequence generators which are used in image encryption algorithms and in secure communication transfer. © 2015 IEEE.
Generalized fractional logistic map suitable for data encryption

Authors

Abstract
This paper presents a generalized form of the fractional logistic map. Two general parameters $a$ and $b$ are added to the classical fractional logistic equation. The effect of such parameters on the map is studied explicitly, in combination with the fractional order parameter $\alpha$, which offers an extra degree of freedom increasing the design flexibility and adding more controllability on the design. The vertical and the zooming map are two special maps that arise as a result of the added parameters. Moreover, different design problems are offered in this work, as a resultant of the control of all these parameters at hand. This shows that any application specific map can be designed, highlighting the flexibility and integrity of the design. The combination of the added extra parameters $a$ and $b$ in addition to the system parameter $\rho$ and the initial condition $x_0$, as well as the fractional order parameter $\alpha$ makes the proposed generalized fractional logistic map the most favorable in constructing more efficient encryption keys. © 2015 IEEE.
Impact of the Cd2+ treatment on the electrical properties of Cu2ZnSnSe4 and Cu(In,Ga)Se2 solar cells

Authors
Ben Messaoud K., Buffière M., Brammertz G., ElAnzeery H., Oueslati S., Hamon J., Kniknie B.J., Meuris M., Amlouk M., Poortmans J.

Abstract
Modification of the absorber surface properties by Cd2+ treatment (Cd2+ partial electrolyte) results in the following: formation of Cd(OH)2 on the absorber surface, deposition of thinner chemical bath-deposited CdS buffer layer, and a smaller space charge region. The impact on electrical performances is as follows: decrease of the series resistance (RS), increase of the fill factor, increase of the efficiency (η), and reduction of the crossover between the dark and light current density-voltage curves. The present contribution aims at determining the impact of modifying the properties of the absorber/buffer layer interface on the electrical performance of Cu2ZnSnSe4 (CZTSe) thin-film solar cells, by using a Cd2+ partial electrolyte (Cd PE) treatment of the absorber before the buffer layer deposition. In this work, CZTSe/CdS solar cells with and without Cd PE treatment were compared with their respective Cu(In,Ga)Se2 (CIGSe)/CdS references. The Cd PE treatment was performed in a chemical bath for 7 min at 70 °C using a basic solution of cadmium acetate. X-ray photoemission spectroscopy measurements have revealed the presence of Cd at the absorber surface after the treatment. The solar cells were characterized using current density-voltage (J-V), external quantum efficiency, and drive-level capacitance profiling measurements. For the CZTSe-based devices, the fill factor increased from 57.7% to 64.0% when using the Cd PE treatment, leading to the improvement of the efficiency (η) from 8.3% to 9.0% for the best solar cells. Similar observations were made on the CIGSe solar cell reference. This effect comes from a considerable reduction of the series resistance (RS) of the dark and light J-V, as determined using the one-diode model. The crossover effect between dark and light J-V curves is also significantly reduced by Cd PE treatment. © 2015 John Wiley & Sons, Ltd.
In the frame of the development of thin crystalline silicon solar cell technologies, surface nanopatterning of silicon is gaining importance. Its impact on the material quality is, however, not yet fully controlled. We investigate here the influence of surface nanotexturing on the series resistance of a contacting scheme relevant for thin-film crystalline silicon heterojunction solar cells. Two-dimensional periodic nanotextures are fabricated using a combination of nanoimprint lithography and either dry or wet etching, while random pyramid texturing is used for benchmarking. We compare these texturing techniques in terms of their effect on the series resistance of a solar cell through a study of the sheet resistance ($R_{sh}$) and contact resistance ($R_c$) of its front layers, i.e., a sputtered transparent conductive oxide and evaporated metal contacts. We have found by four-point probe and the transfer length methods that dry-etched nanopatterns render the highest $R_{sh}$ and $R_c$ values. Wet-etched nanopatterns, on the other hand, have less impact on $R_c$ and render $R_{sh}$ similar to that obtained from the nontextured case. © 2011-2012 IEEE.
Interference-based optimal power-efficient access scheme for cognitive radio networks

Authors
Anwar A.H., El Shafie A., Mohamed A., Elbatt T., Guizani M.

Abstract
In this paper, we propose a new optimization-based access strategy of multi-packet reception (MPR) channel for multiple secondary users (SUs) accessing the primary user (PU) spectrum. We devise an analytical model that realizes the multi-packet access strategy of the SUs. All the network receiving nodes have MPR capability. We aim at maximizing the throughput of the individual SUs subject to the PU’s queue stability. Moreover, we are interested in providing an energy-efficient cognitive scheme. Therefore, we include energy constraints on the PU and SU average transmitted energy to the optimization problem. Each SU accesses the medium with certain probability that depends on the PU’s activity, i.e., active or inactive. The numerical results show the advantage in terms of SU throughput of the proposed scheme over the conventional access scheme, where the SUs access the channel randomly with fixed power when the PU is sensed to be idle. © 2015 IEEE.
Introduction

Authors
Radwan A.G., Fouda M.E.

Abstract
This chapter summarizes the basic linear circuit elements (resistor, capacitor, inductor, and fractional-order elements) with their basic fundamentals and characteristic graphs. Each element was defined by a relation between the state variables of the network: current $I$, voltage $V$, charge $Q$, and flux $\phi$. It also investigates the basic fundamentals of the memristor, its historical background, and its advantages over the last few decades. Moreover, the organization of the book is also discussed. © 2015, Springer International Publishing Switzerland.
Investigation of properties limiting efficiency in Cu2ZnSnSe4-based solar cells

Authors

Abstract
We have investigated different nonidealities in Cu2ZnSnSe4-Cds-ZnO solar cells with 9.7% conversion efficiency, in order to determine what is limiting the efficiency of these devices. Several nonidealities could be observed. A barrier of about 300 meV is present for electron flow at the absorber-buffer heterojunction leading to a strong crossover behavior between dark and illuminated current-voltage curves. In addition, a barrier of about 130 meV is present at the Mo-absorber contact, which could be reduced to 15 meV by inclusion of a TiN interlayer. Admittance spectroscopy results on the devices with the TiN backside contact show a defect level with an activation energy of 170 meV. Using all parameters extracted by the different characterization methods for simulations of the two-diode model including injection and recombination currents, we come to the conclusion that our devices are limited by the large recombination current in the depletion region. Potential fluctuations are present in the devices as well, but they do not seem to have a special degrading effect on the devices, besides a probable reduction in minority carrier lifetime through enhanced recombination through the band tail defects. © 2011-2012 IEEE.
Maximum throughput opportunistic network coding in Two-Way Relay networks

Authors
Zohdy M., Elbatt T., Nafie M.

Abstract
In this paper, we study Two-Way Relaying (TWR) networks well-known for its throughput merits. In particular, we study the fundamental throughput delay trade-off in TWR networks using opportunistic network coding (ONC). We characterize the optimal ONC policy that maximizes the aggregate network throughput subject to an average packet delay constraint. Towards this objective, first, we consider a pair of nodes communicating through a common relay and develop a two-dimensional Markov chain model capturing the buffers’ length states at the two nodes. Second, we formulate an optimization problem for the delay-constrained optimal throughput. Exploiting the structure of the problem, it can be cast as a linear programming problem. Third, we compare the optimal policy to two baseline schemes and show its merits with respect to throughput, average delay and power consumption. The numerical results reveal interesting insights. First, the optimal policy significantly outperforms the first baseline with respect to throughput, delay and power consumption. Moreover, it outperforms the second baseline with respect to the average delay and power consumption for asymmetrical traffic arrival rates. © 2015 IEEE.
Memcapacitor based applications

Authors
Radwan A.G., Fouda M.E.

Abstract
This chapter is divided into three sections focusing on some memcapacitor-based applications. The first one discusses the mathematical analyses and design of resistive-less memcapacitor-based relaxation oscillators where different cases have been investigated and validated. Analytical expressions for the oscillation frequency, duty cycle, stored energy, and conditions of oscillation have been achieved with many numerical examples and circuit simulations. The second section discusses the boundary effect on the analysis and output behavior of memcapacitor-based oscillators compared to the previous case. The last section addresses the memcapacitor-bridge synapses with mathematical analysis, weight programming, and circuit simulations. © 2015, Springer International Publishing Switzerland.
Abstract
This chapter reviews the memcapacitor, mathematical representations of time-invariant, physical realizations, and mathematical models. Moreover, the nonlinear boundary effect of the memcapacitor under step, sinusoidal, and general periodic excitation responses are discussed with analytical, numerical, and circuit simulations for different examples. The general analyses of series and parallel connections of memcapacitors are introduced with many examples and circuit simulations. Finally a charge-controlled, memristor-less memcapacitor is introduced and validated through different cases. © 2015, Springer International Publishing Switzerland.
Meminductor: Modeling, analysis, and emulators

Authors
Radwan A.G., Fouda M.E.

Abstract
This chapter introduces the basic definition of meminductor and its mathematical representation of time-invariant system (Ideal, Generic, and Extended) with some examples. The mathematical model of meminductor and its response under different current excitations (step, sinusoidal, and periodic) are discussed with analytical, numerical, and circuit simulations. Different meminductor emulators are introduced with their mathematical modeling and numerical simulation, and verified using PSPICE simulations. © 2015, Springer International Publishing Switzerland.
Memristor based N-bits redundant binary adder

Authors
El-Slehdar A.A., Fouad A.H., Radwan A.G.

Abstract
This paper introduces a memristor based N-bits redundant binary adder architecture for canonic signed digit code CSDC as a step towards memristor based multilevel ALU. New possible solutions for multi-level logic designs can be established by utilizing the memristor dynamics as a basis in the circuit realization. The proposed memristor-based redundant binary adder circuit tries to achieve the theoretical advantages of the redundant binary system, and to eliminate the carry (borrow) propagation using signed digit representation. The advantage of carry elimination in the addition process is that it makes the speed independent of the operands length which speeds up all arithmetic operations. One memristor is sufficient for both the addition process and for storing the final result as a memory cell. The adder operation has been validated via different cases for 1-bit and 3-bits addition using HP memristor model and PSPICE simulation results. © 2014 Elsevier Ltd. All rights reserved.
Memristor mathematical models and emulators

Authors
Radwan A.G., Fouda M.E.

Abstract
This chapter introduces different generalized mathematical classes of memristors which can be categorized as: continuous symmetrical models (current and voltage controlled emulators), continuous nonsymmetrical model, switched-memristor model, and fractional-order model with some experimental results. Different emulators with experimental results are discussed based on CCII, discrete components, and MOS realizations. Different analytical expressions, numerical analyses, circuit simulations results as well as experimental results are provided for most of the previous models. © 2015, Springer International Publishing Switzerland.
Memristor: Models, types, and applications

Authors
Radwan A.G., Fouda M.E.

Abstract
This chapter discusses the main properties of the memristor, a comparison between five recent memristor models, mathematical modeling of the HP memristor with analytical expressions for different excitations, mathematical representations of time-invariant memristor (ideal, generic, and extended), different memristor implementation types, and some memristor-based applications in digital and analog circuits. © 2015, Springer International Publishing Switzerland.
Memristor-based multilevel digital systems

Authors
Radwan A.G., Fouda M.E.

Abstract
This chapter investigates the advantages of memristor-based digital applications using multi-level arithmetic concepts. Recently, there are huge concerns regarding the memristor in digital signal processing (DSP) circuits to enhance the performance and realize very high density, nonvolatile memories in neural networks. This can be achieved by mapping the high/low logic into the memristor high/low resistances. Recently, the potential to divide the memristance levels to build multilevel digital circuits such as the ternary and redundant circuits are discussed. The concepts have been initiated by designing a half ternary adder based on the memristor; then, the concept is generalized for redundant half adder, full adder, and N-bit adder circuits. The advantages of such circuits that the speed is independent on the operand and parallel processing can be handled efficiently. Moreover, a general approach to build digital functions using mixed memristor-transistor circuits are investigated such as multipliers. © 2015, Springer International Publishing Switzerland.
Year: 2015

Memristor-based redundant binary adder

Authors
El-Slehdar A.A., Fouad A.H., Radwan A.G.

Abstract
This paper introduces a memristor based redundant binary adder for canonic signed digit code, that coding eliminates the carry and provides a carry-free addition. The proposed binary adder circuit tries to achieve high addition speed that is independent on the length of the data using the accumulation property of a Nano-element called a memristor. The general block diagram of the proposed circuit is illustrated based on memristors and its operation has been validated using HP memristor model and simulated via different examples using PSPICE showing a great match. © 2014 IEEE.
Memristor-based relaxation oscillator circuits

Authors
Radwan A.G., Fouda M.E.

Abstract
This chapter discusses the analysis and design of memristor-based oscillators which is considered one of the nonlinear analog block required for many applications such as chaotic memristor oscillators and artificial neuron network. The realizations of memristor-based oscillators have been discussed via replacing capacitors with memristors to construct relaxation reactance-less oscillators. The advantages of such oscillators are related to low frequency, nanoscale, and simple designs and can be used in neuromorphic systems. Different topologies of memristor-based relaxation oscillators have been discussed and either symmetric or asymmetric types with analytical formulas of oscillation frequency and condition for oscillations are derived. The analyses of these oscillators are introduced with their numerical simulations, and verified using PSPICE circuit simulations showing a great matching. Moreover, many fundamentals are also discussed such as the effect of boundary dynamics, series and parallel connections as well as power analysis in memristor-based circuits. © 2015, Springer International Publishing Switzerland.
Memristor-less current- and voltage-controlled meminductor emulators

Authors
Fouda M.E., Radwan A.G.

Abstract
This paper introduces two mathematical models of meminductor based on a simple symmetrical double-loop equation with their generic formulas and analysis. Moreover, new circuits based on CCII are developed for emulating the behavior of the current-controlled and voltage-controlled models. The proposed circuits are realized without using a memristor unlike the previous emulators. Finally, the proposed emulators are verified using PSPICE simulations. © 2014 IEEE.
Multi-phase oscillator for higher-order PSK applications

Authors
Fouda M.E., Soltan A., Radwan A.G., Soliman A.M.

Abstract
Multi-phase oscillator is an essential block in digital communication systems especially phase shift keying PSK based systems. In this paper, a procedure for designing a multi-phase oscillator with any required phase shift is proposed, unlike the previous oscillator which generates equal phase shifts. This oscillator circuit is built using fractional-order elements to generate any distribution of phase shift. The general characteristics equation is studied where the condition for oscillation and oscillation frequency are derived. Finally, different examples are introduced with their simulations. © 2014 IEEE.
Multistep deposition of Cu$_2$Si(S,Se)$_3$ and Cu$_2$ZnSiSe$_4$ high band gap absorber materials for thin film solar cells

Authors
Elanzeery H., Buffière M., Messaoud K.B., Oueslati S., Brammertz G., Daif O.E., Cheyns D., Guindi R., Meuris M., Poortmans J.

Abstract
Cu$_2$Si(S,Se)$_3$ and Cu$_2$ZnSiSe$_4$ are potential materials to obtain cost effective high band gap absorbers for tandem thin film solar cell devices. A method to synthesize Cu$_2$SiS$_3$, Cu$_2$SiSe$_3$, and Cu$_2$ZnSiSe$_4$ thin film absorbers is proposed. This method is based on a multistep process, using sequential deposition and annealing processes. X-ray diffraction analysis performed on the final thin films have confirmed the presence of the Cu$_2$Si(S,Se)$_3$ and Cu$_2$ZnSiSe$_4$ phases. Scanning electron microscopy images revealed the formation of polycrystalline layers with grains size up to 1 μm. The band gap of the ternary Cu$_2$SiSe$_3$, and quaternary Cu$_2$ZnSiSe$_4$ based thin films as determined from optical and photoluminescence measurements are found to be close to their theoretical values. © 2015 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.
Named entity recognition of persons' names in Arabic tweets

Authors
Zayed O.H., El-Beltagy S.R.

Abstract
The rise in Arabic usage within various socialmedia platforms, and notably in Twitter, has led to a growing interest in building ArabicNatural Language Processing (NLP) applications capable of dealing with informal colloquialArabic, as it is the most commonly used form of Arabic in social media. The uniquecharacteristics of the Arabic language make the extraction of Arabic named entities achallenging task, to which, the nature of tweets adds new dimensions. The majority ofprevious research done on Arabic NER focused on extracting entities from the formallanguage, namely Modern Standard Arabic (MSA). However, the unstructured nature ofthe colloquial language used in tweets degrades the performance of NER systems developed to support formal MSA text. In this paper, we focus on the task of Arabic persons'names recognition. Specifically, we introduce an approach to extract Arabic persons'names from tweets without employing any morphological analysis or languagedependentfeatures. The proposed approach adopts a rule-based model combined with a statistical one. This approach uses unsupervised learning of patterns and clustered dictionaries as constrains to identify a person's name and resolve its ambiguity. Our approach outperforms the best reported result in the literature on the same test set by an increase of 19.6% in the F-score.
Abstract
Cloud computing is enabling proper, on-demand network access to a shared pool of computing resources that is elastic in reserve and release with minimal interaction from cloud service provider. As cloud gains maturity, cloud service providers are becoming more competitive, which increase the percentage of cloud adoption. But security remains the most cited challenge in Cloud. So, while we are progressing in cloud adoption, we have to define key elements of our cloud strategy and governance. Governance is about applying policies relating to used services. Therefore, it has to include the techniques and policies that measure and control how we manage cloud. In this paper, we develop an innovative governance model. We changed and tuned the Guo, Z., Song, M. and Song, J governance model from theoretical model into practical model using Cloud Control Matrix (CCM). But, governance model alone will not allow us to bridge the gap between control requirements, technical issues and business risks. As a result, we introduce a new Cloud governance framework using the processes on the new Cloud governance model and controls in CCM. The Framework focuses on using business drivers to guide cloud governance activities while considering cloud risks as part of the organization’s risk management processes. © Springer International Publishing Switzerland 2015.
On orthogonal band allocation for multiuser multiband cognitive radio networks: Stability analysis

Authors
El Shafie A., Khattab T.

Abstract
In this work, we study the problem of band allocation of \( M_i \) buffered (i.e., with data queues capable of storing incoming traffic packets) secondary users (SUs) to \( M_p \) primary frequency bands licensed to (owned by) \( M_p \) buffered primary users. The bands are assigned to SUs in an orthogonal (one-to-one) fashion, such that neither band sharing nor multiband allocations are permitted. In order to study the stability region of the secondary network, the optimization problem used to obtain the stability region's envelope (closure) is established and is shown to be a linear program, which can be solved efficiently and reliably. We compare our orthogonal allocation system with two typical low-complexity and intuitive band allocation systems. In one system, each cognitive user chooses a band randomly, in each time slot, with some assignment probability designed such that the system maintained stable, while in the other system, fixed (deterministic) band assignment is adopted throughout the lifetime of the network. We derive the stability regions of these two systems. We prove mathematically, as well as through numerical results, the advantages of our proposed orthogonal system over the other two systems. © 2015 IEEE.
On spectrum sharing between energy harvesting cognitive radio users and primary users

Authors
El Shafie A., Ashour M., Khattab T., Mohamed A.

Abstract
This paper investigates the maximum throughput for a rechargeable secondary user (SU) sharing the spectrum with a primary user (PU) plugged to a reliable power supply. The SU maintains a finite energy queue and harvests energy from natural resources and primary radio frequency (RF) transmissions. We propose a power allocation policy at the PU and analyze its effect on the throughput of both the PU and SU. Furthermore, we study the impact of the bursty arrivals at the PU on the energy harvested by the SU from RF transmissions. Moreover, we investigate the impact of the rate of energy harvesting from natural resources on the SU throughput. We assume fading channels and compute exact closed-form expressions for the energy harvested by the SU under fading. Results reveal that the proposed power allocation policy along with the implemented RF energy harvesting at the SU enhance the throughput of both primary and secondary links, © 2015 IEEE.
On the Degrees of Freedom of the Two-Cell Two-Hop MIMO Network with Dedicated and Shared Relays

Authors
Zamzam A.S., El-Keyi A., Nafie M., Mohasseb Y.

Abstract
We investigate the degrees of freedom (DoF) of the downlink of a cellular relay network. In this network, two base stations transmit to two mobile stations via relays due to the absence of a direct communication link. Each base station and mobile station is equipped with M antennas. Each base station has two messages; one to each mobile station, and uses two relays to transmit to the mobile stations. The relays are half duplex, decode-and-forward and equipped with N antennas each. We consider two configurations of the relays; shared and dedicated relays. In the shared relays configuration, the system has two relays that are used by both base stations. Whereas, in the dedicated relays configuration, each base station has two dedicated relays, i.e., the system has four relays. We consider all possible relaying schemes where the base stations can use the relays either simultaneously or alternately. We derive an upper bound on the DoF achievable by each relaying scheme as a function of the ratio between N and M. Furthermore, we propose an achievable scheme that uses interference alignment to achieve the upper bound on the DoF for the shared relays configuration, and for all values of M and N except for $1 < \frac{1}{4}N \{M} \{5 \{2}$ in the dedicated relays configuration. © 2015 IEEE.
On the effective capacity of delay constrained cognitive radio networks with relaying capability

Authors
Anwar A.H., Seddik K.G., ElBatt T., Zahran A.H.

Abstract
In this paper we analyze the performance of a secondary link in a cognitive radio relaying system operating under a statistical quality of service (QoS) delay constraint. In particular, we quantify analytically the Effective Capacity improvement for the secondary user when it offers a packet relaying service to the primary user packets that are lost under the SINR interference model. Towards this objective, we utilize the concept of Effective Capacity introduced earlier in the literature as a metric to quantify the wireless link throughput under statistical QoS delay constraints, in an attempt to support real-time applications using cognitive radios. We study a two-link network, a single secondary link and a primary network abstracted to a single primary link, with and without relaying capability. We analytically prove that exploiting the packet relaying capability at the secondary transmitter improves the Effective Capacity of the secondary user. Finally, we present numerical results that support our theoretical findings. © Institute for Computer Sciences, Social Informatics and Telecommunications Engineering 2015.
**Year:** 2015

**On the synergistic benefits of alternating CSIT for X channel within a four-symbol channel extension**

**Authors**
Wagdy A., El-Keyi A., Khattab T., Nafie M.

**Abstract**
In this paper, we investigate the degrees of freedom (DoF) of the two-user single input single output (SISO) X channel with alternating channel state information at the transmitters (CSIT). Three cases are considered for the availability of CSIT; perfect, delayed and no-CSIT. Each state is associated with a fraction of time denoted by $\lambda_P$, $\lambda_D$ and $\lambda_N$, respectively. We provide new results for the achievable DoF of the channel when the available CSIT alternates between these three cases under a certain distribution for $\Lambda(\lambda_P, \lambda_D, \lambda_N)$. Specifically, we show that the two-user SISO X channel with alternating CSIT for $\Lambda(1/8, 3/8, 1/2)$ can achieve $5/4$ DoF. The achieved DoF in this case lie between the maximum DoF of the channel, i.e., $4/3$ DoF for $\Lambda(1, 0, 0)$, and the $6/5$ DoF achieved for $\Lambda(0, 1, 0)$. © 2015 IEEE.
Optimal cooperative cognitive relaying and spectrum access for an energy harvesting cognitive radio: Reinforcement learning approach

Authors
El Shane A., Khattab T., Saad H., Mohamed A.

Abstract
In this paper, we consider a cognitive setting under the context of cooperative communications, where the cognitive radio (CR) user is assumed to be a self-organized relay for the network. The CR user and the primary user (PU) are assumed to be energy harvesters. The CR user cooperatively relays some of the undelivered packets of the PU. Specifically, the CR user stores a fraction of the undelivered primary packets in a relaying queue (buffer). It manages the flow of the undelivered primary packets to its relaying queue using the appropriate actions over time slots. Moreover, it has the decision of choosing the used queue for channel accessing at idle time slots (slots where the PU’s queue is empty). It is assumed that one data packet transmission dissipates one energy packet. The optimal policy changes according to the primary and CR users arrival rates to the data and energy queues as well as the channels connectivity. The CR user saves energy for the PU by taking the responsibility of relaying the undelivered primary packets. It optimally organizes its own energy packets to maximize its payoff as time progresses. © 2015 IEEE.
Optimal spectrum access for a rechargeable cognitive radio user based on energy buffer state

Authors

El Shafie A., Ashour M., Mohamed A., Khattab T.

Abstract

This paper investigates the maximum throughput for a rechargeable secondary user (SU) sharing the spectrum with a primary user (PU) plugged to a reliable power supply. The SU maintains a finite energy queue and harvests energy from natural resources, e.g., solar, wind and acoustic noise. We propose a probabilistic access strategy by the SU based on the number of packets at its energy queue. In particular, when the energy queue is in a certain state, the SU probabilistically uses a total number of energy packets that is at most equal to the number of packets at its energy queue. The probability of using certain amount of energy in a given state is optimizable. We investigate the effect of the energy arrival rate, the amount of energy per energy packet, and the capacity of the energy queue on the SU throughput under fading channels. © 2015 IEEE.
Optimization of wireless powered communication networks with heterogeneous nodes

Authors
Abd-Elmagid M.A., Elbatt T., Seddik K.G.

Abstract
This paper studies optimal resource allocation in a wireless powered communication network with two groups of users; one is assumed to have radio frequency (RF) energy harvesting capability and no other energy sources, while the other group has legacy nodes that are assumed not to have RF energy harvesting capability and are equipped with dedicated energy supplies. First, the base-station (BS) with a constant power supply broadcasts an energizing signal over the downlink. Afterwards, all users transmit their data independently on the uplink using time division multiple access (TDMA). We propose two transmission schemes, namely OPIC and OPAC, subject to different energy constraints on the system. Within each scheme, we formulate two optimization problems with different objective functions, namely maximizing the sum throughput and maximizing the minimum throughput, for enhanced fairness. We establish the convexity of all formulated problems which opens room for efficient solution using standard techniques. Our numerical results show the superiority of our realistic system accommodating legacy nodes, along with RF harvesting nodes, compared to the baseline WPCN system with RF energy harvesting nodes only. Moreover, the results reveal new insights and throughput-fairness trade-offs unique to our new problem setting. © 2015 IEEE.
Physical and electrical characterization of high-performance Cu2ZnSnSe4-based thin film solar cells

Authors
Oueslati S., Brammertz G., Buffière M., Elanjeery H., Touayar O., Köble C., Bekkaert J., Meuris M., Poortmans J.

Abstract
We report on the electrical, optical and physical properties of Cu2ZnSnSe4 solar cells using an absorber layer fabricated by selenization of sputtered Cu, Zn and Cu10Sn90 multilayers. A maximum active-area conversion efficiency of 10.4% under AM1.5G was measured with a maximum short circuit current density of 39.7 mA/cm², an open circuit voltage of 394 mV and a fill factor of 66.4%. We perform electrical and optical characterization using photoluminescence spectroscopy, external quantum efficiency, current-voltage and admittance versus temperature measurements in order to derive information about possible causes for the low open circuit voltage values observed. The main defects derived from these measurements are strong potential fluctuations in the absorber layer as well as a potential barrier of the order of 133 meV at the back side contact. © 2014 Elsevier B.V.
Physical characterization of Cu$_2$ZnGeSe$_4$ thin films from annealing of Cu-Zn-Ge precursor layers

Authors
Buffière M., Elanzeery H., Oueslati S., Ben Messaoud K., Brammertz G., Meuris M., Poortmans J.

Abstract
Cu$_2$ZnGeSe$_4$(CZGeSe) can be considered as a potential alternative for wide band gap thin film devices. In this work, CZGeSe thin films were deposited on Mo-coated soda lime glass substrates by sequential deposition of sputtered Cu, Zn and e-beam evaporated Ge layers from elemental targets followed by annealing at high temperature using H$_2$Se gas. We report on the effect of the precursor stack order and composition and the impact of the annealing temperature on the physical properties of CZGeSe thin films. The optimal layer morphology was obtained when using a Mo/Cu/Zn/Ge precursor stack annealed at 460 °C. We have observed that the formation of secondary phases such as ZnSe can be prevented by tuning the initial composition of the stack, the stack order and the annealing conditions. This synthesis process allows synthesizing CZGeSe absorber with an optical band gap of 1.5 eV. © 2014 Elsevier B.V.
Abstract
A new green synthesis method for the preparation of a silver-reduced graphene oxide (Ag-RGO) nanocomposite using Potamogeton pectinatus (Po) plant extract is introduced. The size, morphology and crystallinity of the as-prepared nanomaterials were studied with an explanation for the role of Po in the synthesis. A preliminary antibacterial experiment was developed to ensure the enhanced antibacterial effect of the Ag-RGO nanocomposite. The antibacterial measurements were done using the colony counting method. The results indicated that the majority of the silver nanoparticles "AgNPs" were formed in a spherical shape with small sizes ranging from 11 to 20 nm. IR spectroscopy results indicated the role of amine and hydroxyl groups from Po in the reduction and capping processes. The preliminary antibacterial examination ensured the enhanced antibacterial effect of the Ag-RGO nanocomposite.

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Year: 2015

Pinched hysteresis with inverse-memristor frequency characteristics in some nonlinear circuit elements

Authors
Fouda M.E., Elwakil A.S., Radwan A.G.

Abstract
Abstract Pinched hysteresis is considered to be a signature of the existence of memristance. However, here we report on a model that exhibits pinched hysteresis yet it may represent a nonlinear inductor or a nonlinear capacitor (both with quadratic nonlinearity) or a derivative-controlled nonlinear resistor/transconductor. Further, the lobe area of the pinched hysteresis loop in these devices has inverse-memristor characteristics; i.e. it is observed to widen rather than decline with increased operating frequency. Experimental results are provided to validate the model. © 2015 Elsevier Ltd.
Power dissipation of memristor-based relaxation oscillators

Authors
Fouda M.E., Radwan A.G.

Abstract
Recently, many reactance-less memristive relaxation oscillators were introduced, where the charging and discharging processes depend on memristors. In this paper, we investigate the power dissipation in different memristor based relaxation oscillators. General expressions for these memristive circuits as well as the power dissipation formulas for three different topologies are derived analytically. In addition, general expressions for the maximum and minimum power dissipation are calculated. Finally, the calculated expressions are verified using PSPICE simulations showing very good matching.
Power-optimal feedback-based random spectrum access for an energy harvesting cognitive user

Authors
Ashour M., El Shafie A., Mohamed A., Khattab T.

Abstract
In this paper, we study and analyze cognitive radio networks in which secondary users (SUs) are equipped with energy harvesting (EH) capability. We design a random spectrum sensing and access protocol for the SU that exploits the primary link's feedback and requires less average sensing time. Unlike previous works proposed earlier in literature, we do not assume perfect feedback. Instead, we take into account the more practical possibilities of overhearing unreliable feedback signals and accommodate spectrum sensing errors. Moreover, we assume an interference-based channel model where the receivers are equipped with multi-packet reception (MPR) capability. Furthermore, we perform power allocation at the SU with the objective of maximizing the secondary throughput under constraints that maintain certain quality-of-service (QoS) measures for the primary user (PU). © 2015 IEEE.
Predicting telecommunication tower costs using fuzzy subtractive clustering

Authors
Marzouk M., Alaraby M.

Abstract
This paper presents a fuzzy subtractive modelling technique to predict the weight of telecommunication towers which is used to estimate their respective costs. This is implemented through the utilization of data from previously installed telecommunication towers considering four input parameters: a) tower height; b) allowed tilt or deflection; c) antenna subjected area loading; and d) wind load. Telecommunication towers are classified according to designated code (TIA-222-F and TIA-222-G standards) and structures type (Self-Supporting Tower (SST) and Roof Top (RT)). As such, four fuzzy subtractive models are developed to represent the four classes. To build the fuzzy models, 90% of data are utilized and fed to Matlab software as training data. The remaining 10% of the data are utilized to test model performance. Sugeno-Type first order is used to optimize model performance in predicting tower weights. Errors are estimated using Mean Absolute Percentage Error (MAPE) and Root Mean Square Error (RMSE) for both training and testing data sets. Sensitivity analysis is carried to validate the model and observe the effect of clusters radius on models performance. Copyright © 2015 Vilnius Gediminas Technical University (VGTU) Press.
Year: 2015

Process variability in Cu2ZnSnSe4 solar cell devices: Electrical and structural investigations

Authors

Abstract
We have fabricated 9.7% efficient Cu2ZnSnSe4/CdS/ZnO solar cells by H2Se selenization of sequentially sputtered metal layers. Despite the good efficiency obtained, process control appears to be difficult. In the present contribution we compare the electrical and physical properties of two devices with nominal same fabrication procedure, but 1% and 9.7% power conversion efficiency respectively. We identify the problem of the lower performing device to be the segregation of ZnSe phases at the backside of the sample. This ZnSe seems to be the reason for the strong bias dependent photocurrent observed in the lower performing devices, as it adds a potential barrier for carrier collection. The reason for the different behavior of the two nominally same devices is not fully understood, but speculated to be related to sputtering variability. © 2015 IEEE.
Real-time scale-adaptive compressive tracking using two classification stages

Authors
Naglah A., Eldesouky A., Elhelw M.

Abstract
In this paper, we describe a method for Scale-Adaptive visual tracking using compressive sensing. Instead of using scale-invariant-features to estimate the object size every few frames, we use the compressed features at different scale then perform a second stage of classification to detect the best-fit scale. We describe the proposed mechanism of how we implement the Bayesian Classifier used in the algorithm and how to tune the classifier to address the scaling problem and the method of selecting the positive training samples and negative training samples of different scales. The obtained results demonstrate enhanced tracking accuracy when compared to the original compressive tracking algorithm. © 2015 IEEE.
Abstract

CZTSe thin film solar cells are promising emergent photovoltaic technologies based on low-bandgap absorber layer with high absorption coefficient. To reduce optical losses in such devices and thus improve their efficiency, numerical simulations of CZTSe solar cells optical characteristics can be performed based on individual optical properties of each layer present in the cell structure. In this contribution, we have first determined the optical coefficients of individual thin films (i.e., (n, k) of the absorber, buffer, and window layers) to build a realistic model simulating the optical behavior of the whole cell stack we propose. Optical characterization was performed using two approaches, one based on ellipsometry measurements for characterizing thin flat cadmium sulfide (CdS) and zinc oxide (ZnO) layers and the other relying on reflectance and transmission (R/T) analysis for the rough CZTSe absorber. Then, we performed numerical simulations using as input experimental optical parameters predicting optimal CZTSe cell structure minimizing optical losses. The impact of each layer's thickness on the cell's short-circuit current has been studied. A set of optimal thicknesses of each of the active layers was proposed. Finally, the proposed optical optimization was experimented practically leading to CZTSe cells with 9.7% and 10.4% efficiencies. © 2015 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.
Stability and delay analysis for cooperative relaying with multi-access transmission

Authors
Salman M., El-Keyi A., Nafie M., Hasna M.

Abstract
We consider a cooperative relaying system with two source terminals, one full duplex relay, and a common destination. Each terminal has a local traffic queue while the relay has two relaying queues to store the relayed source packets. We assume that the source terminals transmit packets in orthogonal frequency bands. In contrast to previous work which assumes a time division multi-access cooperation strategy, we assume that the source terminals and the relay simultaneously transmit their packets to the common destination through a multi-access channel (MAC). A new cooperative MAC scheme for the described network is proposed. We drive an expression for the stable throughput and characterize the stability region of the network. Moreover, the fundamental trade-off between the delay and the stable throughput is studied. Numerical results reveal that the proposed protocol outperforms traditional time division multi-access strategies. © Institute for Computer Sciences, Social Informatics and Telecommunications Engineering 2015.
Study of alternative back contacts for thin film Cu2ZnSnSe4-based solar cells

Authors

Abstract
Cu2ZnSnSe4 thin film solar cells are usually fabricated on a soda lime glass substrate with a molybdenum (Mo) back contact. It is suspected that degradation in electrical performance occurs due to the formation of a barrier between the absorber and Mo back contact. To overcome such degradation, Titanium Nitride (TiN), Titanium Tungsten (TiW), Chromium (Cr), Titanium (Ti) and Aluminum (Al) deposited on Mo-coated glass substrates are investigated as alternative back contact materials. Physical and electrical characterization as well as photoluminescence measurements are performed. Compositional analysis of the absorber layer on the metallized substrates identifies Mo, TiN and TiW as being the most inert during the formation of Cu2ZnSnSe4. On the other hand, Ti and Cr reacted with Se during selenization, thereby affecting the growth of the absorber, leading to low conversion efficiency. For Al, the absorber layer was etched after the standard potassium cyanide etch, hence, cannot be used as a back contact. The best device efficiencies obtained are 8.8% on TiN, 7.5% on Mo and 5.9% on TiW, respectively. The TiN back contact provides the lowest barrier value of about 15 meV which could be considered as a good ohmic contact. © 2015 IOP Publishing Ltd.
Supporting bioinformatics applications with hybrid multi-cloud services

Authors
Ali A.A., El-Kalioby M., Abouelhoda M.

Abstract
Cloud computing provides a promising solution to the big data problem associated with next generation sequencing applications. The increasing number of cloud service providers, who compete in terms of performance and price, is a clear indication of a growing market with high demand. However, current cloud computing based applications in bioinformatics do not profit from this progress, because they are still limited to just one cloud service provider. In this paper, we present different use case scenarios using hybrid services and resources from multiple cloud providers for bioinformatics applications. We also present a new version of the elasticHPC package to realize these scenarios and to support the creation of cloud computing resources over multiple cloud platforms, including Amazon, Google, Azure, and clouds supporting OpenStack. The instances created on these cloud environments are pre-configured to run big sequence analysis tasks using a large set of pre-installed software tools and parallelization techniques. In addition to its flexibility, we show by experiments that the use of hybrid cloud resources from different providers can save time and cost. © Springer International Publishing Switzerland 2015.
Year:  2015

**Towards optimal power control for delay-constrained cognitive radio networks**

**Authors**  
Abdalla I., Elbatt T., Nafie M., Digham F.

**Abstract**  
In this paper we study the problem of optimal power control for a Z-interference channel abstracting an underlay cognitive radio network where the secondary user has delay constraints. More specifically, we minimize the packet drop probability at the secondary user (equivalent to delay bound violation probability) subject to quality of service (QoS) constraints at the primary and secondary users, among other constraints. Towards this objective, we develop a mathematical framework using Markov chains and formulate a constrained optimization problem. First, we assess the complexity of the problem which is found to be non-convex. Motivated by the sheer complexity of characterizing the global optimum for the problem at hand, we resort to known non-linear problem solvers which guarantee only local optimality. Nevertheless, our proposed solution approach outperforms [1] for plausible scenarios of the point-to-point fading link studied therein. Our numerical results reveal interesting insights about the power control policy that minimizes the delay for a cognitive network in a Rayleigh fading channel. Furthermore, it demonstrates the effect of tuning both the delay constraint and the cross channel mean on the resulting power control policies. © 2015 IEEE.
TraffiSense: A smart integrated visual sensing system for traffic monitoring

Authors
Elhakim R., Abdelwahab M., Eldesokey A., Elhelw M.

Abstract
Intelligent camera systems provide an effective solution for road traffic monitoring with traffic stream characteristics, such as volumes and densities, continuously computed and relayed to control stations. However, developing a functional vision-based traffic monitoring system is a complex task that entails the creation of appropriate visual sensing platforms with on-board visual analytics algorithms, integration of versatile technologies for data provision and stream management, and development of data visualization techniques suitable for end-users. This paper describes TraffiSense, a complete and integrated intelligent camera system that has been developed to facilitate key traffic management tasks ranging from traffic network monitoring to detection of law violations. TraffiSense provides useful information in real-time to road users and law enforcement authorities, and the paper details the intricacies involved in the development of such functional system. The potential value of the TraffiSense system for traffic monitoring is demonstrated and results obtained from actual deployment are described. © 2015 IEEE.
A collaborative resource to build consensus for automated left ventricular segmentation of cardiac MR images

Authors

Abstract
A collaborative framework was initiated to establish a community resource of ground truth segmentations from cardiac MRI. Multi-site, multi-vendor cardiac MRI datasets comprising 95 patients (73 men, 22 women; mean age 62.73 ± 11.24 years) with coronary artery disease and prior myocardial infarction, were randomly selected from data made available by the Cardiac Atlas Project (Fonseca et al., 2011). Three semi- and two fully-automated raters segmented the left ventricular myocardium from short-axis cardiac MR images as part of a challenge introduced at the STACOM 2011 MICCAI workshop (Suinesiaputra et al., 2012). Consensus myocardium images were generated based on the Expectation-Maximization principle implemented by the STAPLE algorithm (Warfield et al., 2004). The mean sensitivity, specificity, positive predictive and negative predictive values ranged between 0.63 and 0.85, 0.60 and 0.98, 0.56 and 0.94, and 0.83 and 0.92, respectively, against the STAPLE consensus. Spatial and temporal agreement varied in different amounts for each rater. STAPLE produced high quality consensus images if the region of interest was limited to the area of discrepancy between raters. To maintain the quality of the consensus, an objective measure based on the candidate automated rater performance distribution is proposed. The consensus segmentation based on a combination of manual and automated raters were more consistent than any particular rater, even those with manual input. The consensus is expected to improve with the addition of new automated contributions. This resource is open for future contributions, and is available as a test bed for the evaluation of new segmentation algorithms, through the Cardiac Atlas Project (www.cardiacatlas.org). © 2013 Elsevier B.V.
A cooperative Q-learning approach for distributed resource allocation in multi-user femtocell networks

Authors
Saad H., Mohamed A., El Batt T.

Abstract
This paper studies distributed interference management for femtocells that share the same frequency band with macrocells. We propose a multi-agent learning technique based on distributed Q-learning, called subcarrier-based distributed resource allocation using Q-learning (SBDRA-Q). SBDRA-Q operates under three different learning paradigms: Independent (IL), Cooperative (CL) and Weighted Cooperative (WCL). In the IL paradigm, all femtocells learn independently from each other. In both, CL and WCL, femtocells share partial information during the learning process in order to enhance their performance. The results show that WCL outperforms both CL and IL in terms of aggregate femtocell capacity, while slightly affecting fairness. Also, the results show that CL and WCL are more robust, when compared to IL, to new femtocells being deployed during the learning process. Finally, we show SBDRA-Q achieves higher aggregate femtocell capacity under the three learning paradigms when compared to a power allocation scheme (SBDPC-Q) that was proposed in the literature. © 2014 IEEE.
A degrees of freedom-optimal scheme for SISO X channel with synergistic alternating CSIT

Authors
Wagdy A., El-Keyi A., Khattab T., Nafie M.

Abstract
In this paper, the degrees of freedom (DoF) of the two-user single input single output (SISO) X channel are investigated. Three cases are considered for the availability of channel state information at the transmitters (CSIT); perfect, delayed, and no-CSIT. A new achievable scheme is proposed to elucidate the potency of interference creation-resurrection (IRC) when the available CSIT alternates between these three cases. For some patterns of alternating CSIT, the proposed scheme achieves 4/3 DoF, and hence, coincides with the information theoretic upper bound on the DoF of the X channel with perfect and instantaneous CSIT. The CSIT alternation patterns are investigated where the patterns that provide extraordinary synergistic gain and dissociative ones are identified. © 2014 IEEE.
A dynamic relaying scheme for cognitive networks with multipacket reception capability

Authors
Elazzouni S., El-Keyi A., Nafie M.

Abstract
We study a cognitive radio system where the secondary users can relay the unsuccessful packets of the primary user. We study a model with one primary link and two secondary links with Multipacket Reception capability (MPR) added to the receivers. Secondary users relaying the primary unsuccessful packets are shown to increase the primary maximum stable throughput and increase the secondary user transmission opportunities. MPR capability is shown to further increase the secondary transmission opportunities as the secondary users can relay with a rate higher than 1 packets/slot as opposed to conventional relaying schemes. Our goal is to control the relaying procedure in secondary nodes such that the secondary transmission opportunities are maximized. We formulate this problem as a constrained optimization problem and then transform it to a linear programming problem. We derive an approximation for the probability of primary idle slots which translates to secondary transmission opportunities, as well as lower and upper bounds for the primary maximum stable throughput. Results show that under some channel conditions, the MPR relaying scheme can outperform other conventional relaying schemes in terms of secondary throughput. © 2014 IEEE.
A feedback-soft sensing-based cognitive access scheme with feedback erasures

Authors
Arafa A.M., Seddik K.G., Sultan A.K., Elbatt T., El-Sherif A.A.

Abstract
In this paper, we examine a cognitive spectrum access scheme in which a secondary user exploits the primary feedback information. We consider an overlay model in which the secondary user accesses the channel by certain access probabilities that are function of the spectrum sensing metric. In setting our problem, we assume that the secondary user can receive the primary link's feedback automatic repeat request (ARQ), but through an erasure channel. This means that the primary feedback may either be received correctly or is erased with a certain erasure probability. We study the cognitive radio network from a queuing theory point of view. Access probabilities are determined by solving a secondary throughput maximization problem subject to a constraint on the primary queues’ stability. Fortunately, our problem is convex and can be solved using standard optimization techniques. Our scheme yields improved results in the secondary throughput than the non-feedback based access scheme attributed to the efficient utilization of the primary user's unerased feedback messages. © 2014 IEEE.
A fully automated approach for Arabic slang lexicon extraction from microblogs

Authors
Elsahar H., El-Beltagy S.R.

Abstract
With the rapid increase in the volume of Arabic opinionated posts on different social media forums, comes an increased demand for Arabic sentiment analysis tools and resources. Social media posts, especially those made by the younger generation, are usually written using colloquial Arabic and include a lot of slang, many of which evolves over time. While some work has been carried out to build modern standard Arabic sentiment lexicons, these need to be supplemented with dialectical terms and continuously updated with slang. This paper proposes a fully automated approach for building a dialectical/slang subjectivity lexicon for use in Arabic Sentiment analysis using lexico-syntactic patterns. Since existing Arabic part of speech taggers and other morphological resources have been found to handle colloquial Arabic very poorly, the presented approach does not employ any such tools, allowing the presented approach to generalize across dialects with some minor modifications. Results of experiments, that targeted Egyptian Arabic, show the approach’s ability to detect subjective internet slang represented by single words or by multi-word expressions, as well as classifying the polarity of these with a high degree of precision. © 2014 Springer-Verlag Berlin Heidelberg.
A new cloud computing governance framework

Authors
Saidah A.S., Abdelbaki N.

Abstract
Nowadays, most service providers adopt Cloud Computing technology. Moving to Cloud creates new risks and challenges. The Cloud era is to outsource our services to Cloud Service Provider (CSP). However, we have to develop a strong governance framework to review the service level, to manage risk effectively and to certify that our critical information is secure. In this paper, we develop an innovative governance model. It is based on the theoretical Guo, Z., Song, M. and Song, J governance model for Cloud computing. We distribute Cloud Control Matrix (CCM) on the Guo's model categories. This turns the theoretical Guo's model to a practical model. Governance model alone will not allow us to bridge the gap between control requirements, technical issues and business risks. As a result, we introduce a new Cloud governance framework using the processes on the new Cloud governance model. Copyright © 2014 SCITEPRESS - Science and Technology Publications.
A pricing-based cooperative spectrum sharing Stackelberg game

Authors

Abstract
In this paper, we study the problem of cooperative spectrum sharing among a primary user (PU) and multiple secondary users (SUs) under quality of service (QoS) constraints. The SUs network is controlled by the PU through a relay which gets a revenue for amplifying and forwarding the SUs' signals to their respective destinations. The relay charges each SU a different price depending on its received signal-to-interference-and-noise ratio (SINR). The primary relay controls the SUs network and maximize any desired PU utility function. The PU utility function represents its QoS, which is affected by the SUs access, and its gained revenue to allow the access of the SUs. The problem of maximizing the primary utility is formulated as a Stackelberg game and solved through three different approaches, namely, the optimal, the heuristic and the suboptimal algorithms. © 2014 IFIP.
A probabilistic MAC for cognitive radio systems with energy harvesting nodes

Authors

Abstract
In this paper, we consider a cognitive radio (CR) system where the secondary user (SU) harvests energy from both the nature resources and the primary user (PU) radio frequency (RF) signal. We propose an energy-based probabilistic access scheme in which SU probabilistically accesses and senses the primary channel. The decision is based on the available energy and the PU’s activity. We investigate the problem of maximizing the SU’s success rate provided that the PU average quality of service (QoS) constraint is satisfied. We also assume multi-packet reception (MPR) capability and sensing errors under a Rayleigh fading channel. Numerical results show the effectiveness of the proposed probabilistic access scheme. © 2014 IEEE.
A novel transmission scheme is developed for the downlink frame of cellular networks. Each base station (BS) aims at iteratively balancing the throughput at the mobile stations (MSs) of its cell with the interference it causes at the MSs of the neighboring cells, requiring negligible coordination between the BSs. A simplified version of the scheme that neither requires iterations nor cooperation is also proposed. Simulation results show that the proposed schemes achieve substantial gains over well-known schemes in the literature. © 2014 IEEE.
A time series classification approach for motion analysis using ensembles in Ubiquitous healthcare systems

Authors
Salaheldin R., Elhelw M., Gayar N.E.

Abstract
Human motion analysis is a vital research area for healthcare systems. The increasing need for automated activity analysis inspired the design of low cost wireless sensors that can capture information under free living conditions. Body and Visual Sensor Networks can easily record human behavior within a home environment. In this paper we propose a multiple classifier system that uses time series data for human motion analysis. The proposed approach adaptively integrates feature extraction and distance based techniques for classifying impaired and normal walking gaits. Information from body sensors and multiple vision nodes are used to extract local and global features. Our proposed method is tested against various classifiers trained using different feature spaces. The results for the different training schemes are presented. We demonstrate that the proposed model outperforms the other presented classification methods. © Springer International Publishing Switzerland 2014.
Year:  2014

**Accurate estimation of the myocardium global function from reduced magnetic resonance image acquisitions**

**Authors**
El-Rewaidy H., Khalifa A., Fahmy A.S.

**Abstract**

Evaluating the heart global function from magnetic resonance images is based on estimating a number of functional parameters such as the left ventricular (LV) volume, LV mass, ejection fraction, and stroke volume. Estimating these parameters requires accurate calculation of the volumes enclosed by the inner and outer surfaces of the LV chamber at the max contraction and relaxation states of the heart. Currently, this is achieved through acquisition and segmentation of a large number of short-axis (SAX) views of the LV, which is time-consuming and expensive. Reducing the number of acquisitions results in undersampling the LV surfaces and hence increases the calculation errors. In this work, we describe and evaluate a method for estimating the cardiac parameters from a small number of image acquisitions that includes one long-axis (LAX) view of the LV. In this method, the LAX contour is used to swipe the SAX contours to fill in the missed LV surface between the SAX slices. Results on 25 patients and CT phantoms shows that, given the same number of slices, the proposed method is superior to other methods. © 2014 IEEE.
Achievable degrees of freedom region of MIMO relay networks using Detour Schemes

Authors
Zewail A.A., Nafie M., Mohasseb Y., El Gamal H.

Abstract
In this paper, we study the degrees of freedom (DoF) of the MIMO relay networks. We start with a general Y channel, where each user has Mi antennas and aims to exchange messages with the other two users via a relay equipped with N antennas. Then, we extend our work to a general 4-user MIMO relay network. Unlike most previous work which focused on the total DoF of the network, our aim here is to characterize the achievable DoF region as well. We develop an outer bound on the DoF region based on the notion of one sided genie. Then, we define a new achievable region using the Signal Space Alignment (SSA) and the Detour Schemes. Our achievable scheme achieves the upper bound for certain conditions relating Mi's and N. © 2014 IEEE.
An in-band full-duplex transceiver prototype with an in-system automated tuning for RF self-interference cancellation

Authors
Mikhael M., Van Liempd B., Craninckx J., Guindi R., Debaillie B.

Abstract
This paper presents a transceiver prototype capable of in-band full duplex communication. Apart from a conventional transceiver and antenna, this prototype relies on a tunable electrical balance duplexer to minimize the in-band self-interference at RF. Such duplexer however requires continuous-time tuning to ensure accurate impedance balancing with the antenna across different environmental conditions. An automatic tuning algorithm is presented which tracks antenna impedance variations and tunes the duplexer accordingly. This tuning operates on a standard compliant training sequence to minimize the overhead on the communication system. The implemented tuning mechanism does not require any additional RF or analog hardware, and maximally re-uses the digital resources of a conventional baseband processor. The full duplex prototype was validated in a wireless link for IEEE802.11 channels in the 2.4GHz ISM band, in which the error vector magnitude improves by 15dB as the RF self-interference cancellation increased from 25dB to 45dB. © 2014 ICST.
An integrated approach to assess manufacturing greenness level

Authors
Salem A.H., Deif A.M.

Abstract
This paper proposes an integrated approach for relative greenness level assessment in selected manufacturing industries at the system level. The approach builds on existing methodologies to develop a multi-layer tool box called "Greenometer" which focus on the strategic comparison for cross industries evaluation as well as tactical comparison for intra-industries. The assessment tool captures the fundamental evaluation parameters of green manufacturing namely Environment Energy Resources and Economy In addition the Greenometer employs geometric mean method (GMM) for the strategic layer and data envelopment analysis (DEA) for the tactical layer and will be used for different selected manufacturing disciplines. The proposed tool will have a practical impact on assessing, developing and improving environmental plans and policies of the selected industries. © 2014 Elsevier B.V.
An integrated approach to assess manufacturing greenness level

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Salem A.H., Deif A.M.

Abstract
This paper proposes an integrated approach for relative greenness level assessment in selected manufacturing industries at the system level. The approach builds on existing methodologies to develop a multi-layer tool box called "Greenometer" which focus on the strategic comparison for cross industries evaluation as well as tactical comparison for intra-industries. The assessment tool captures the fundamental evaluation parameters of green manufacturing namely Environment Energy Resources and Economy In addition the Greenometer employs geometric mean method (GMM) for the strategic layer and data envelopment analysis (DEA) for the tactical layer and will be used for different selected manufacturing disciplines. The proposed tool will have a practical impact on assessing, developing and improving environmental plans and policies of the selected industries. © 2014 Elsevier B.V.
Band allocation for cognitive radios with buffered primary and secondary users

Authors
El Shafie A., Sultan A., Khattab T.

Abstract
In this paper, we study band allocation of Ms buffered secondary users (SUs) to Mp orthogonal primary licensed bands, where each primary band is assigned to one primary user (PU). Each SU is assigned to one of the available primary bands with a certain probability designed to satisfy some specified quality of service (QoS) requirements for the SUs. In the proposed system, only one SU is assigned to a particular band. The optimization problem used to obtain the stability region's envelope (closure) is shown to be a linear program. We compare the stability region of the proposed system with that of a system where each SU chooses a band randomly with some assignment probability. We also compare with a fixed (deterministic) assignment system, where only one SU is assigned to one of the primary bands all the time. We prove the advantage of the proposed system over the other systems. © 2014 IEEE.
Breathing charge density waves in intrinsic Josephson junctions

Authors
Shukrinov Y.M., Abdelhafiz H.

Abstract
We demonstrate the creation of a charge density wave (CDW) along a stack of coupled Josephson junctions (JJs) in layered superconductors. Electric charge in each superconducting layer oscillates around some average value, forming a breathing CDW. We show the transformation of a longitudinal plasma wave to CDW in the state corresponding to the outermost branch. Transition between different types of CDW’s related to the inner branches of IV characteristic is demonstrated. The effect of the external electromagnetic radiation on the states corresponding to the inner branches differs crucially from the case of the single JJ. The Shapiro steps in the IV characteristics of the junctions in the stack do not correspond directly to the frequency of radiation $\omega$. The system of JJs behaves like a single whole system: the Shapiro steps or their harmonics in the total IV characteristics appear at voltage $\sum V_l = NR_m/n\omega$, where $V_l$ is the voltage in the $l$th junction, $N_R$ is the number of JJs in the rotating state, and $m$ and $n$ are integers. © 2013 Pleiades Publishing, Inc.
Classification of cardiac magnetic resonance image type and orientation

Authors
Wael M., Fahmy A.S.

Abstract
Cardiac magnetic resonance imaging provides a number of different imaging acquisition types and views of different body cross sections and orientations. A huge amount of images are produced which demand an automatic method for classification based on the visual contents to facilitate diagnosis and searching operations. In this work, we propose a fully automated classification method for classifying cardiac MRI images according to image acquisition type and orientation. Local binary pattern is used to represent the texture differences among the different image types. Edge orientation histogram is used to differentiate the different image orientations. In addition, two similarity measures are applied and compared: log-likelihood and chi-square distance. The chi-square similarity measure showed better results than the log-likelihood. An average accuracy for classifying the image type and orientation using chi-square was respectively 97% and 96%. © 2014 IEEE.
Cloud-based parallel suffix array construction based on MPI

Authors
Abdelhadi A., Kandil A.H., Abouelhoda M.

Abstract
Massive amount of genomics data are being produced nowadays by Next Generation Sequencing machines. The suffix array is currently the best choice for indexing genomics data, because of its efficiency and large number of applications. In this paper, we address the problem of constructing the suffix array on computer cluster in the cloud. We present a solution that automates the establishment of a computer cluster in a cloud and automatically constructs the suffix array in a distributed fashion over the cluster nodes. This has the advantage of encapsulating all set-up details and execution of the algorithm. The distributed nature of the algorithm we use overcomes the problem that arises when the user wishes, due to cost issues, to use low memory machines in the cloud. Our experiments show that our implementation scales well with the increasing number of processors. The cloud cost is affordable and it provides a cost effective solution. © 2014 IEEE.
Cluster Head election in Wireless Sensor Networks

Authors
El-Refaay S., Azer M.A., Abdelbaki N.

Abstract
Wireless Sensor Networks (WSNs) consist of a collection of cheap, easy to deploy Sensor nodes arranged together to fulfill a specific purpose (monitoring, tracking...etc.). A WSN network is composed of a Base Station (BS) and collection of sensors. There are a lot of approaches for the network construction. Amongst them is the hierarchical structure, where the network is divided into clusters and the node inside this cluster communicates with BS through a chosen leader called Cluster Head (CH). In this paper, we present cluster-Head election algorithms for WSNs. We will discuss the operations of these algorithms, and compare their performance. © 2014 IEEE.
Cognitive access protocol for alleviating sensing errors in cognitive multiple-access systems

Authors
El Shafie A.

Abstract
This letter studies a time-slotted multiple-access system with a primary user (PU) and a secondary user (SU) sharing the same channel resource. We propose a novel secondary access protocol which alleviates sensing errors and detects the availability of primary channels with the highest ability of detection. Under the proposed protocol, the SU may access the channel at one of a predefined instants within the time slot each of which associated with a certain access probability that changes based on the sensing outcome. There is also a possibility of accessing the channel at the beginning of the time slot without channel sensing. The optimization problem is stated such that the secondary throughput is maximized under stability of the primary queue and a constraint on the primary queueing delay. Numerical results demonstrate the beneficial gains of the proposed protocol in terms of secondary throughput. © 2012 IEEE.
Computing the Burrows-Wheeler transform of a string and its reverse in parallel

Authors
Ohlebusch E., Beller T., Abouelhoda M.I.

Abstract
The contribution of this article is twofold. First, we provide new theoretical insights into the relationship between a string and its reverse: If the Burrows-Wheeler transform (BWT) of a string has been computed by sorting its suffixes, then the BWT, the suffix array, and the longest common prefix array of the reverse string can be derived from it without suffix sorting. Furthermore, we show that the longest common prefix arrays of a string and its reverse are permutations of each other. Second, we provide a parallel algorithm that, given the BWT of a string, computes the BWT of its reverse much faster than all known (parallel) suffix sorting algorithms. Some bioinformatics applications will benefit from this. © 2013 Elsevier B.V. All rights reserved.
Convergence study of IPv6 tunneling techniques

Authors
Amr P., Abdelbaki N.

Abstract
IPv4 address exhaustion pushed IETF to create IPv6, the improved substitute of IPv4. The Internet complexity and its enormous size prolong the transition from IPv4 to IPv6 process. This means that both versions will necessarily co-exist. Meanwhile, tunneling appears as a solution trend. The tunneling is a transition technique that is considered temporary till all ISPs would support IPv6. At this paper, we compare the routing convergence of two tunnel types, 6to4 and Manually Configured versus the conventional IPv4 and IPv6 protocols. We analyze the network resources consumed during cold start phase. Bandwidths occupied by routing traffic and convergence duration are measured. Finally we propose tunnel recommendations for different range of network resources. © 2014 IEEE.
Cooperative access in cognitive radio networks: Stable throughput and delay tradeoffs

Authors
Ashour M., El-Sherif A.A., Elbatt T., Mohamed A.

Abstract
In this paper, we study and analyze fundamental throughput-delay tradeoffs in cooperative multiple access for cognitive radio systems. We focus on the class of randomized cooperative policies, whereby the secondary user (SU) serves either the queue of its own data or the queue of the primary user (PU) relayed data with certain service probabilities. The proposed policy opens room for trading the PU delay for enhanced SU delay. Towards this objective, stability conditions for the queues involved in the system are derived. Furthermore, a moment generating function approach is employed to derive closed-form expressions for the average delay encountered by the packets of both users. Results reveal that cooperation expands the stable throughput region of the system and significantly reduces the delay at both users. Moreover, we quantify the gain obtained in terms of the SU delay under the proposed policy, over conventional relaying that gives strict priority to the relay queue. © 2014 IFIP.
Cooperative cognitive relaying under primary and secondary quality of service satisfaction

Authors
Shafie A.E., Khattab T.

Abstract
This paper proposes a new cooperative protocol which involves cooperation between primary and secondary users. We consider a cognitive setting with one primary user (PU) and multiple secondary users (SUs). The time resource is partitioned into discrete time slots. Each time slot, one of the SUs is scheduled for transmission according to time division multiple access scheme, and the remainder of the SUs, which we refer to as secondary relays, attempt to decode the primary packet. If more than one relay can decode the primary packet, the secondary relays then employ cooperative beamforming to forward the packet and to provide protection to the destination of the SU scheduled for transmission from interference. We characterize the diversity-multiplexing tradeoff of the primary source under the proposed protocol. We consider certain quality of service for each user specified by its required throughput. The optimization problem is stated under such condition. It is shown that the optimization formulation is linear and can be readily solved. © 2014 IEEE.
Cost performance dynamics in lean production leveling

Authors
Deif A.M., Elmaraghy H.

Abstract
Balancing of production systems is one of the main lean manufacturing principles as it reduces in-process storage and related forms of waste. A dynamic systems approach is proposed to investigate challenges of implementing production leveling and associated costs. A lean cell producing at takt time is modeled using system dynamics. The model captures various lean tools influencing production leveling and their implications. Comparative cost analysis between various leveling implementation policies for stochastic demand with multiple products is conducted. Results showed that determining the most feasible leveling policy is highly dictated by both the cost and limitations of capacity scalability. In addition, delivery sequence plans of different products/parts needed to achieve mix leveling and lot sizes affect the feasible production leveling policy while implementing lean principles. The developed model and insights gained from the results can help lean manufacturing practitioners to better decide when and how to implement production leveling as well as determine both production lots sizes and sequence. They also emphasize the importance of cost analysis as assisting decision support tool in the trade-off required between the benefits of different levels of lean policies and their associated cost. © 2014 The Society of Manufacturing Engineers.
Degrees of freedom for a two-cell relay network with soft handoffs

Authors
Zamzam A.S., El-Keyi A., Nafie M., Mohasseb Y.

Abstract
In this paper we investigate the degrees of freedom of a cellular relay network that consists of two base stations, two mobile stations and four decode-and-forward relays. The base stations and the mobile stations are equipped with M antennas each, whereas the relays are equipped with N antennas each. In addition, each base station has an independent message to each mobile station. The relays are used to forward the messages from the base stations to the mobile station as there is no direct link. We consider three different relaying architectures where the two relays associated with each base station simultaneously or alternately transmit their messages. We derive an upper bound on the degrees of freedom achievable by each relaying architecture as a function of the ratio between N and M. Furthermore, we propose an achievable scheme that uses interference alignment to achieve the upper bound on the DoF for all values of M and N except for $1 \leq N/M \leq 5/2$. © 2014 IEEE.
Dynamic lean assessment for Takt time implementation

Authors
Ali R.M., Deif A.M.

Abstract
Increasing volatility global competitiveness and sales crisis all force the manufacturers to commit to the journey of world-class manufacturing performance via adopting "lean systems" to enable economic success in difficult times. Among the journey to lean one of the hardest steps is measuring the progress of lean policies implementation especially in this highly dynamic market. This paper presents a dynamic model to evaluate the degree of leanness in manufacturing firms. The model is based on system dynamics approach and presents a "leanness score" for the manufacturing system. In addition, it examines the dynamics associated with the application of "One-piece flow" concept via "Takt time". Results show that working on adjusting the system's cycle times to follow takt time will improve the overall performance. Improvements are reflected in the overall service level, overall WIP efficiency, and overall equipment effectiveness. The developed model with its performance metrics will help the decision makers in adopting different lean policies and assist in optimal parameters settings of the system. © 2014 Elsevier B.V.
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Dynamic modelling of impact of lean policies on production levelling feasibility

Authors
Elmaraghy H., Deif A.M.

Abstract
A dynamic systems approach is proposed to investigate challenges of implementing production levelling and associated costs. A model of a lean cell is developed using system dynamics. The model captures various lean tools influencing production levelling. Comparative cost analysis between various levelling implementation policies for stochastic demand with multiple products is conducted. Results showed that determining the most feasible levelling policy is highly dictated by both capacity scalability cost and limitations. The developed model and revealed insights can help lean practitioners to better decide on when and how to implement production levelling as well as determine production lots sizes. © 2014 CIRP.
Effective capacity of cognitive radio links: Accessing primary feedback erroneously

Authors
Butt M.M., Anwar A.H., Mohamed A., El Batt T.

Abstract
We study the performance of a cognitive system modeled by one secondary and one primary link and operating under statistical quality of service (QoS) delay constraints. We analyze the effective capacity (EC) to quantify the secondary user (SU) performance under delay constraints. The SU intends to maximize the benefit of the feedback messages on the primary link to reduce SU interference for primary user (PU) and makes opportunistic use of the channel to transmit his packets. We assume that SU has erroneous access to feedback information of PU. We propose a three power level scheme and study the tradeoff between degradation in EC of SU and reliability of PU defined as the success rate of the transmitted packets. Our analysis shows that increase in error in feedback access causes more interference to PU and packet success rate decreases correspondingly. © 2014 IEEE.
Enhanced customer churn prediction using social network analysis

Authors
Abd-Allah M.N., Salah A., El-Beltagy S.R.

Abstract
There were 6.8 billion estimates for mobile subscriptions worldwide by end of 2013 [11]. As the mobile market gets saturated, it becomes harder for telecom providers to acquire new customers, and makes it essential for them to retain their own. Due to the high competition between different telecom providers and the ability of customers to move from one provider to another, all telecom service providers suffer from customer churn. As a result, churn prediction has become one of the main telecom challenges. The primary goal of churn prediction is to predict a list of potential churners, so that telecom providers can start targeting them by retention campaigns. This work describes work in progress in which we model churn as a dyadic social behavior, where customer churn propagates in the telecom network over strong social ties. We propose a novel method for measuring social tie strength between telecom customers. We then, incorporate strong social ties in an influence propagation model, and apply a machine-learning based prediction model that combines both churn social influence and other traditional churn factors. The goals of our proposed model is to enhance churn prediction by modeling churn as a dyadic phenomena, provide an enhanced evaluation for the social tie strength based on customers social interactions, and to study the effect of strong social ties on churn propagation over mobile telecom networks. Copyright © 2014 by the Association for Computing Machinery, Inc. (ACM).
Equal-priority multiple access communications with minimum queuing delay

Authors
Soliman M., El-Keyi A., Sultan A.

Abstract
In this paper, a multiple-access wireless network consisting of two transmitters and one receiver is considered. The transmitters can access the same channel simultaneously and the receiver performs successive interference cancellation (SIC) to decode the messages from both senders. A two-dimensional Markov chain is used to model the medium access control layer behavior of the system, where the state represents the queue length of the transmitters. In this model, a general number of packets can be transmitted from any user in a single time slot. A probabilistic cross-layer scheme is proposed to regulate the transmission process between both senders and the receiver. The proposed scheme probabilistically selects the number of packets transmitted from each user and the SIC decoding order at the receiver in order to achieve minimum total average packet delay while satisfying the power constraints for each transmitter. The problem is formulated as a constrained optimization problem then transformed into a set of convex feasibility problems that can be solved efficiently using the bisection algorithm. © 2014 IEEE.
Fractional order two port network oscillator with equal order

Authors
Said L., Radwan A., Madian A., Soliman A.

Abstract
Most of electric circuits can be viewed as a two port network with two terminals defined as input and output ports. In this paper, two different concepts are combined together which are the two port network concept and the fractional calculus to design a general fractional order two port network with equal order. An oscillator case study with three impedances structure has been presented. The three impedances are two equal order fractional capacitors and a resistor. Two different two port network are studied which are Op-amp based circuit and nonideal gyrator circuit. The general oscillation frequency and condition for each case have been derived and discussed numerically using Matlab. Spice simulations are presented for some cases to validate the proposed idea where the fractional order oscillator has more degrees of freedom than the integer order. © 2014 IEEE.
Fractional sequential sensing for energy efficient cooperative cognitive radio networks

Authors
Salama A.M., Zahran A., Elbatt T.

Abstract
In this paper, we propose fractional sequential sensing (FSS) as a novel cooperative sensing scheme for cognitive radio networks. FSS compromises a tradeoff between sensing accuracy and efficiency by formulating an optimization problem whose solution identifies FSS sensing parameters. These parameters include the sensing period and channels allocated for each user. Our simulation results show that FSS successfully improves the sensing accuracy while maintaining a low power profile. Additionally, we show that the sensing accuracy performance gap between FSS and other traditional schemes increases by optimizing decision engine. © 2014 IEEE.
Year: 2014

**Greedy framework for optical flow tracking of myocardium contours**

**Authors**
Al-Agamy A.O., Khalifa A., Fahmy A.S.

**Abstract**
Optical flow (OF) tracking of the myocardium contours has a potential in segmenting the myocardium in time sequences of cardiac medical images. Nevertheless, to estimate the displacement field of the contour points, a number of assumptions are required to solve an under-determined set of optical flow equations. In this work, a new framework is proposed to solve the OF tracking problem using greedy optimisation algorithm. The new framework allows different types of constraints such as motion invariance, shape and topology to be applied in a unified way. The developed methods are applied to a publicly-available cardiac magnetic resonance imaging dataset containing image sequences for 33 patients. Quantitative evaluation of the results shows high potential of the methods to accurately track and segment the myocardium contours. © The Institution of Engineering and Technology 2014.
Hybrid intensity- and phase-based optical flow tracking of tagged MRI

Authors
Eldeeb S.M., Khalifa A.M., Fahmy A.S.

Abstract
Accurate tracking of the myocardium tissues in tagged Magnetic Resonance Images (MRI) is essential for evaluating the cardiac function. Current tracking methods utilize either the image intensity or the image phase as landmarks that can be tracked. In either case, the performance is vulnerable to the image quality and the fading of the tag lines. In this work, we propose a hybrid optical flow tracking method that combines both the intensity and the phase features of the image. The method is validated using numerical cardiac phantom as well as real MRI data experiments. Both experiments showed that the proposed method outperforms current intensity-based optical flow tracking and the phase-based HARP method with maximum error of 1 pixel at extreme conditions of tag fading. © 2014 IEEE.
Impact of dynamic capacity policies on WIP level in mix leveling lean environment

Authors
Deif A.M., ElMaraghy H.

Abstract
Balancing demand's product variety in production planning is one aspect of variety management challenge. This phenomenon is described in lean systems as mix leveling. This paper approach product mix leveling problem from a dynamic perspective. A system dynamics model is developed to explore the dynamics associated with the WIP level performance at different mix leveling policies in a lean environment. The system captures different lean tools and policies. Results showed that the best WIP performance is sensitive to both the degree of lean tools implementation as well as the capacity scalability level of the system. The presented analysis showed that dynamic capacity is essential for successful mix leveling policies; however investments in such scalability can be minimized with shorter production cycles as well as efficient JIT implementation. In addition, the positive impact of SMED on WIP accumulation in lean environment was well demonstrated. © 2014 Elsevier B.V.
Impact of dynamic capacity policies on WIP level in mix leveling lean environment

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Implementing earned value management using bridge information modeling

Authors
Marzouk M., Hisham M.

Abstract
Building Information Modeling (BIM) has widely become an effective tool in engineering and construction fields. It could be used in: generating shop drawings; detecting clashes; estimating quantities; and controlling documents. Applying BIM technology on bridges is named Bridge Information Modeling (BrIM). Bridge Information Modeling (BrIM) is an intelligent representation of bridges since it contains all information needed about bridges through their whole lifecycle. This paper presents the use of Building Information Modeling in cost and time management of infrastructure bridges. BIM-based cost estimation application is presented which is capable to carry out approximate cost estimate; and detailed cost estimate. The application is designed in a flexible manner to be used with default values, or user defined values. Different performance measurement indexes are used in order to control the cost and schedule during execution phase of construction projects. This application integrates BIM with Earned Value (EV) concept to determine the project status at specific reporting date. A case study is presented to demonstrate the use of the developed modules. © 2014 Korean Society of Civil Engineers and Springer-Verlag Berlin Heidelberg.
Integration of a 2-D periodic nanopattern into thin-film polycrystalline silicon solar cells by nanoimprint lithography

Authors
Abdo I., Trompoukis C., Deckers J., Depauw V., Tous L., Van Gestel D., Guindi R., Gordon I., El Daif O.

Abstract
The integration of 2-D periodic nanopattern defined by nanoimprint lithography and dry etching into aluminum-induced crystallization-based polycrystalline silicon thin-film solar cells is investigated experimentally. Compared with the unpatterned cell, an increase of 6% in the light absorption has been achieved thanks to the nanopattern, which, in turn, increased the short-circuit current from 20.6 to 23.8 mA/cm². The efficiency, on the other hand, has limitedly increased from 6.4% to 6.7%. We show using the transfer length method that the surface topography modification caused by the nanopattern has increased the sheet resistance of the antireflection coating (ARC) layer as well as the contact resistance between the ARC layer and the emitter front contacts. This, in turn, resulted in increased series resistance of the nanopatterned cell, which has translated into a decreased fill factor, explaining the limited increase in the efficiency. © 2014 IEEE.
J-aggregates of amphiphilic cyanine dyes for dye-sensitized solar cells: A combination between computational chemistry and experimental device physics

Authors
Abdel-Mottaleb M.S.A., Abdel-Mottaleb M.M.S., Hafez H.S., Saif M.

Abstract
We report on the design and structure principles of 5,5′-6,6′-tetrachloro-1,1′-dioctyl-3,3′-bis-(3-carboxypropyl)-benzimidacarbocyanine (Dye 1). Such metal-free amphiphilic cyanine dyes have many applications in dye-sensitized solar cells. AFM surface topographic investigation of amphiphilic molecules of Dye 1 adsorbed on TiO$_2$ anode reveals the ability of spontaneous self-organization into highly ordered aggregates of fiber-like structure. These aggregates are known to exhibit outstanding optical properties of J-aggregates, namely, efficient exciton coupling and fast exciton energy migration, which are essential for building up artificial light harvesting to the photovoltaic device. A light-to-electricity conversion efficiency of DSSC based on the metal free amphiphilic Dye 1 is $\eta = 3.75$, which is about 50% of that based on metal-based N719 Ru-dye (Di-tetraethylammoniumcis-bis(isothiocyanato)bis(2,2′-bipyridyl-4,4′-dicarboxylato)ruthenium(II)). DFT and TD-DFT studies show that large intramolecular charge transfer takes place from the HOMO to LUMO. HOMO is localized on a part of the molecule with almost no contribution from the carboxylic moiety. This clearly indicates that the anchoring carboxylic group plays a minor role. © 2014 M. S. A. Abdel-Mottaleb et al.
Abstract

Energy efficient operation of cellular systems becomes a core design goal for economic and environment-friendly network operation. Several studies have shown that the energy consumed in base stations represents 60-80% of the energy consumption in cellular networks. In this paper, we develop an optimization framework that exploits several energy efficient techniques including switching power modes of base stations, Adaptive Modulation (AM), and the use of relays. Our main objective is to reduce both, transmitted and circuit power, subject to satisfying the quality of service constraints. To accommodate the complexity of the target problem, we further propose two sub-optimal algorithms, minimum power heuristic (MPH) and minimum relays heuristic (MRH). The simulation results show that energy saving merits of our proposed schemes can be up to 80%. © 2014 IEEE.
Maximum throughput of a cooperative energy harvesting cognitive radio user

Authors
Shafie A.E., Khattab T.

Abstract
In this paper, we investigate the maximum throughput of a saturated rechargeable secondary user (SU) sharing the spectrum with a primary user (PU). The SU harvests energy packets (tokens) from the environment with a certain harvesting rate. All transmitters are assumed to have data buffers. In addition to its own traffic buffer, the SU has a buffer for storing the admitted primary packets for relaying; and a buffer for storing the energy tokens harvested from the environment. We propose a new cooperative cognitive relaying protocol that allows the SU to relay a fraction of the undelivered primary packets. We consider an interference channel model (or a multi-packet reception (MPR) channel model), where concurrent transmissions can survive with certain probability characterized by the complement of channel outages. The proposed protocol exploits the primary queue burstiness and receivers’ MPR capability. In addition, it efficiently expends the secondary energy tokens. Our numerical results show the benefits of cooperation, receivers' MPR capability, and secondary energy queue arrival rate on the system performance from a network layer standpoint. © 2014 IEEE.
Maximum throughput of a secondary user cooperating with an energy-aware primary user

Authors
El Shafie A., Sultan A., Khattab T.

Abstract
This paper proposes a cooperation protocol between a secondary user (SU) and a primary user (PU) which dedicates a free frequency subband for the SU if cooperation results in energy saving. Time is slotted and users are equipped with buffers. Under the proposed protocol, the PU releases portion of its bandwidth for secondary transmission. Moreover, it assigns a portion of the time slot duration for the SU to relay primary packets and achieve a higher successful packet reception probability at the primary receiver. We assume that the PU has three states: idle, forward, and retransmission states. At each of these states, the SU accesses the channel with adaptive transmission parameters. The PU cooperates with the SU if and only if the achievable average number of transmitted primary packets per joule is higher than the number of transmitted packets per joule when it operates alone. The numerical results show the beneficial gains of the proposed cooperative cognitive protocol. © 2014 IFIP.
Memcapacitor response under step and sinusoidal voltage excitations

Authors
Fouda M.E., Radwan A.G.

Abstract
Recently, mem-elements have become fundamental in the circuit theory through promising potential applications based on the built-in memory-properties of these elements. In this paper, the mathematical analysis of the memcapacitor model is derived and the effect of different voltage excitation signals is studied for the linear dopant model. General closed form expressions and analyses are presented to describe the memcapacitor behavior under DC step and sinusoidal voltage excitations. Furthermore, the step and sinusoidal responses are used to analyze the memcapacitor response under any periodic signal using Fourier series expansion where the effect of the DC component on the output response is investigated. In addition, the stored energy in the memcapacitor under step, sinusoidal and square wave excitations is discussed. Moreover, the analysis of series and parallel connection of N non-matched memcapacitors in general is introduced and special cases of matched memcapacitors are discussed. The derived equations are verified using SPICE simulations showing great matching. © 2014 Elsevier Ltd. All rights reserved.
Memristor-based voltage-controlled relaxation oscillators

Authors
Fouda M.E., Radwan A.G.

Abstract
This paper introduces two voltage-controlled memristor-based reactance-less oscillators with analytical and circuit simulations. Two different topologies which are R-M and M-R are discussed as a function of the reference voltage where the generalized formulas of the oscillation frequency and conditions for oscillation for each topology are derived. The effect of the reference voltage on the circuit performance is studied and validated through different examples using PSpice simulations. A memristor-based voltage-controlled oscillator (VCO) is introduced as an application for the proposed circuits which is nano-size and more efficient compared to the conventional VCOs. Copyright © 2013 John Wiley & Sons, Ltd.
Memristor-MOS hybrid circuit redundant multiplier

Authors
El-Slehdar A.A., Radwan A.G.

Abstract
This paper introduces a step forward towards memristor-MOS hybrid circuit to achieve any combinational function. The proposed design is based on reducing the area by replacing the complete pull-down network with just one memristor and one comparator. The concept is then verified using an example of a simple function. Also, a proposed architecture for memristor based redundant multiplier circuit is introduced and verified using the SPICE simulation. Therefore, any redundant functions can be implemented using the same concept. © 2014 IEEE.
In this paper, a platform for measuring the impulse response of wireless multiple-input-multiple-output (MIMO) vehicle-to-vehicle (V2V) channels is presented. The platform is developed using Rice University Wireless Open-Access Research Platform (WARP) boards and utilized to perform an experimental study of V2V channels through conducting field measurements. A full characterization of MIMO-V2V channels is given via extracting the channel parameters from the acquired measurements. These parameters include the power-delay profile, the Doppler spectrum, and the MIMO transmit and receive correlation matrices of the channel. Numerical simulations are utilized to examine the effect of the channel parameters on the bit error rate (BER) performance of an orthogonal frequency division multiplexing (OFDM) based system. © 2014 IEEE.
New insight into HCV E1/E2 region of genotype 4a

Authors

Abstract
Introduction: Hepatitis C virus (HCV) genome contains two envelope proteins (E1 and E2) responsible for the virus entry into the cell. There is a substantial lack of sequences covering the full length of E1/E2 region for genotype 4. Our study aims at providing new sequences as well as characterizing the genetic divergence of the E1/E2 region of HCV 4a using our new sequences along with all publicly available datasets. Methods: The genomic segments covering the whole E1/E2 region were isolated from Egyptian HCV patients and sequenced. The resulting 36 sequences were analyzed using sequence analysis techniques to study variability within and among hosts in the same time point. Furthermore, previously published HCV E1/E2 sequence datasets for genotype 4a were retrieved and categorized according to the geographical location and date of isolation and were used for further analysis of variability among Egyptian over a period of 15 years, also compared with non-Egyptian sequences to figure out region-specific variability. Results: Phylogenetic analysis of the new sequences has shown variability within the host and among different individuals in the same time point. Analysis of the 36 sequences along with the Egyptian sequences (254 sequences in E1 in the period from 1997 to 2010 and 8 E2 sequences in the period from 2006 to 2010) has shown temporal change over time. Analysis of the new HCV sequences with the non-Egyptian sequences (182 sequences in E1 and 155 sequences in the E2) has shown region specific variability. The molecular clock rate of E1 was estimated to be 5E-3 per site per year for Egyptian and 5.38E-3 for non-Egyptian. The clock rate of E2 was estimated to be 8.48E per site per year for Egyptian and 6.3E-3 for non-Egyptian. Conclusion: The results of this study support the high rate of evolution of the Egyptian HCV genotype 4a. It has also revealed significant level of genetic variability among sequences from different regions in the world. © 2015 Hussein et al.
**Year:** 2014

**Novel chitosan-ZnO based nanocomposites as luminescent tags for cellulosic materials**

**Authors**
Saeed S.E.-S., El-Molla M.M., Hassan M.L., Bakir E., Abdel-Mottaleb M.M.S., Abdel-Mottaleb M.S.A.

**Abstract**
Novel chitosan-ZnO composites have been synthesized as luminescent taggants for cellulosic materials. The synthesized chitosan-ZnO nanospheres (CS-ZnO NS), chitosan-ZnO-oleic acid quantum dots (CS-ZnO-oleic QD) and chitosan-ZnO-oleic acid:Eu3+ doped nanorods (CS-ZnO-oleic:Eu3+ NR) were characterized by X-ray diffraction, photoluminescence spectroscopy, FTIR spectroscopy and transmission electron microscopy. The prepared luminescent CS-ZnO composites were used in printing paste and applied to different types of papers and textiles by using screen printing technique. The colorimetric values of the printed CS-ZnO-oleic acid and CS-ZnO-oleic:Eu3+ showed that printing caused slightly change in color values. Scanning electron microscopy images and color values of the printed surface showed that CS-ZnO-oleic QD and highly luminescence CS-ZnO-olic:Eu3+ NR are suitable for use as a printed security feature. © 2013 Elsevier Ltd. All rights reserved.
Year: 2014

On the achievable rates of a secondary link coexisting with a primary multiple access network

Authors
Tadrous J., Nafie M.

Abstract: An achievable rate region for a primary multiple access network coexisting with a secondary link of one transmitter and a corresponding receiver is analyzed. The rate region depicts the sum primary rate versus the secondary rate and is established assuming that the secondary link performs rate splitting. The achievable rate region is the union of two types of rate regions. The first type is a rate region established assuming that the secondary receiver cannot decode any primary signal, whereas the second is established assuming that the secondary receiver can decode the signal of one primary link. The achievable rate region is determined first assuming discrete memoryless channel (DMC), then the results are applied to a Gaussian channel. In the Gaussian channel, the performance of rate splitting is characterized for the two types of rate regions. Moreover, a necessary and sufficient condition to determine which primary signal the secondary receiver can decode without degrading the range of primary achievable sum rates is provided. When this condition is satisfied by a certain primary user, the secondary receiver can decode its signal and achieve larger rates without reducing the sum of the primary achievable rates as compared to the case in which it does not decode any primary signal. It is also shown that the probability of having at least one primary user satisfying this condition grows with the primary signal-to-noise ratio. © 2014, Tadrous and Nafie; licensee Springer.
On the generalization of fractional-order transmission lines

Authors
Ismail R., Radwan A.G., El-Barkouky R.A.

Abstract
This paper demonstrates some fundamentals concerning the study of the Fractional order Transmission Line (FTL) operation. A numerical algorithm applied to study the transient analysis is shown describing the abnormal diffusion that appears in the operation of the TL. According to the steady state analysis of the FTL operation, the superior advantages over the conventional domain of imposing the fractional parameters are shown in this work. Moreover, all the conventional formulas are retrieved from the corresponding fractional ones by setting all fractional derivatives to unity. © 2014 IEEE.
On the mathematical modeling of memcapacitor bridge synapses

Authors
Fouda M., Radwan A.

Abstract
Mem-element based synaptic bridge is a very promising topic due to its learning capability where the synaptic bridge can be build using either memristors or memcapacitors. In this paper, the detailed mathematical analysis of memcapacitor bridge circuit is introduced. This mathematical analysis is build when a current input signal is applied to excite the bridge. Closed form expressions for the required pulse width; synaptic weight; and conditions for positive, negative and zero synaptic weight are derived. The obtained expressions are verified using SPICE simulations showing very good matching. © 2014 IEEE.
On the stable throughput of cooperative cognitive radio networks with finite relaying buffer

Authors
Elmahdy A.M., El-Keyi A., Elbatt T., Seddik K.G.

Abstract
In this paper, we study the problem of cooperative communications in cognitive radio systems where the secondary user has limited relaying room for the overheard primary packets. More specifically, we characterize the stable throughput region of a cognitive radio network with a finite relaying buffer at the secondary user. Towards this objective, we formulate a constrained optimization problem for maximizing the secondary user throughput while guaranteeing the stability of the primary user queue. We consider a general cooperation policy where the packet admission and queue selection probabilities, at the secondary user, are both dependent on the state (length) of the finite relaying buffer. Despite the sheer complexity of the optimization problem, attributed to its non-convexity, we transform it to a linear program. Our numerical results reveal a number of valuable insights, e.g., it is always mutually beneficial to cooperate in delivering the primary packets in terms of expanding the stable throughput region. In addition, the stable throughput region of the system, compared to the case of infinite relaying queue capacity, marginally shrinks for limited relaying queue capacity. © 2014 IEEE.
One-step thermolysis synthesis of divalent transition metal ions monodoped and tridoped CdS and ZnS luminescent nanomaterials

Authors
Saeed S.E., Abdel-Mottaleb M.M.S., Abdel-Mottaleb M.S.A.

Abstract
Mn$^{2+}$, Co$^{2+}$, or Ni$^{2+}$ monodoped CdS (or ZnS) and Mn$^{2+}$-Co$^{2+}$-Ni$^{2+}$ tridoped CdS (or ZnS) have been successfully synthesized by novel one-step thermolysis method using thiourea as a sulphur source. The synthesized nanomaterials were characterized by X-ray diffraction (XRD), transmission electron microscopy (TEM), and scanning electron microscopy (SEM). It is found that the average diameter and morphology of the synthesized samples varied with the nature of dopant ion. The successful doping of Mn$^{2+}$-Co$^{2+}$-Ni$^{2+}$ tridoped ions into the host CdS (or ZnS) was proved by the EDX spectra. The luminescence of CdS is only enhanced when monodoped with Mn$^{2+}$ whereas it is enhanced when ZnS is either monodoped with Mn$^{2+}$, Co$^{2+}$, or Ni$^{2+}$ or tridoped with Mn$^{2+}$-Co$^{2+}$-Ni$^{2+}$. The synthesized samples could therefore offer opportunities for further fundamental research and technological applications. Copyright © 2014 S. E. Saeed et al.
Optimal windowing and decision feedback equalization for space-frequency alamouti-coded OFDM in doubly selective channels

Authors
Abotabl A.A., El-Keyi A., Mohasseb Y., Bai F.

Abstract
Space-frequency block coding with orthogonal frequency-division multiplexing (SFBC-OFDM) suffers from the effect of intercarrier interference (ICI) in doubly selective channels. In this paper, a scheme is proposed in which windowing is applied to the received signal to reduce the effect of ICI to a limited number of neighboring subcarriers. The subcarriers holding the SFBC components of each codeword are separated by a number of subcarriers larger than the ICI range, and hence, they do not interfere with each other. To preserve the structure of the SFBC, the separation between the codeword components is also selected within the coherence bandwidth of the channel. As a result, the diversity gain of the SFBC is preserved. By proper selection of the pilot locations, each OFDM symbol can be divided into subsymbols that can be decoded independently. We show that the proposed windowing technique allows the use of decision feedback equalization to estimate the data transmitted in each subsymbol with low complexity. Simulation results are presented showing the ability of the proposed scheme to significantly improve the performance of SFBC-OFDM and preserve its diversity gain. © 2013 IEEE.
Parallelizing exact motif finding algorithms on multi-core

Authors
Abbas M.M., Bahig H.M., Abouelhoda M., Mohie-Eldin M.M.

Abstract
The motif finding problem is one of the important and challenging problems in bioinformatics. A variety of sequential algorithms have been proposed to find exact motifs, but the running time is still not suitable due to high computational complexity of finding motifs. In this paper we parallelize three efficient sequential algorithms which are HEPPMSprune, PMS5 and PMS6. We implement the algorithms on a Dual Quad-Core machine using openMP to measure the performance of each algorithm. Our experiment on simulated data show that: (1) the parallel PMS6 is faster than the other algorithms in case of challenging instances, while the parallel HEPPMSprune is faster than the other algorithms in most of solvable instances; (2) the scalability of parallel HEPPMSprune is linear for all instances, while the scalability of parallel PMS5 and PMS6 is linear in case of challenging instances only; (3) the memory used by HEPPMSprune is less than that of the other algorithms. © 2014, Springer Science+Business Media New York.
Practical distributed computation of maximal exact matches in the cloud

Authors
El-Din S.S., Aboelhoda M.

Abstract
Computation of maximal exact matches (MEMs) is an important problem in comparing genomic sequences. Optimal sequential algorithms for computing MEMs have been already introduced and integrated in a number of software tools. To cope with large data and exploit new computing paradigms like cloud computing, it is important to develop efficient and ready-to-use solutions running on distributed parallel architecture. In a previous work, we have introduced a distributed algorithm running on a computer cluster for computing the MEMs. In this paper, we extend this work in two directions: First, we introduce new variants of this algorithm; one of them has a better time complexity than the published one. These variants as we will demonstrate by experiments are faster in practice. Second, we introduce a cloud based implementation, where we automate the process of creating and configuring the cluster, submitting the jobs, and finally collecting the results and terminating the cloud machines. © 2014 IEEE.
Year: 2014

Proactive scheduling for content pre-fetching in mobile networks

Authors
Shoukry O., Elmohsen M.A., Tadrous J., Gamal H.E., Elbatt T., Wanas N., Elnakieb Y., Khairy M.

Abstract
The global adoption of smart phones has raised major concerns about a potential surge in the wireless traffic due to the excessive demand on multimedia services. This ever increasing demand is projected to cause significant congestions and degrade the quality of service for network users. In this paper, we develop a proactive caching framework that utilizes the predictability of the mobile user behavior to offload predictable traffic through the WiFi networks ahead of time. First, we formulate the proactive scheduling problem with the objective of maximizing the user-content hit ratio subject to constrains stemming from the user behavioral models. Second, we propose a quadratic-complexity (in the number of slots per day) greedy, yet, high performance heuristic algorithm that pinpoints the best download slot for each content item to attain maximal hit ratio. We confirm the merits of the proposed scheme based on the traces of a real dataset leveraging a large number of smart phone users who consistently utilized our framework for two months. © 2014 IEEE.
Probabilistic band-splitting for a buffered cooperative cognitive terminal

Authors
Shafie A.E., Sultan A., Khattab T.

Abstract
In this paper, we propose a cognitive protocol that involves cooperation between the primary and secondary users. In addition to its own queue, the secondary user (SU) has a queue to store, and then relay, the undelivered primary packets. When the primary queue is nonempty, the SU remains idle and attempts to decode the primary packet. When the primary queue is empty, the SU splits the total channel bandwidth into two orthogonal subbands and assigns each to a queue probabilistically. We show the advantage of the proposed protocol over the prioritized cognitive relaying (PCR) protocol in which the SU assigns a priority in transmission to the primary packets over its own packets. We present two problem formulations, one based on throughput and the other on delay. Both optimization problems are shown to be linear programs for a given bandwidth assignment. Numerical results demonstrate the benefits of the proposed protocol. © 2014 IEEE.
Protocol design and stability analysis of cooperative cognitive radio users

Authors
Shafie A.E., Khattab T., Poor H.V.

Abstract
A single cognitive radio transmitter-receiver pair shares the spectrum with two primary users communicating with their respective receivers. Each primary user has a local traffic queue, whereas the cognitive user has three queues; one storing its own traffic while the other two are relaying queues used to store primary relayed packets admitted from the two primary users. A new cooperative cognitive medium access control protocol for the described network is proposed, where the cognitive user exploits the idle periods of the primary spectrum bands. Traffic arrival to each relaying queue is controlled using a tuneable admittance factor, while relaying queues service scheduling is controlled via channel access probabilities assigned to each queue based on the band of operation. The stability region of the proposed protocol is characterized shedding light on its maximum expected throughput. Numerical results demonstrate the performance gains of the proposed cooperative cognitive protocol. © 2014 IEEE.
Year: 2014

Radiation hybrid map of buffalo chromosome 7 detects a telomeric inversion compared to cattle chromosome 6

Authors

Abstract
[No abstract available]
Real-time vehicle detection and tracking using haar-like features and compressive tracking

Abstract
This paper presents a real-time vision framework that detects and tracks vehicles from stationary camera. It can be used to calculate statistical information such as average traffic speed and flow as well as in surveillance tasks. The framework consists of three main stages. Vehicles are first detected using Haar-like features. In the second phase, an adaptive appearance-based model is built to dynamically keep track of the detected vehicles. This model is also used in the third phase of data association to fuse the detection and tracking results. The use of detection results to update the tracker enhances the overall framework accuracy. The practical value of the proposed framework is demonstrated in real-life experiments where it is used to robustly compute vehicle counts within certain region of interest under variety of challenges. © Springer International Publishing Switzerland 2014.
Resistorless memristor based oscillator

Authors
ElSamman A., Radwan A., Madian A.

Abstract
This paper introduces the replacement of four and six resistors with four and six memristors at the same time for the modified single input Op-Amps oscillator. The full independency between the oscillation condition and the oscillation frequency facilitates the study. Mathematical analysis is provided for the double replacement of resistors with memristors. The whole range of operation of the memristor is taken in consideration and examined for all kind of replacements. Also, the poles of the system are presented while the existence of two, four and six memristors. © 2014 IEEE.
Robust scale-invariant object tracking

Authors
Salaheldin A., Elkerdawi S.M., Elhelw M.

Abstract
Tracking by detection methods are becoming increasingly popular in recent years. They use samples classified in previous frames to detect object in a new frame. These methods have shown successful results. However, due to the self updating nature of this approach, tracking by detection methods usually suffer from object drift. Inaccurately detected samples are added to the training set which degrades the performance. Another problem is that the object may change in shape and size which increases the potential for inaccurate detection and subsequently the chance of losing the object. We propose a robust object tracking algorithm that adapts to changes in the size of the object. The algorithm is divided into two steps. The first step uses random projections compressed using a sparse matrix to describe positive and negative samples generated around the object. These samples are used to train a classifier to detect the position of the object in the next frame. The second step searches for the best size to fit the object around the position chosen in the first step. Experimental results show that our method provides robust tracking and help alleviate the drift problems. © Springer International Publishing Switzerland 2014.
Scale-adaptive object tracking with diverse ensembles

Authors
Elkerdawy S., Eldesokey A., Salaheldin A., ElHelw M.

Abstract
Tracking by detection techniques have recently been gaining increased attention in visual object tracking due to their promising results in applications such as robotics, surveillance, traffic monitoring, to name a few. These techniques often employ semi-supervised appearance model where a set of samples are continuously extracted around the object to train a discriminant classifier between the object and the background whereas real-time performance is attained by using reduced object representations as in the case of the compressive tracking algorithm. However, because they rely on self-updating, visual tracking algorithms are prone to visual drift especially when the object undergoes significant scale changes. In this paper, we present a real-time visual tracker that is adaptive to appearance and scale variations. The algorithm is divided into two phases: (1) object localization using a diverse ensemble of multiple random projections, and (2) scale estimation between an updated object template and the localized object position computed in the first phase. Experimental results obtained with publicly-available visual tracking datasets demonstrate that the proposed tracker provides robust tracking in case of significant scale variations with more accurate overlap and less visual drift. © Springer International Publishing Switzerland 2014.
Simple floating voltage-controlled memductor emulator for analog applications

Authors
Fouda M.E., Radwan A.G.

Abstract
The topic of memristive circuits is a novel topic in circuit theory that has become of great importance due to its unique behavior which is useful in different applications. But since there is a lack of memristor samples, a memristor emulator is used instead of a solid state memristor. In this paper, a new simple floating voltage-controlled memductor emulator is introduced which is implemented using commercial off the shelf (COTS) realization. The mathematical modeling of the proposed circuit is derived to match the theoretical model. The proposed circuit is tested experimentally using different excitation signals such as sinusoidal, square, and triangular waves showing an excellent matching with previously reported simulations.
Space-time coding for an energy harvesting cooperative secondary terminal

Authors
El Shafie A.

Abstract
In this letter, we consider a cognitive scenario where an energy harvesting secondary user (SU) shares the channel with a primary user (PU). The SU is equipped with two antennas. It maintains a finite capacity energy queue and two infinite capacity data queues: one for storing its own data packets and the other for storing the primary undelivered data packets. The PU communicates with its destination whenever it has data at its queue head. During idle sessions of the PU, if the secondary energy queue maintains at least $\kappa$ packets, the SU employs the Alamouti coding scheme over two of its data packets. The optimization problem for secondary throughput maximization is stated under the stability of all queues in the network and a specific end-to-end queueing delay for the primary packets. © 2014 IEEE.
Spectral current-voltage analysis of kesterite solar cells

Authors
Buffière M., Brammertz G., Oueslati S., El Anzeery H., Bekaert J., Messaoud K.B., Köble C., Khelifi S., Meuris M., Poortmans J.

Abstract
Current-voltage analysis using different optical band pass filters has been performed on Cu2ZnSnSe4 and Cu2ZnSn(S,Se)4 thin-film solar cells. When using red or orange light (i.e. wavelengths above 600 nm), a distortion appears in the I-V curve of the Cu2ZnSnSe4 solar cell, indicating an additional potential barrier to the current flow in the device for these conditions of illumination. This barrier is reduced when using a Cu2ZnSn(S,Se)4 absorber. Numerical simulations demonstrate that the barrier visible under red light could be explained by a positive conduction band offset at the front interface coupled with compensating defects in the buffer layer. © 2014 IOP Publishing Ltd.
Year: 2014

Spectrum-aggregating cognitive multi-antenna user with multiple primary users

Authors
El Shafie A., Khattab T.

Abstract
We investigate a cognitive radio scenario involving a single cognitive transmitter equipped with K antennas sharing the spectrum with M primary users (PUs) transmitting over orthogonal bands. Each terminal has a queue to store its incoming traffic. We propose a novel protocol where the cognitive user transmits its packet over a channel formed by the aggregate of the inactive primary bands. We study the impact of the number of PUs, sensing errors, and the number of antennas on the maximum secondary stable throughput. © 2014 IEEE.
The quest for user similarity in mobile societies

Authors
Elsherief M., Elbatt T., Zahran A., Helmy A.

Abstract
In this paper we explore the notion of mobile users' similarity as a key enabler of innovative applications hinging on opportunistic mobile encounters. In particular, we analyze the performance of known similarity metrics, applicable to our problem domain, as well as propose a novel temporal-based metric, in an attempt to quantify the inherently qualitative notion of similarity. Towards this objective, we first introduce generalized profile structures, beyond mere location, that aim to capture users' interests and prior experiences, in the form of a probability distribution. Afterwards, we analyze known and proposed similarity metrics for the proposed profile structures using publicly available data. Apart from the classic Cosine similarity, we identify a distance metric from probability theory, namely Hellinger distance, as a strong candidate for quantifying similarity due to the probability distribution structure of the proposed profiles. In addition, we introduce a novel temporal similarity metric, based on matrix vectorization, to capitalize on the richness in the temporal dimension and maintain low complexity. Finally, the numerical results unveil a number of key insights. First, the temporal metrics yield, on the average, lower similarity indices, compared to the non-temporal ones, due to incorporating the dynamics in the temporal dimension. Second, the Hellinger distance holds great promise for quantifying similarity between probability distribution profiles. Third, vectorized metrics constitute a low-complexity approach towards temporal similarity on resource-limited mobile devices. © 2014 IEEE.
Throughput maximization via adjusting packet size of a buffered cognitive radio user

Authors
Shafie A.E., Khattab T.

Abstract
In this paper, we investigate a cognitive scenario with one secondary user and one primary user. Users are assumed to be buffered terminals. Each user has certain arrival rate with certain packet size. We propose a scheme where the cognitive radio user (secondary user) may combine some of the arrived packets into a single larger packet or split each of them into smaller packets to increase its maximum mean stable arrival rate. We consider sensing errors and study two channel models; namely, collision channel model, where concurrent transmissions cause definite packets loss, and multi-packet reception channel model, where packet could survive from interference if the received signal-to-interference-and-noise-ratio is greater than a certain threshold. When the channel is a collision channel, the objective function of the optimization problem which characterizes the stability region is shown to be log-concave. The optimization problem can be easily converted to a concave program that can be solved efficiently and reliably. When the channel is a multi-packet channel model, the problem is a simple grid search over the divisors and multiples of the original packets size. The results show the gains of the proposed technique and demonstrate its ability to alleviate the sensing errors’ negative impact on the secondary stable throughput. © 2014 IEEE.
Towards cloud customers self-monitoring and availability-monitoring

Authors
Hussein S., Abdelbaki N.

Abstract
As an attractive IT environment, Cloud Computing represents a good enough paradigm which governments, national entities, small/medium/large organizations and companies want to migrate to. In fact, outsourcing IT related services to Cloud technology, needs monitoring and controlling mechanisms. However, Cloud Customers cannot fully rely on the Cloud Providers measurements, reports and figures. In this book chapter, we cover the two Cloud Computing operation sides. For the first operation side, we provide advices and guidelines for Cloud layers which can be under Cloud Customer control, to allow Cloud Customer contributes in Cloud infrastructure monitoring and controlling. For second operation side, we produce our developed monitoring tool, to allow Cloud Customer contributes in service monitoring. It is for Cloud Customers to self-monitor the Availability as a metric of the outsourced IT service. © Springer-Verlag Berlin Heidelberg 2014.
Year: 2014

Towards energy efficient relay placement and load balancing in future wireless networks

Authors
Lateef H.Y., Chiasserini C.F., Elbatt T., Mohamed A., Guizani M.

Abstract
This paper presents an energy efficient relay deployment algorithm that determines the optimal location and number of relays for future wireless networks, including Long Term Evolution (LTE)-Advanced heterogeneous networks. We formulate an energy minimization problem for macro-relay heterogeneous networks as a Mixed Integer Linear Programming (MILP) problem. The proposed algorithm not only optimally connects users to either relays or eNodeBs (eNBs), but also allows eNBs to switch into inactive mode. This is possible by enabling relay-to-relay communication which forms the basis for relays to act as donors for neighboring relays instead of eNBs. Moreover, it relaxes traffic load of some eNBs in order to allow them to enter the inactive mode. We characterize the optimal as well as provide an approximate solution, which, however, performs very closely to the optimum. Our performance evaluation shows that an optimal relay deployment with relays acting as donors can significantly improve system energy efficiency. © 2014 IEEE.
Using the sadakane compressed suffix tree to solve the all-pairs suffix-prefix problem

Authors
Haj Rachid M., Malluhi Q., Abouelhoda M.

Abstract
The all-pairs suffix-prefix matching problem is a basic problem in string processing. It has an application in the de novo genome assembly task, which is one of the major bioinformatics problems. Due to the large size of the input data, it is crucial to use fast and space efficient solutions. In this paper, we present a space-economical solution to this problem using the generalized Sadakane compressed suffix tree. Furthermore, we present a parallel algorithm to provide more speed for shared memory computers. Our sequential and parallel algorithms are optimized by exploiting features of the Sadakane compressed index data structure. Experimental results show that our solution based on the Sadakane's compressed index consumes significantly less space than the ones based on noncompressed data structures like the suffix tree and the enhanced suffix array. Our experimental results show that our parallel algorithm is efficient and scales well with increasing number of processors. © 2014 Maan Haj Rachid et al.
VAFLE: Visual analytics of firewall log events

Authors
Ghoniem M., Shurkhovetskyy G., Bahey A., Otjacques B.

Abstract
In this work, we present VAFLE, an interactive network security visualization prototype for the analysis of firewall log events. Keeping it simple yet effective for analysts, we provide multiple coordinated interactive visualizations augmented with clustering capabilities customized to support anomaly detection and cyber situation awareness. We evaluate the usefulness of the prototype in a use case with network traffic datasets from previous VAST Challenges, illustrating its effectiveness at promoting fast and well-informed decisions. We explain how a security analyst may spot suspicious traffic using VAFLE. We further assess its usefulness through a qualitative evaluation involving network security experts, whose feedback is reported and discussed. © 2014 SPIE-IS&T.
2DHOOF-2DPCA contour based optical flow algorithm for human activity recognition

Authors
Fawzy F., Abdelwahab M.M., Mikhael W.

Abstract
A novel algorithm for human activity recognition is presented in this paper. This approach is based on a new 2D representation for the Histogram of Oriented Optical Flow (2DHOOF) describing the motion of the actor's contour, where one multi-layer 2D-histogram per video is constructed. Each histogram layer consists of 2D bins (layers) that represent different range of angles. Applying our 2DHOOF features descriptors on the actor's contour reduces the storage requirement and the computation complexity since a sparse optical flow is calculated instead of dense optical flow. In addition, it is robust to variations in the background, actor's appearance, and imperfections in actor's contour. This new 2D representation allows the usage of the Two Dimensional Principle Component Analyses (2DPCA) which maintains the spatial relation of the motion, and provides further high accuracy and low computation complexity. Experimental results applied on the Weizmann and IXMAS datasets achieved the highest reported recognition accuracy and the fastest runtime compared to recent methods. © 2013 IEEE.
A 2.5 μwatts two stage wake-up receiver for Wireless Sensor Networks

Authors
Shabayek S., Medra A., Guindi R.

Abstract
An ultra low power wake-up receiver for Wireless Sensor Network (WSN) applications is presented. The proposed wake-up receiver is composed of two stages. The first stage is a low-power low-sensitivity stage that acts as a 'sentinel' and continuously monitors the channel, while the second stage is a conventional low-power wake-up receiver. The 2.44GHz two-stage receiver has a sensitivity of -72dBm when the transmitted signal power is 0dBm. The power consumed during sleep mode is 2.5μWatts and 41μWatts in the wake-up receiver active mode with a 0.5V supply voltage. The power consumption is nearly one order-of-magnitude below previously published wake-up receiver designs for WSNs. © 2013 IEEE.
A cooperative Q-learning approach for online power allocation in femtocell networks

Authors
Saad H., Mohamed A., Elbatt T.

Abstract
In this paper, we address the problem of distributed interference management of cognitive femtocells that share the same frequency range with macrocells using distributed multiagent Q-learning. We formulate and solve three problems representing three different Q-learning algorithms: namely, centralized, femto-based distributed and subcarrier-based distributed power control using Q-learning (CPC-Q, FBDPC-Q and SBDPCQ). CPC-Q, although not of practical interest, characterizes the global optimum. Each of FBDPC-Q and SBDPC-Q works in two different learning paradigms: Independent (IL) and Cooperative (CL). The former is considered the simplest form for applying Q-learning in multi-agent scenarios, where all the femtocells learn independently. The latter is the proposed scheme in which femtocells share partial information during the learning process in order to strike a balance between practical relevance and performance. In terms of performance, the simulation results showed that the CL paradigm outperforms the IL paradigm and achieves an aggregate femtocells capacity that is very close to the optimal one. For the practical relevance issue, we evaluate the robustness and scalability of SBDPC-Q in real time, by deploying new femtocells in the system during the learning process, where we showed that SBDPC-Q in the CL paradigm is scalable to large number of femtocells and more robust to the network dynamics compared to the IL paradigm. Copyright © 2013 by the Institute of Electrical and Electronic Engineers, Inc.
A corpus based approach for the automatic creation of Arabic broken plural dictionaries

Authors
El-Beltagy S.R., Rafea A.

Abstract
Research has shown that Arabic broken plurals constitute approximately 10% of the content of Arabic texts. Detecting Arabic broken plurals and mapping them to their singular forms is a task that can greatly affect the performance of information retrieval, annotation or tagging tasks, and many other text mining applications. It has been reported that the most effective way of detecting broken plurals is through the use of dictionaries. However, if the target domain is a specialized one, or one for which there are no such dictionaries, building those manually becomes a tiresome, not to mention expensive task. This paper presents a corpus based approach for automatically building broken plural dictionaries. The approach utilizes a set of rules for mapping broken plural patterns to their candidate singular forms, and a corpus based co-occurrence statistic to determine when an entry should be added to the broken plural dictionary. Evaluation of the approach has shown that it is capable of creating dictionaries with high levels of precision and recall. © 2013 Springer-Verlag.
A feedback-soft sensing-based access scheme for cognitive radio networks

Authors
Arafa A.M., Seddik K.G., Sultan A.K., Elbatt T., El-Sherif A.A.

Abstract
In this paper, we examine a cognitive spectrum access scheme in which secondary users exploit the primary feedback information. We consider an overlay secondary network employing a random access scheme in which secondary users access the channel by certain access probabilities that are functions of the spectrum sensing metric. In setting our problem, we assume that secondary users can eavesdrop on the primary link's feedback. We study the cognitive radio network from a queuing theory point of view. Access probabilities are determined by solving a secondary throughput maximization problem subject to a constraint on the primary queues' stability. First, we formulate our problem which is found to be non-convex. Yet, we solve it efficiently by exploiting the structure of the secondary throughput equation. Our scheme yields improved results in, both, the secondary user throughput and the primary user packet delay as compared to the scheme where no feedback information is exploited. In addition, it comes very close to the optimal genie-aided scheme in which secondary users act upon the presumed perfect knowledge of the primary users' activity. © 2013 IEEE.
Year: 2013

A novel 10-Bit high-throughput two-stage TDC with reduced power and improved linearity

Authors
Abdelmejeed M., Guindi R., Abdel-Moneum M.

Abstract
This paper introduces a new architecture that improves the throughput of the two-stage Time to Digital Converter (TDC). An oscillator-based TDC is used for conversion. The time residue from the first stage is generated directly after the stop signal is asserted and saved in the form of phase-shift between two oscillating signals. Instead of using two stages, an asynchronous control block is implemented to reuse the same hardware block for both the first and second conversion stages. This technique not only reduces power and area, but also eliminates the TDC nonlinearity due to the mismatch between the two stages. A throughput of 400 MS/s for a 10bit resolution, a time resolution of 2.6 ps, a DNL of 0.38, and an INL of 0.402 are achieved. © 2013 IEEE.
A novel high throughput high resolution two-stage oscillator-based TDC

Authors
Abdelmejeed M., Guindi R., Abdel-Moneum M.

Abstract
This paper presents a new technique to reduce the conversion time, hence improve the throughput, of the two-stage Time to Digital Converter (TDC) architecture. An oscillator based TDC is used in the first and second stages. The time residue from the first stage is generated directly after the stop signal is asserted and saved in the form of phase-shift between two oscillating signals. A throughput of 400 MS/s, a DNL of 0.38, and an INL of 0.36 are achieved. © 2013 IEEE.
A novel proximity based trust model for opportunistic networks

Authors
El-Sherief M.H., Azer M.A.

Abstract
Trust should be earned. This is a famous quote that we use everyday implicitly or explicitly. Trust often is an inherent characteristic of our daily life, but in the digital community and between devices how can we represent trust? Since our mobile and digital devices became our confidants, we cannot share the information embedded in these devices with other devices without establishing trust. Hence, in this research a proximity based trust model based on Homophily principle is proposed. Earlier social studies have shown that people tend to have similarities with others in close proximity. In such clustered communities of interest people tend to communicate, socialize and potentially trust each other. In this paper, a novel proximity based trust model is built taking into consideration different aspects like cooperation or unselfishness, honesty, similarity and Activity. © 2013 IEEE.
Year: 2013

A novel stochastic geometrical model for wideband MIMO-V2V channels

Authors
Elmoslimany A., El-Keyi A., Mohasseb Y.

Abstract
In this paper, we present a novel wideband multiple-input multiple-output Vehicle-to-Vehicle channel model. The proposed channel model is derived using the geometrical elliptical scattering approach. In order to emulate the appearance and disappearance of scatterers (vehicles, terrain, roadside units, etc.) in the environment, we associate a persistence process with each physical scatterer in the model. The parameters of the proposed model can be tuned to represent a variety of vehicular environments. We also derive the temporal and spatial correlation functions of the channel coefficients. Channel measurements and numerical examples are presented to provide more insight into the model and the physical interpretation of its parameters. © 2013 IEEE.
A system for assessing the quality of Web pages

Authors
Mohammed W.I., El-Beltagy S.R.

Abstract
The World Wide Web has brought about an unprecedented explosion in the amount of information available on-line, largely in the form of Web pages. The fact that anyone can publish anything has ultimately led to pages with varying degrees of quality. This paper aims at investigating means for assessing the quality of a random web page and provides a quantitative approach for selecting high quality-content pages. The work was motivated by the need to locate pages that may be considered as candidates for translation. © 2013 IEEE.
Ab initio density functional theory investigation of the interaction between carbon nanotubes and water molecules during water desalination Process

Authors
Elalfy L.A., Hassan W.M.I., Akl W.N.

Abstract
Density functional theory calculations using B3LYP/3-21G level of theory have been implemented on 6 carbon nanotubes (CNTs) structures (3 zigzag and 3 armchair CNTs) to study the energetics of the reverse osmosis during water desalination process. Calculations of the band gap, interaction energy, highest occupied molecular orbital, lowest unoccupied molecular orbital, electronegativity, hardness, and pressure of the system are discussed. The calculations showed that the water molecule that exists inside the CNT is about 2-3 Å away from its wall. The calculations have proven that the zigzag CNTs are more efficient for reverse osmosis water desalination process than armchair CNTs as the reverse osmosis process requires pressure of approximately 200 MPa for armchair CNTs, which is consistent with the values used in molecular dynamics simulations, while that needed when using zigzag CNTs was in the order of 60 MPa. © 2013 Loay A. Elalfy et al.
Accurate timing analysis of combinational logic cells engine using adaptive technique based on current source model

Authors

Abstract
As the usage of very large scale integration (VLSI) in computers continues to increase, debugging of timing problems on actual hardware becomes more and more difficult. The post-layout gate-level simulation constitutes a critical design step for timing closure. The major drawback of traditional post-layout gate-level simulation is its long analysis time, which increases as design complexity increases. An alternative method is static timing analysis (STA), which can reduce analysis time. Going deeper through the nanometer technology, new STA techniques have to be present to provide more accurate results for cell delay models characterization. New STA techniques now go for current source based models (CSM) which are based on modeling MOSFETs as trans-conductance. In this paper, a SW engine is presented and used to perform a comparison on accuracy and speed between the default STA technique based on library lookup tables (LUT) and a proposed CSM-based technique for combinational logic cells. Moreover, an adaptive technique, which is based on utilizing both the LUT and CSM methods, is presented. The adaptive technique uses the method with the more accurate delay results when solving for circuits combined of NAND2X0, NOR2X0 and INVX0 standard cells. Also, provides the calculation for some metrics like (arrival time and slack delay values at each node in the combinational circuit). © 2013 IEEE.
Achievable secrecy rate regions for the two-way wiretap channel

Authors
El Gamal A., Koyluoglu O.O., Youssef M., El Gamal H.

Abstract
The two-way wiretap channel is considered in this paper. Two legitimate users, Alice and Bob, wish to exchange messages securely in the presence of a passive eavesdropper Eve. In the full-duplex scenario, where each node can transmit and receive simultaneously, new achievable secrecy rate regions are obtained based on the idea of allowing the two users to jointly optimize their channel prefixing distributions and binning codebooks in addition to key sharing. The new regions are shown to be strictly larger than the known ones for a wide class of discrete memoryless and Gaussian channels. In the half-duplex case, where a user can only transmit or receive on any given degree of freedom, the idea of randomized scheduling is introduced and shown to offer a significant gain in terms of the achievable secrecy sum-rate. A practical setup is further developed based on a near field wireless communication scenario, and it is shown that one can exploit the two-way nature of the communication, via appropriately randomizing the transmit power levels and transmission schedule, to introduce significant ambiguity at a noiseless Eve. © 1963-2012 IEEE.
Alternate relaying and the degrees of freedom of one-way cellular relay networks

Authors
Salah A., El-Keyi A., Nafie M.

Abstract
In this paper, a cellular relaying network consisting of two source-destination pairs, and four decode-and-forward relays operating in half-duplex mode is considered. Each source is assisted by two relays and all nodes are equipped with N antennas. In order to compensate for the loss of capacity by a factor of half due to the half-duplex mode, an alternate transmission protocol among the two relays is proposed. An outer bound on the degrees of freedom (DoF) of this system is developed. A constructive proof of achievability based on two different schemes is provided. Aligning the inter-relay interference due to alternate transmission and the interference received at the destination nodes is utilized to achieve the maximum DoF and recover the pre-log factor loss. For the K-user case, it is shown that the resulting system of interference alignment equations is proper when the number of streams transmitted by each source is less than or equal to 2(K3N;1). Numerical simulations show that for proper systems these DoF are achievable. © 2013 IEEE.
Amplitude modulation and synchronization of fractional-order memristor-based Chua's circuit

Authors
Radwan A.G., Moaddy K., Hashim I.

Abstract
This paper presents a general synchronization technique and an amplitude modulation of chaotic generators. Conventional synchronization and antisynchronization are considered a very narrow subset from the proposed technique where the scale between the output response and the input response can be controlled via control functions and this scale may be either constant (positive, negative) or time dependent. The concept of the proposed technique is based on the nonlinear control theory and Lyapunov stability theory. The nonlinear controller is designed to ensure the stability and convergence of the proposed synchronization scheme. This technique is applied on the synchronization of two identical fractional-order Chua's circuit systems with memristor. Different examples are studied numerically with different system parameters, different orders, and with five alternative cases where the scaling functions are chosen to be positive/negative and constant/dynamic which covers all possible cases from conventional synchronization to the amplitude modulation cases to validate the proposed concept. © 2013 A. G. Radwan et al.
An approach for deriving semantically related category hierarchies from Wikipedia category graphs

Authors
Hejazy K.A., El-Beltagy S.R.

Abstract
Wikipedia is the largest online encyclopedia known to date. Its rich content and semi-structured nature has made it into a very valuable research tool used for classification, information extraction, and semantic annotation, among others. Many applications can benefit from the presence of a topic hierarchy in Wikipedia. However, what Wikipedia currently offers is a category graph built through hierarchical category links the semantics of which are un-defined. Because of this lack of semantics, a sub-category in Wikipedia does not necessarily comply with the concept of a sub-category in a hierarchy. Instead, all it signifies is that there is some sort of relationship between the parent category and its sub-category. As a result, traversing the category links of any given category can often result in surprising results. For example, following the category of "Computing" down its sub-category links, the totally unrelated category of "Theology" appears. In this paper, we introduce a novel algorithm that through measuring the semantic relatedness between any given Wikipedia category and nodes in its sub-graph is capable of extracting a category hierarchy containing only nodes that are relevant to the parent category. The algorithm has been evaluated by comparing its output with a gold standard data set. The experimental setup and results are presented. © 2013 Springer-Verlag.
Building a system to extract Arabic named entities is a complex task due to the ambiguity and structure of Arabic text. Previous approaches that have tackled the problem of Arabic named entity recognition relied heavily on Arabic parsers and taggers combined with a huge set of gazetteers and sometimes large training sets to solve the ambiguity problem. But while these approaches are applicable to modern standard Arabic (MSA) text, they cannot handle colloquial Arabic. With the rapid increase in online social media usage by Arabic speakers, it is important to build an Arabic named entity recognition system that deals with both colloquial Arabic and MSA text. This paper introduces an approach for extracting Arabic persons' name without utilizing any Arabic parsers or taggers. Evaluation of the presented approach shows that it achieves high precision and an acceptable level of recall on a benchmark dataset. © 2013 Springer-Verlag Berlin Heidelberg.
Characterization of defects in 9.7% efficient Cu2ZnSnSe4-CdS-ZnO solar cells

Authors
Brammertz G., Buffière M., Oueslati S., Elanjeery H., Ben Messaoud K., Sahayaraj S., Köble C., Meuris M., Poortmans J.

Abstract
We have fabricated Cu2ZnSnSe4-CdS-ZnO solar cells with a total area efficiency of 9.7%. The absorber layer was fabricated by selenization of sputtered Cu10Sn90, Zn, and Cu multilayers. A large ideality factor of the order of 3 is observed in both illuminated and dark IV-curves, which seems to point in the direction of complex recombination mechanisms such as recombination through fluctuating potentials in the conduction and valence bands of the solar cell structure. A potential barrier of about 135 meV in the device seems to be responsible for an exponential increase of the series resistance at low temperatures, but at room temperature, the effect of this barrier remains relatively small. The free carrier density in the absorber is of the order of 1015 cm⁻³ and does not vary much as the temperature is decreased. © 2013 AIP Publishing LLC.
Cognitive radio transmission strategies for primary erasure channels

Authors
Elsamadony A., Nafie M., Sultan A.

Abstract
A fundamental problem in cognitive radio systems is that the secondary user is ignorant of the primary channel state and the interference it inflicts on the primary license holder. We consider a secondary user that can eavesdrop on the ACK/NACK Automatic Repeat reQuest (ARQ) fed back from the primary receiver to the primary transmitter. Assuming the primary channel states follow a Markov chain, this feedback gives the secondary user an indication of the primary channel quality. Based on the ACK/NACK received, we devise optimal transmission strategies for the secondary user so as to maximize a weighted sum of primary and secondary throughput. We fully characterize an optimal achievable scheme that spans the boundary of the primary-secondary rate region for a two state erasure primary channel. Our scheme maximizes a weighted sum of primary and secondary throughput. The actual weight used during network operation is determined by the degree of protection afforded to the primary channel. Moreover, we study a three-state model where we derive the optimal transmission strategy using dynamic programming. © 2013 IEEE.
Configurable low complexity decoder architecture for Quasi-Cyclic LDPC codes

Authors
Zied S.A., Sayed A.T., Guindi R.

Abstract
In this paper, we present a fully pipelined QC-LDPC decoder for 802.11n standard that supports variable block sizes and multiple code rates. The proposed architecture utilizes features of Quasi-Cyclic LDPC codes and layered decoding to reduce memory bits and interconnection complexity through efficient utilization of permutation network for forward and backward interconnection routing. Permutation network reorganization and small check node granularity reduced the overall resources required for routing, thus reducing the overall decoder dynamic power consumption. Proposed architecture has been synthesized using Virtex-6 FPGA and achieved 19% reduction in dynamic power consumption, 5% less logic resources and 12% increase in throughput. © 2013 IEEE.
Year: 2013

Content based image retrieval of diabetic macular edema images

Authors
Naguib A.M., Ghanem A.M., Fahmy A.S.

Abstract
Colour fundus images play an important role in diagnosing and screening diabetic macular edema (DME). In rural areas, content-based image retrieval (CBIR) might compensate the lack of expert ophthalmologists. In this work, we present a fully automated CBIR system that retrieves fundus images according to their content (quantity and location) of exudates. First, the macula is divided into three concentric regions whose texture discontinuities are used to represent lesion content of the retina. The image-to-image distance measure gives higher weights to lesions closer to the fovea to reflect the severity of the DME. Retrieval results of the system show precision of 79.2%. © 2013 IEEE.
Content-based image retrieval of diabetic macular edema images

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Colour fundus images play an important role in diagnosing and screening diabetic macular edema (DME). In rural areas, content-based image retrieval (CBIR) might compensate the lack of expert ophthalmologists. In this work, we present a fully automated CBIR system that retrieves fundus images according to their content (quantity and location) of exudates. First, the macula is divided into three concentric regions whose texture discontinuities are used to represent lesion content of the retina. The image-to-image distance measure gives higher weights to lesions closer to the fovea to reflect the severity of the DME. Retrieval results of the system show precision of 79.2%. © 2013 IEEE.


title: Coverage probability analysis for wireless networks using repulsive point processes
authors: Ibrahim A.M., ElBatt T., El-Keyi A.

Abstract
The recent witnessed evolution of cellular networks from a carefully planned deployment to more irregular, heterogeneous deployments of Macro, Pico and Femto-BSs motivates new analysis and design approaches. In this paper, we analyze the coverage probability in cellular networks assuming repulsive point processes for the base station deployment. In particular, we characterize, analytically using stochastic geometry, the downlink probability of coverage under a Matern hardcore point process to ensure minimum distance between the randomly located base stations. Assuming a mobile user connects to the nearest base station and Rayleigh fading, we derive two lower bounds expressions on the downlink probability of coverage that is within 4% from the simulated scenario. To validate our model, we compare the probability of coverage of the Matern hardcore topology against an actual base station deployment obtained from a public database. The comparison shows that the actual base station deployment can be fitted by setting the appropriate Matern point process density. © 2013 IEEE.

Nile University
جامعة النيل
Creating an innovative generic virtual learning lab

Authors
Gaber A., Naseef O.A., Abdelbaki N.

Abstract
The use of multimedia technology and gamification has offered an alternative way of delivering information in education. Interactive Multimedia has the potential to revolutionize the way we work, learn and communicate. With gamification and interactive multimedia, the learning process becomes active, not passive and it ensures that users are doing, not simply watching. Also the Laboratory has a great role in enhancing students' skills as it is a vital environment of a variety of activities and experiments in which science is delivered. In this paper we introduce our concept of designing a Generic Virtual Lab (GVL) and its architecture. GVL is an interactive learning environment to be used mainly by children or students of ages 8-15 to increase their understanding of some difficult subjects. It is a comprehensive easy-to-use architecture that also enables teachers to create labs and experiments in different fields and subjects to ease the way of education. © 2013 IEEE.
Year: 2013

Cross-layer minimum-delay scheduling and maximum-throughput resource allocation for multiuser cognitive networks

Authors
Saleh G., El-Keyi A., Nafie M.

Abstract
A cognitive network is considered that consists of a base station (BS) communicating with multiple primary and secondary users. Each secondary user can access only one of the orthogonal primary channels. A model is considered in which the primary users can tolerate a certain average delay. A special case is also considered in which the primary users do not suffer from any delay. A novel cross-layer scheme is proposed in which the BS performs successive interference cancellation and thus a secondary user can coexist with an active primary user without adversely affecting its transmission. A scheduling algorithm is proposed that minimizes the average packet delay of the secondary user under constraints on the average power transmitted by the secondary user and the average packet delay of the primary user. A resource allocation algorithm is also proposed to assign the secondary users' channels such that the total throughput of the network is maximized. Our results indicate that the network throughput increases significantly by increasing the number of transmitted packets of the secondary users and/or by allowing a small delay for the primary user packets. © 2002-2012 IEEE.
Year: 2013

**Current source based standard-cell model for accurate timing analysis of combinational logic cells**

**Authors**
Mahmoud M., Wassal A., El-Rouby A., Guindi R.

**Abstract**
Timing verification is an essential process in nanometer design. Therefore, static timing analysis (STA) is currently the main aspect of performance verification. Traditional STA is based on lookup tables with input slew and output load capacitance. It is becoming insufficient to accurately characterize many significant aspects of the conventional cell delays models, such as: the process variations, nonlinear waveforms, nonlinear loads, and multiple inputs switching (MIS). Therefore, the current trend in modern designs is to use current source based models (CSM), which model MOSFETs as a transconductance. This paper proposes a CSM for combinational logic cells which can accommodate single input switching (SIS) signals. It can also handle where small capacitances are connected at the gate output, while fast ramp signals are applied to the gate input. When compared with ELDO, the proposed model produces more accurate stage delay than that obtained from the standard cell lookup tables. © 2013 IEEE.
Demo: O'BTW - An opportunistic, similarity-based mobile recommendation system

Authors
ElSherief M., EBatt T., Zahran A., Helmy A.

[No abstract available]
Effective capacity of delay constrained cognitive radio links exploiting primary feedback

Authors
Anwar A.H., Seddik K.G., ElBatt T., Zahran A.H.

Abstract
In this paper, we analyze the performance of a secondary link in a cognitive radio (CR) system operating under statistical quality of service (QoS) delay constraints. In particular, we quantify analytically the performance improvement for the secondary user (SU) when applying a feedback based sensing scheme under the SINR Interference model. We leverage the concept of effective capacity (EC) introduced earlier in the literature to quantify the wireless link performance under delay constraints, in an attempt to opportunistically support real-time applications. Towards this objective, we study a two-link network, a single secondary link and a primary network abstracted to a single primary link, with and without primary feedback exploitation. We analytically prove that exploiting primary feedback at the secondary transmitter improves the EC of the secondary user and decreases the secondary user average transmitted power. Finally, we present numerical results that support our analytical results. © 2013 IFIP.
Empirical correction of the Okumura-Hata model for the 900 MHz band in Egypt

Authors
Farhoud M., El-Keyi A., Sultan A.

Abstract
This paper studies the performance of the Okumura-Hata model in the 900 MHz band. The results of several measurement campaigns carried out in different regions of Egypt show significant errors in the Okumura-Hata model. The paper, hence, introduces correction to the Okumura-Hata model that suits the Egyptian 900 MHz cellular environment. The correction is evaluated empirically by fitting the received field strength to the corrected model in different terrains. The paper, also, gives better categorization for the different regions in Egypt in terms of the topography and the morphology. The study of the RMSE (root-mean-square error) shows that the error has been decreased from an average value of 65 dBμV/m to an average value of 9 dBμV/m. © 2013 IEEE.
Enhanced target tracking in UAV imagery with P-N learning and structural constraints

Authors
Siam M., Elhelw M.

Abstract
This paper presents improved automatic moving target detection and tracking framework that is suitable for UAV imagery. The framework is comprised of motion compensation phase to detect moving targets from a moving camera, target state estimation with Kalman filter, and overlap-rate-based data association. Finally, P-N learning is used to maintain target appearance by utilizing novel structural constraints to select positive and negative samples, where data association decisions are used as positive (P) constraints. After learning target appearance, a cascaded classifier is employed to detect the target in case of association failure. The proposed framework enables to recapture targets after being out of camera field of view and helps discriminating between targets with similar appearance while alleviating drift problems. Experimental results obtained with publicly available DARPA aerial datasets demonstrate that the proposed tracker with automatic detection feedback achieves better recall and average overlap than existing manually-initialized trackers. © 2013 IEEE.
Estimation of the myocardium rotation from standard cine Magnetic Resonance Imaging sequences

Authors
Ahmed A., Abouelhoda M., Khalifa A., Fahmy A.S.

Abstract
Myocardium rotation and torsion are important indicators of the cardiac function. Currently, tagged Magnetic Resonance Imaging (tMRI) sequences are analyzed to estimate these parameters. Unfortunately, tMRI is not widely used in clinical practice because it prolongs the scanning time and requires sophisticated analysis software. In this work, we present a method for estimating the myocardium rotation from standard cine MRI sequences. The method is based on identifying special features, i.e. landmarks, of the intensity pattern around the myocardium borders at each timeframe. Each set of landmarks is then encoded using a string of characters that can be matched across the different timeframes. String alignment technique is used to match the characters and thus determine the inter-frame motion of each landmark. Preliminary results using dataset of three patients (apical, mid, and basal slices) indicate the potential of the method to estimate the myocardium rotation especially at late timeframes where tMRI fails due to tag fading. © 2013 IEEE.
Year: 2013

Face and gesture recognition for human computer interaction employing 2DHoG

Authors
Abdelwahab M.M., Elsaadany O.S.

Abstract
Face and hand gesture recognition is one of the most challenging topics in computer vision. In this paper, a novel algorithm presenting a new 2D representation of histogram of oriented gradients is proposed, where each bin represents a range of angles dealt with in a separate layer employing 2DPCA. This method maintains the spatial relation between pixels which enhance the recognition accuracy. In addition it can be applied on either face or hand gesture images. Experimental results confirm excellent properties of the proposed algorithm and promotes it for real time applications © 2013 IEEE.
Fibonacci-based hardware post-processing for non-autonomous signum hyperchaotic system

Authors

Abstract
This paper presents a hardware implementation of a robust non-autonomous hyperchaotic-based PRNG driven by a 256-bit LFSR. The original chaotic output is post-processed using a novel technique based on the Fibonacci series, bitwise XOR, rotation, and feedback. The proposed post-processing technique preserves the throughput of the system and enhances the randomness in the output which is verified by successfully passing all NIST SP. 800-22 tests. The system is realized on a Xilinx Virtex 4 FPGA achieving throughput up to 13.165 Gbits/s for 16-bit bus-width surpassing previously reported CB-PRNGs. © 2013 IEEE.
Year: 2013

Fractional order butterworth filter: Active and passive realizations

Authors
Ali A.S., Radwan A.G., Soliman A.M.

Abstract
This paper presents a general procedure to obtain Butterworth filter specifications in the fractional-order domain where an infinite number of relationships could be obtained due to the extra independent fractional-order parameters which increase the filter degrees-of-freedom. The necessary and sufficient condition for achieving fractional-order Butterworth filter with a specific cutoff frequency is derived as a function of the orders in addition to the transfer function parameters. The effect of equal-orders on the filter bandwidth is discussed showing how the integer-order case is considered as a special case from the proposed procedure. Several passive and active filters are studied to validate the concept such as Kerwin-Huelsman-Newcomb and Sallen-Key filters through numerical and Advanced Design System (ADS) simulations. Moreover, these circuits are tested experimentally using discrete components to model the fractional order capacitor showing great matching with the numerical and circuit simulations. © 2013 IEEE.
Year: 2013

**Generalized analysis of symmetric and asymmetric memristive two-gate relaxation oscillators**

**Authors**
Fouda M.E., Khatib M.A., Mosad A.G., Radwan A.G.

**Abstract**
Memristive oscillators are a novel topic in nonlinear circuit theory, where the behavior of the reactive elements is emulated by the memristor. This paper presents symmetric and asymmetric memristive two-gate relaxation oscillators. First, the analysis of the two series memristors is introduced to study the effect of changing their polarities, as well as the mobility factor to be used in the two-gate relaxation oscillator instead of the RC circuit. The generalized analysis for the proposed memristive two-gate oscillator is introduced, where the generalized expressions for the oscillation frequency and conditions for oscillation are derived then four special cases for different mismatching of the memristors are introduced; showing a perfect matching with the PSPICE simulations. Finally, the discussion and comparison are proposed to discuss the four special cases and MATLAB simulations are also provided to study the effect of the memristance and the mobility ratio between the memristors on the oscillation frequency. © 2013 IEEE.
Generalized hardware post-processing technique for chaos-based pseudorandom number generators

Authors
Barakat M.L., Mansingka A.S., Radwan A.G., Salama K.N.

Abstract
This paper presents a generalized post-processing technique for enhancing the pseudorandomness of digital chaotic oscillators through a nonlinear XOR-based operation with rotation and feedback. The technique allows full utilization of the chaotic output as pseudorandom number generators and improves throughput without a significant area penalty. Digital design of a third-order chaotic system with maximum function nonlinearity is presented with verified chaotic dynamics. The proposed post-processing technique eliminates statistical degradation in all output bits, thus maximizing throughput compared to other processing techniques. Furthermore, the technique is applied to several fully digital chaotic oscillators with performance surpassing previously reported systems in the literature. The enhancement in the randomness is further examined in a simple image encryption application resulting in a better security performance. The system is verified through experiment on a Xilinx Virtex 4 FPGA with throughput up to 15.44 Gbit/s and logic utilization less than 0.84% for 32-bit implementations. © 2013 ETRI.
Year: 2013

Hardware Advancements Effects on MANET Development, Application and Research

Authors
ElBanna A., ElShafei E., ElSabrouty K., Azer M.A.

Abstract
Mobile devices' development has remarkably improved in light of the fast growing hardware advancements. These advancements include multicore processor chips, ultra large main memories and batteries that last for hours even when running modern applications such as file transfer, voice communication and video streaming ...etc. In this paper, we shed the light on recent and future trends of hardware advancements for mobile devices, and their impact on MANET developments. In addition, the effect of such advancements is investigated on application and different research areas. © Springer-Verlag Berlin Heidelberg 2013.
Year: 2013

**Improved memristor-based relaxation oscillator**

**Authors**
Mosad A.G., Fouda M.E., Khatib M.A., Salama K.N., Radwan A.G.

**Abstract**
This paper presents an improved memristor-based relaxation oscillator which offers higher frequency and wider tuning range than the existing reactance-less oscillators. It also has the capability of operating on two positive supplies or alternatively a positive and negative supply. Furthermore, it has the advantage that it can be fully integrated on-chip providing an area-efficient solution. On the other hand, the oscillation concept is discussed then a complete mathematical analysis of the proposed oscillator is introduced. Furthermore, the power consumption of the new relaxation circuit is discussed and validated by the PSPICE circuit simulations showing an excellent agreement. MATLAB results are also introduced to demonstrate the resistance range and the corresponding frequency range which can be obtained from the proposed relaxation oscillator. © 2013 Elsevier Ltd.
Improved spectrum mobility using virtual reservation in collaborative cognitive radio networks

Authors
Abdel-Hamid A.T., Zahran A.H., Elbatt T.

Abstract
Cognitive radio technology would enable a set of secondary users (SU) to opportunistically use the spectrum licensed to a primary user (PU). On the appearance of this PU on a specific frequency band, any SU occupying this band should free it for PUs. Typically, SUs may collaborate to reduce the impact of cognitive users on the primary network and to improve the performance of the SUs. In this paper, we propose and analyze the performance of virtual reservation in collaborative cognitive networks. Virtual reservation is a novel link maintenance strategy that aims to maximize the throughput of the cognitive network through full spectrum utilization. Our performance evaluation shows significant improvements not only in the SUs blocking and forced termination probabilities but also in the throughput of cognitive users. © 2013 IEEE.
Abstract
This paper tries to alleviate some challenges facing blind and visually impaired people in public transportation systems by providing them with in-station navigation information and real-time schedule information. Novel system architecture for the Intelligent Transportation Systems (ITS) navigation for blind and visually impaired people based on recent Radio Frequency Identification (RFID) localization technologies, commonly used in robotics, is proposed. Furthermore, a live timetable using a new ZigBee network broadcasting protocol with detailed frame structure is used for provision of real-time schedule information. The elements of the proposed system and their functionality are detailed while the presented experimental results demonstrate the potential of proposed system. © 2013 IEEE.
Joint power and rate scheduling for cognitive multi-access networks with imperfect sensing

Authors
Saleh G., El-Keyi A., Nafie M.

Abstract
A cognitive multi-access network in which a primary user and a secondary user transmit to a common receiver is considered. The secondary user senses the channel at the beginning of each time slot to determine whether the primary user is active or idle. The sensing is not perfect; hence, the secondary user can miss the detection of an active primary user or erroneously declare an idle primary user as active. The secondary user can vary its transmission rate and power from a time slot to the other. A joint rate and power scheduling algorithm is proposed that minimizes the probability of packet loss of the secondary user under a maximum probability of collision constraint at the primary user and a constraint on the average power transmitted by the secondary user. The case in which no retransmissions are allowed and the cases in which one or both users retransmit the collided packets are also considered. The problem is posed as a linear optimization problem that can be solved efficiently. © 2013 Liao et al.; licensee Springer.
Low-complexity Kalman filter-based carrier frequency offset estimation and tracking for OFDM systems

Authors
Ashour M., El-Keyi A., Sultan A.

Abstract
In this paper, an iterative blind estimator for fractional carrier frequency offset (CFO) in orthogonal frequency division multiplexing (OFDM) systems is proposed. The estimator utilizes the null subcarriers transmitted at the edge of the spectrum and does not require any training. In addition, the proposed estimator does not require any prior knowledge of the frequency response of the channel. The problem is formulated using a state-space model, and an extended Kalman filter (EKF) is employed to estimate the CFO iteratively. Simulation results illustrate the enhanced ability of the proposed algorithm, relative to the existing approaches, to estimate and track the CFO even in the presence of high Doppler. © 2013 IEEE.
Year: 2013

Mathematical modeling of Upflow Anaerobic Sludge Blanket reactor in domestic wastewater treatment

Authors
El-Seddek M.M., Galal M.M., Radwan A.G., Abdel-Halim H.S.

Abstract
This paper introduces a dynamic model to adequately describe an Upflow Anaerobic Sludge Blanket (UASB) reactor. Some available models of a UASB reactor are discussed in order to modify their drawbacks and propose a new improved model with less complexity and more reliability. The developed model is a combination of two recent models introduced in Sweden. According to this model, a UASB reactor is divided hydraulically into three compartments with integration of a kinetic model. Simulations are performed to investigate the validity of the developed model which indicates a good agreement with experimental data. Moreover, the developed model appears to be sensitive to variation of hydraulic and kinetic parameters through sensitivity analysis. © 2013 Cairo University, Egypt.
Maximizing the signal to leakage ratio in downlink cellular networks

Authors
Hindy A., El-Keyi A., Nafie M., Tulino A.M.

Abstract
A transmission scheme is developed for the downlink frame of cellular networks. While the mobile stations (MSs) maximize the signal power from the serving base station (BS), each BS aims at balancing the signal power of its users with the interference caused at the MSs of the neighboring cells, based on an approximated performance metric. A closed form solution for the beamforming vectors of the BSs and the MSs is derived. Simulation results show that the proposed scheme achieves substantial gains for different antenna configurations, outperforming well-known schemes in the literature. © 2013 IEEE.
Memristor-based balanced ternary adder

Authors
El-Slehdar A.A., Fouad A.H., Radwan A.G.

Abstract
This paper introduces a memristor based ternary adder, which is an essential building block for any arithmetic ternary operations. The proposed ternary adder circuit tries to achieve the theoretical advantages of the ternary system, increase the density and decrease the processing time by using the memristor properties such as its hysteresis and nanotechnology. The general block diagram of the proposed circuit is illustrated based on memristors and its operation has been validated via different examples using PSPICE where simulation results show a great match. © 2013 IEEE.
Human action recognition is an important area of research in computer vision. Its applications include surveillance systems, patient monitoring, human-computer interaction, just to name a few. Numerous techniques have been developed to solve this problem in 2D and 3D spaces. However, 3D imaging gained a lot of interest nowadays. In this paper we propose a novel view-independent action recognition algorithm based on fusion between a global feature and a graph-based feature. We used the motion history of skeleton volumes; we compute a skeleton for each volume and a motion history for each action. Then, alignment is performed using cylindrical coordinates-based Fourier transform to form a feature vector. A dimension reduction step is subsequently applied using PCA and action classification is carried out by using Mahalonobis distance, and Linear Discriminant analysis. The second feature is the temporal changes in bounding volume, volumes are aligned using PCA and each divided into sub volumes then temporal change in volume is calculated and classified using Logistic Model Trees. The fusion is done using majority vote. The proposed technique is evaluated on the benchmark IXMAS and i3DPost datasets where results of the fusion are compared against using each feature individually. Obtained results demonstrate that fusion improve the recognition accuracy over individual features and can be used to recognize human actions independent of view point and scale. © 2013 Springer-Verlag.
Multiobjective optimisation algorithm for sewer network rehabilitation

Authors
Marzouk M., Omar M.

Abstract
Understanding of deterioration mechanisms in sewers helps asset managers in developing prediction models for estimating whether or not sewer collapse is likely. Effective utilisation of deterioration prediction models along with the development and use of life cycle maintenance cost analysis contribute to reducing operation and maintenance costs in sewer systems. This article presents a model for life-cycle maintenance planning of deteriorating sewer network as a multi-objective optimisation problem that treats the sewer network condition and service life as well as life-cycle maintenance cost (LCMC) as separate objective functions. The developed model utilises Markov chain model for the prediction of the deterioration of the network. A multi-objective genetic algorithm is used to automatically locate an appropriate maintenance scenario that exhibits an optimised tradeoff among conflicting objectives. Monte Carlo simulation is used to account for LCMC uncertainties. The optimisation algorithm provides an improved opportunity for asset managers to actively select near-optimum maintenance scenario that balances life-cycle maintenance cost, condition and service life of deteriorating sewer network. A case study is used to demonstrate the practical features of developed methodology. © 2013 Copyright Taylor and Francis Group, LLC.
Myocardium segmentation in strain-encoded (SENC) magnetic resonance images using graph-cuts

Authors
Al-Agamy A.O., Osman N.F., Fahmy A.S.

Abstract
Evaluation of cardiac functions using Strain Encoded (SENC) magnetic resonance (MR) imaging is a powerful tool for imaging the deformation of left and right ventricles. However, automated analysis of SENC images is hindered due to the low signal-to-noise ratio SENC images. In this work, the authors propose a method to segment the left and right ventricles myocardium simultaneously in SENC-MR short-axis images. In addition, myocardium seed points are automatically selected using skeletonisation algorithm and used as hard constraints for the graph-cut optimization algorithm. The method is based on a modified formulation of the graph-cuts energy term. In the new formulation, a signal probabilistic model is used, rather than the image histogram, to capture the characteristics of the blood and tissue signals and include it in the cost function of the graph-cuts algorithm. The method is applied to SENC datasets for 11 human subjects (five normal and six patients with known myocardial wall motion abnormality). The segmentation results of the proposed method are compared with those resulting from both manual segmentation and the conventional histogram-based graph-cuts segmentation algorithm. The results show that the proposed method outperforms the histogram-based graph-cuts algorithm especially to segment the thin structure of the right ventricle. © The Institution of Engineering and Technology 2013.

Authors
Eldin S.S., El-Beltagy S.R.

Abstract
This paper presents an efficient method for automatically annotating Arabic news stories with tags using Wikipedia. The idea of the system is to use Wikipedia article names, properties, and re-directs to build a pool of meaningful tags. Sophisticated and efficient matching methods are then used to detect text fragments in input news stories that correspond to entries in the constructed tag pool. Generated tags represent real life entities or concepts such as the names of popular places, known organizations, celebrities, etc. These tags can be used indirectly by a news site for indexing, clustering, classification, statistics generation or directly to give a news reader an overview of news story contents. Evaluation of the system has shown that the tags it generates are better than those generated by MSN Arabic news. © 2013 IEEE.
Nuzzer: A large-scale device-free passive localization system for wireless environments

Authors
Seifeldin M., Saeed A., Kosba A.E., El-Keyi A., Youssef M.

Abstract
The widespread usage of WLANs and mobile devices has fostered the interest in localization systems for wireless environments. The majority of research in the context of wireless-based localization systems has focused on device-based active localization, in which devices are attached to tracked entities. Recently, device-free passive localization (DfP) has been proposed where the tracked entity is neither required to carry devices nor to participate actively in the localization process. Previous studies have focused on small areas and/or controlled environments. In this paper, we present the design, implementation, and analysis of Nuzzer, a large-scale DfP localization system, which tracks entities in real environments, rich in multipath. We first present probabilistic techniques for DfP localization of a single entity and evaluate their performance both analytically and in typical office buildings. Our results show that Nuzzer gives location estimates with less than 2-meters median distance error. We then give an algorithm for estimating the number of entities in an area of interest and localizing them into coarse-grained zones to enhance the scalability of the system. This indicates the suitability of Nuzzer to a large number of application domains. © 2002-2012 IEEE.
On some generalized discrete logistic maps

Authors
Radwan A.G.

Abstract
Recently, conventional logistic maps have been used in different vital applications like modeling and security. However, unfortunately the conventional logistic maps can tolerate only one changeable parameter. In this paper, three different generalized logistic maps are introduced with arbitrary powers which can be reduced to the conventional logistic map. The added parameter (arbitrary power) increases the degree of freedom of each map and gives us a versatile response that can fit many applications. Therefore, the conventional logistic map is considered only a special case from each proposed map. This new parameter increases the flexibility of the system, and illustrates the performance of the conventional system within any required neighborhood. Many cases will be illustrated showing the effect of the arbitrary power and the equation parameter on the number of equilibrium points, their locations, stability conditions, and bifurcation diagrams up to the chaotic behavior. © 2012.
On the flow anonymity problem in network coding

Authors
Atya A.O.F., Elbatt T., Youssef M.

Abstract
In this paper, we aim at protecting the privacy of the communicating parties while ensuring the authenticity of source nodes. In particular, we exploit intra-flow network coding to preserve the anonymity of communicating parties. Towards this objective, we propose an anonymity preservation scheme, namely closed group anonymity (CGA) that preserves the anonymity of the communicating parties via mixing their flows. Afterwards, we explore an instance of the Authentication-Privacy Trade-off in the context of Network Coding. We analyze the trade-off with the aid of the proposed anonymity scheme and a previously proposed Source Authentication Scheme using Network Coding (SANC). We present simulation results showing that the proposed algorithm successfully leverages network coding to preserve anonymity against traffic analysis attacks. Finally, we not only confirm the fundamental authentication-privacy trade-off in the context of intra-flow network coding but also parameterize it via introducing a tunable parameter to dynamically control, and potentially balance, this trade-off depending on the security provisions dictated by the operational scenario and application of interest. © 2013 IEEE.
On the mathematical modeling of series and parallel memcapacitors

Authors
Fouda M.E., Khatib M.A., Radwan A.G.

Abstract
Recently, Memristive elements such as memristor, memcapacitor and meminductors have become very attractive components in many applications, due to its unique behavior which can not be obtained using the other conventional elements. This paper discusses the analytical analysis of two memcapacitors connected in series and in parallel taking the effect of mismatch in mobility factor and polarity of each one. The obtained formulas of instantaneous memcapacitance for each memcapacitor are derived and four special cases are analyzed in more details. The proposed special cases are validated using PSPICE simulations showing a great matching. © 2013 IEEE.
Open issues in the sentiment analysis of Arabic social media: A case study

Authors
El-Beltagy S.R., Ali A.

Abstract
With the rapid increase in the volume of Arabic opinionated posts on different microblogging mediums comes an increasing demand for Arabic sentiment analysis tools. Yet, research in the area of Arabic sentiment analysis is progressing at a very slow pace compared to that being carried out in English and other languages. This paper highlights the major problems and open research issues that face sentiment analysis of Arabic social media. The paper also presents a case study the goal of which is to investigate the possibility of determining the semantic orientation of Arabic Egyptian tweets and comments given limited Arabic resources. One of the outcomes of the presented study, is an Egyptian dialect sentiment lexicon © 2013 IEEE.
Opportunistic secrecy with a strict delay constraint

Authors
Khalil K., Koyluoglu O.O., Gamal H.E., Youssef M.

Abstract
We investigate the delay limited secrecy capacity of the flat fading channel under two different assumptions on the available transmitter channel state information (CSI). The first scenario assumes perfect prior knowledge of both the main and eavesdropper channel gains. Here, upper and lower bounds on the delay limited secrecy capacity are derived, and shown to be tight in the high signal-to-noise ratio (SNR) regime. In the second scenario, only the main channel CSI is assumed to be available at the transmitter where, remarkably, we establish the achievability of a non-zero delay-limited secure rate, for a wide class of channel distributions, with a high probability. In the two cases, our achievability arguments are based on a novel two-stage key-sharing approach that overcomes the secrecy outage phenomenon observed in earlier works. © 1972-2012 IEEE.
Optimal beamforming for MIMO shared relaying in downlink cellular networks with ARQ

Authors
Hosny A.R., Tannious R.A., El-Keyi A.

Abstract
In this paper, we study the performance of the downlink of a cellular network with automatic repeat-request (ARQ) and a half duplex decode-and-forward shared relay. In this system, two multiple-input-multiple-output (MIMO) base stations serve two single antenna users. A MIMO shared relay retransmits the lost packets to the target users. First, we study the system with direct retransmission from the base station and derive a closed form expression for the outage probability of the system. We show that the direct retransmission can overcome the fading, however, it cannot overcome the interference. After that, we invoke the shared relay and design the relay beamforming matrices such that the signal-to-interference-and-noise ratio (SINR) is improved at the users subject to power constraints on the relay. In the case when the transmission of only one user fails, we derive a closed form solution for the relay beamformers. On the other hand when both transmissions fail, we pose the beamforming problem as a sequence of non-convex feasibility problems. We use semidefinite relaxation (SDR) to convert each feasibility problem into a convex optimization problem. We ensure a rank one solution, and hence, there is no loss of optimality in SDR. Simulation results are presented showing the superior performance of the proposed relay beamforming strategy compared to direct ARQ system in terms of the outage probability. © 2013 IEEE.
Optimal random access for a cognitive radio terminal with energy harvesting capability

Authors
Shafie A.E., Sultan A.

Abstract
We consider a cognitive radio scenario with an energy harvesting secondary user (SU) attempting to access a primary channel randomly. We assume multipacket reception (MPR) capability and investigate a system in which the SU may or may not exploit the primary feedback messages. The access probabilities are obtained to maximize the secondary throughput under the constraints of primary queue stability and such that the primary queueing delay is kept below a specified value in order to guarantee a certain quality of service (QoS) for the primary user (PU). We investigate the impact of the energy queue arrivals, MPR capability, and the primary queueing delay constraint on the maximum secondary throughput. © 1997-2012 IEEE.
Optimal selection of spectrum sensing duration for an energy harvesting cognitive radio

Authors
El Shafie A., Sultan A.

Abstract
In this paper, we consider a time-slotted cognitive radio (CR) setting with buffered and energy harvesting primary and CR users. At the beginning of each time slot, the CR user probabilistically chooses the spectrum sensing duration from a predefined set. If the primary user (PU) is sensed to be inactive, the CR user accesses the channel immediately. The CR user optimizes the sensing duration probabilities in order to maximize its mean data service rate with constraints on the stability of the primary and cognitive queues. The optimization problem is split into two subproblems. The first is a linear-fractional program, and the other is a linear program. Both subproblems can be solved efficiently. © 2013 IEEE.
Optimization of fractional-order RLC filters

Authors
Radwan A.G., Fouda M.E.

Abstract
This paper introduces some generalized fundamentals for fractional-order RL $\beta C \alpha$ circuits as well as a gradient-based optimization technique in the frequency domain. One of the main advantages of the fractional-order design is that it increases the flexibility and degrees of freedom by means of the fractional parameters, which provide new fundamentals and can be used for better interpretation or best fit matching with experimental results. An analysis of the real and imaginary components, the magnitude and phase responses, and the sensitivity must be performed to obtain an optimal design. Also new fundamentals, which do not exist in conventional RLC circuits, are introduced. Using the gradient-based optimization technique with the extra degrees of freedom, several inverse problems in filter design are introduced. The concepts introduced in this paper have been verified by analytical, numerical, and PSpice simulations with different examples, showing a perfect matching. © 2013 Springer Science+Business Media New York.
This paper discusses the influence of the fractional order parameter on conventional chaotic systems. These fractional-order parameters increase the system degree of freedom allowing it to enter new domains and thus it can be used as a control for such dynamical systems. This paper investigates the behaviour of the equally-fractional-order Lü chaotic system when changing the fractional-order parameter and determines the fractional-order ranges for chaotic behaviour. Five different parameter values and six fractional-order cases are discussed through this paper. Unlike the conventional parameters, as the fractional-order increases the system response begins with stability, passing by chaotic behaviour then reaches periodic response. As the system parameter $\alpha$ increases, a shift in the fractional order is required to maintain chaotic response. Therefore, the range of chaotic response can be expanded or minimized by controlling the fractional-order parameter. The non-standard finite difference method is used to solve the fractional-order Lü chaotic system numerically to validate these responses. © IOP Publishing Ltd 2013.
Performance assessment of prepared polyamide thin film composite membrane for desalination of saline groundwater at Mersa Alam-Ras Banas, Red Sea Coast, Egypt

Authors

Abstract
This study aims to enhance the performance of the flat sheet thin-film composite (TFC) polyamide-polysulfone reverse osmosis (RO) membranes. Composite RO membranes with high salt rejection were fabricated by treating a porous polysulfone (PS) support sequentially with a di-amine and then with a polyfunctional acid chloride, thereby forming a thin film of polyamide (PA) on the PS support. In order to establish conditions for the development of suitable thin-film composite (PS/TFC) membranes, various parametric studies were carried out which included varying the concentration of reactants, reaction time, curing temperature, and curing time for thin-film formation by the interfacial polymerization technique. By suitable combination of these factors, 2.0 wt.% MPD, 0.5 wt.% TMC, 60-s reaction time, 80°C curing temperature, and curing time 10 min., a desired thin film of PA with improved performance for groundwater desalination could be obtained. Further, a combination of scanning electron microscopy (SEM), attenuated total reflectance infrared (ATR-IR), X-ray diffraction (XRD) was utilized to confirm the existence and to examine the morphology of the PS/TFC membrane. Pilot-scale RO filtration unit was used to study the performance of the fabricated membranes for desalinating brackish, saline groundwater of Red Sea coastal area. Salt rejections percent for various feeds were found to be in the range of 90.6-98.5. © 2013 Copyright Balaban Desalination Publications.
Year: 2013

Performance evaluation and comparison of the top market virtualization hypervisors

Authors
Elsayed A., Abdelbaki N.

Abstract
The virtualization of IT infrastructure enables the consolidation and pooling of IT resources so that they can be shared over diverse applications to offset the limitation of shrinking resources and growing business needs. It provides a logical abstraction of physical computing resources and creates computing environments that are not restricted by physical configuration or implementation. Virtualization is very important for cloud computing because the delivery of services is simplified by providing a platform for optimizing complex IT resources in a scalable manner, which makes cloud computing more cost effective. Hypervisor plays an important role in the virtualization of hardware. It is a piece of software that provides a virtualized hardware environment to support running multiple operating systems concurrently using one physical server. The hypervisor type introduces significant impacts on the virtualization environment performance. The intent of this paper is to quantitatively and qualitatively compare the performance of the latest shipping versions of the VMware ESXi5, Citrix Xen Server 6.0.2 and Hyper-Hyper-V2008R2 Hypervisors at time of this study using customized SQL instance as workload simulating real life situations. This Paper helps both IT decision makers and end users to choose the right virtualization hypervisor and their readiness for enterprise datacenters and cloud infrastructure. © 2013 IEEE.
Performance evaluation of AODV under dos attacks

Authors
Lotfy P.A., Azer M.A.

Abstract
Mobile Ad-hoc Networks consist of a group of nodes with wireless connectivity forming a network without fixed infrastructure or centralized administration. Such networks are very dynamic due to nodes' mobility. This causes frequent unpredictable changes in topology, a characteristic that must be dealt with using special routing protocols. The Ad-hoc on Demand Distance Vector (AODV) is one of the most commonly used routing protocols, where nodes act as routers and routes are only provided on demand. In this paper, we evaluate the AODV's performance in the presence of two MANET attacks: Hello flood and flooding attacks. © 2013 IEEE.
Phytosynthesis of Au, Ag, and Au-Ag bimetallic nanoparticles using aqueous extract of sago pondweed (Potamogeton pectinatus L.)

Authors
Abdelhamid A.A., Al-Ghobashy M.A., Fawzy M., Mohamed M.B., Abdel-Mottaleb M.M.S.A.

Abstract
A green and facile method for the synthesis of Au, Ag, and Au-Ag bimetallic nanoparticles was developed using the aqueous extract of sago pondweed (Potamogeton pectinatus L.). Size, morphology, crystallinity, composition, capping layer, and stability of the synthesized nanoparticles were all investigated. The effect of the synthesis variables on the nanoparticles was also studied. Results showed that the synthesized nanoparticles were mostly spherical in shape, although other shapes as nanotriangles and hexagons were occasionally observed. Alloy-type Au-Ag nanoparticles could be synthesized at pH 12. The synthesis of the nanoparticles was optimized. The synthesized nanoparticles were stable over three weeks. Results indicate that the flavones and proteins present in the plant extract are responsible for the synthesis and stabilization of the nanoparticles. © 2013 American Chemical Society.
Abstract
This paper details the approach of implementing an English plagiarism source retrieval system to be presented at PAN 2013. The system uses the TextTiling algorithm to break a given document into segments that are centered around certain topics within the document. From these segments, keyphrases are generated using the KPMiner keyphrase extraction system. These keyphrases and segments are then used in generating queries indicative of the segment, and consequently the document. The queries are submitted to ChatNoir for finding plagiarism sources in the ClueWeb09 corpus from which the pan13 dataset is plagiarized. The target is to lessen the overall search effort while maximizing the performance by scoring unconsumed queries against the already downloaded candidate sources. Comparison to other PAN 2013 submissions for the same task, show the presented system to be one of the top performers.
Real-time 2DHoG-2DPCA algorithm for hand gesture recognition

Authors
Elsaadany O.S., Abdelwahab M.M.

Abstract
Hand gesture recognition is one of the most challenging topics in computer vision. In this paper, a new hand gesture recognition algorithm presenting a 2D representation of histogram of oriented gradients is proposed, where each bin represents a range of angles dealt with in a separate layer which allows using 2DPCA. This method maintains the spatial relation between pixels which enhances the recognition accuracy. In addition, it can be applied on either hand contour or image representing hand details. Experimental results were performed on the latest existing depth camera dataset. The comparison with reported methods confirms excellent properties of our proposed method and promotes it for real time applications. © 2013 Springer-Verlag.
Robust real-time tracking with diverse ensembles and random projections

Authors
Salaheldin A., Maher S., El Helw M.

Abstract
Tracking by detection techniques have recently been gaining popularity and showing promising results. They use samples classified in previous frames to detect an object in a new frame. However, because they rely on self updating, such techniques are prone to object drift. Multiple classifier systems can be used to improve the detection over that of a single classifier. However, such techniques can be slow as they combine information from different tracking methods. In this paper we propose a novel real-time ensemble approach to tracking by detection. We create a diverse ensemble using random projections to select strong and diverse sets of compressed features. We show that our proposed ensemble tracker significantly improves the accuracy of tracking while not using any additional information than that available to the single classifier, thus requiring little extra computational overhead. Our results also show that employing our multiple classifier system with feature subsets gives significantly better results than directly combining the features. © 2013 IEEE.
Year: 2013

SAODV and modified SAODV performance comparison

Authors
Hanafy A.A., Azer M.A., Noureldin S.H.

Abstract
Routing plays a vital role in ad hoc networks and Ad hoc On-demand Distance Vector (AODV) protocol is considered one of the most famous routing protocols in ad hoc networks. Unfortunately it doesn't specify security measures. This has motivated the researchers to design secured version of AODV. However Security always collides with performance. The higher the security level is, the lower the performance level. This paper presents a performance comparison between Secure AODV (SAODV) and Modified SAODV (MSAODV). © 2013 IEEE.
Security access control research trends

Authors
Fathy M., Azer M., Bahgat M., Yehia A.

Abstract
Information security policy is a critical property in any organization. For systems, the security policy addresses constraints on access by external systems and adversaries including programs and access to data by people. A continuous research effort is done throughout security policy aspects, such as policy procedures, documentation, policy enforcement, and administration. In this paper, we explore the research trends in an important component of security policies, which is access control. We survey the different modes of access controls, and identify the open research areas associated with them. © 2013 IEEE.
Segmentation of choroidal neovascularization in fundus fluorescein angiograms

Authors
Abdelmoula W.M., Shah S.M., Fahmy A.S.

Abstract
Choroidal neovascularization (CNV) is a common manifestation of age-related macular degeneration (AMD). It is characterized by the growth of abnormal blood vessels in the choroidal layer causing blurring and deterioration of the vision. In late stages, these abnormal vessels can rupture the retinal layers causing complete loss of vision at the affected regions. Determining the CNV size and type in fluorescein angiograms is required for proper treatment and prognosis of the disease. Computer-aided methods for CNV segmentation is needed not only to reduce the burden of manual segmentation but also to reduce inter-and intraobserver variability. In this paper, we present a framework for segmenting CNV lesions based on parametric modeling of the intensity variation in fundus fluorescein angiograms. First, a novel model is proposed to describe the temporal intensity variation at each pixel in image sequences acquired by fluorescein angiography. The set of model parameters at each pixel are used to segment the image into regions of homogeneous parameters. Preliminary results on datasets from 21 patients with Wet-AMD show the potential of the method to segment CNV lesions in close agreement with the manual segmentation. © 1964-2012 IEEE.
Single and multiple risk factors in the Egyptian stock market

Authors
Omran M.F.

Abstract
The return-risk trade-off of the 100 stocks contained in the Egyptian EGX100 index is examined. The Egyptian stock market has an average free float of only 45%. It is estimated that 50% of trading in the free float stocks is dominated by large investors, and local and international fund managers. The market suffers from low turnovers and more recently long periods of trade suspension after the political unrest of January 25th, 2011. The study finds that a serial correlated returns model is more suitable to estimate returns for low free float stocks in Egypt. However, it is unlikely that this serial correlation could lead to above average trading profits since it is a reflection of ownership concentration in a small illiquid market. The market offers diversification benefits due to its low correlation with major world indices. However, trade suspension due to political instability is an extra risk that could negate diversification benefits. Copyright © 2013 Inderscience Enterprises Ltd.

Nile University
جامعة النيل
Stability analysis of an ordered cognitive multiple-access protocol

Authors
El Shafie A., Sultan-Salem A.

Abstract
We investigate an ordered-access protocol for cognitive radios. The primary user (PU) operates in a time-slotted fashion and starts transmitting at the beginning of the time slot if its queue is nonempty. The secondary users, depending on their queues and spectrum sensing results, may start transmitting at times $\tau$, $2\tau$, $3\tau$ relative to the beginning of the time slot, where $\tau$ is the sensing duration. Secondary user $j$ is assigned rank or order $i$ and possibly starts transmitting at time $i\tau$ relative to the beginning of the time slot with a certain probability designed to guarantee the stability of system queues. We consider two models. In the first model, which is denoted by $S$, only one secondary user is assigned a particular rank, whereas in the second model, which is denoted by $\hat{S}$, there is less coordination, and some secondary users may have the same access order. We provide some analytical results for the case of two users and two ranks, under the assumption of perfect spectrum sensing. Our results show that system $S$ is better than $\hat{S}$ in terms of the maximum stable throughput region. After considering perfect spectrum sensing, we provide outer and inner bounds on the maximum stable throughput region for the case of sensing errors. We then investigate the multiple-cognitive-user scenario. We prove the advantage of system $S$ over a random access scheme, where all the secondary users access the channel probabilistically after a sensing period of duration $\tau$, and the advantage of system $S$ over a time-division multiple-access (TDMA) system, where each secondary user is individually assigned to a whole time slot for a certain fraction of the overall operational time and carries out spectrum sensing over duration $\tau$. © 1967-2012 IEEE.
Cloud computing provides a promising solution to the genomics data deluge problem resulting from the advent of next-generation sequencing (NGS) technology. Based on the concepts of "resources-on-demand" and "pay-as-you-go", scientists with no or limited infrastructure can have access to scalable and cost-effective computational resources. However, the large size of NGS data causes a significant data transfer latency from the client's site to the cloud, which presents a bottleneck for using cloud computing services. In this paper, we provide a streaming-based scheme to overcome this problem, where the NGS data is processed while being transferred to the cloud. Our scheme targets the wide class of NGS data analysis tasks, where the NGS sequences can be processed independently from one another. We also provide the elastream package that supports the use of this scheme with individual analysis programs or with workflow systems. Experiments presented in this paper show that our solution mitigates the effect of data transfer latency and saves both time and cost of computation. © 2013 Shadi A. Issa et al.
The deterministic capacity of relay networks with relay private messages

Authors
Zewail A.A., Mohasseb Y., Nafie M., El Gamal H.

Abstract
We study the capacity region of a deterministic 4-node network, where 3 nodes can only communicate via the fourth one. However, the fourth node is not merely a relay since it can exchange private messages with all other nodes. This situation resembles the case where a base station relays messages between users and delivers messages between the backbone system and the users. We assume an asymmetric scenario where the channel between any two nodes is not reciprocal. First, an upper bound on the capacity region is obtained based on the notion of single sided genie. Subsequently, we construct an achievable scheme that achieves this upper bound using a superposition of broadcasting node 4 messages and an achievable 'detour' scheme for a reduced 3-user relay network. © 2013 IEEE.
The deterministic multicast capacity of 4-node relay networks

Authors
Zewail A.A., Mohasseb Y., Nafie M., El Gamal H.

Abstract
In this paper, we completely characterize the deterministic capacity region of a four-node relay network with no direct links between the nodes, where each node communicates with the three other nodes via a relay. Towards this end, we develop an upper bound on the deterministic capacity region, based on the notion of a one-sided genie. To establish achievability, we use the detour schemes that achieve the upper bound by routing specific bits via indirect paths instead of sending them directly. © 2013 IEEE.
The modified single input Op-Amps memristor based oscillator

Authors
Elsamman A.H., Radwan A.G., Madian A.H.

Abstract
This paper introduces the modified single input Op-Amps memristor based oscillator. The oscillator is realized with ideal, LM741 and current feedback (AD844) Op-Amps where memristors replace resistors. The effect of memristor on the oscillation frequency and the oscillation condition that are totally independent is studied. This helped in studying the whole operation regime of the memristor. The effect of initial conditions on the circuit behavior is discussed. The dynamic poles of the oscillator after resistors replacement are illustrated. Sustained oscillation is obtained and simulated results are nearly matched to the calculated results. © 2013 IEEE.
The visual object tracking VOT2013 challenge results

Authors

Abstract
Visual tracking has attracted a significant attention in the last few decades. The recent surge in the number of publications on tracking-related problems have made it almost impossible to follow the developments in the field. One of the reasons is that there is a lack of commonly accepted annotated data-sets and standardized evaluation protocols that would allow objective comparison of different tracking methods. To address this issue, the Visual Object Tracking (VOT) workshop was organized in conjunction with ICCV2013. Researchers from academia as well as industry were invited to participate in the first VOT2013 challenge which aimed at single-object visual trackers that do not apply pre-learned models of object appearance (model-free). Presented here is the VOT2013 benchmark dataset for evaluation of single-object visual trackers as well as the results obtained by the trackers competing in the challenge. In contrast to related attempts in tracker benchmarking, the dataset is labeled per-frame by visual attributes that indicate occlusion, illumination change, motion change, size change and camera motion, offering a more systematic comparison of the trackers. Furthermore, we have designed an automated system for performing and evaluating the experiments. We present the evaluation protocol of the VOT2013 challenge and the results of a comparison of 27 trackers on the benchmark dataset. The dataset, the evaluation tools and the tracker rankings are publicly available from the challenge website (http://votchallenge.net). © 2013 IEEE.
Towards efficient and secure cloud

Authors
Radwan T., Azer M., Abdelbaki N.

Abstract
Cloud computing is becoming more and more popular. It is increasing in popularity with companies as it enables them to share various resources in a cost effective way. Cloud computing has lots of advantages, however some issues need to be handled before organizations and individuals have the confidence to rely on it. Security and privacy are at the forefront of these important issues. In this paper, the evolution of cloud computing along with its deployment and delivery models are highlighted. Also, the difference between cloud computing and other deployment models are discussed. We present different security threats and propose some countermeasures. In addition, we discuss cloud computing security trends. © 2013 IEEE.
As the common understanding of Cloud Computing is continuously evolving, the terminology and concepts used to define it often need clarifying. Therefore, Cloud customers and Cloud Providers are used to dispute about Service Level Agreements, Service Level Objectives and Quality of Service. Simultaneously, SLAs/SLOs/QoS represent other related technical problems such as Security, Privacy, Compliancy and others. Technical problems are usually defined within technical context, where both parties ignore analyzing problem's legally related causes. In fact, these problems are stemming from the mapping and translating of surrounding laws and regulations into technical terms. In this paper we propose an IT based Legal Framework for Cloud Computing. It helps Cloud customers and Cloud Providers to avoid having such problems. Also it manages the interlocks in the gray area between the IT department and the legal department via setting clear boundaries, resolving conflict of interests and offering segregation of duties. © Springer-Verlag Berlin Heidelberg 2013.
Towards scalable and cost-aware bioinformatics workflow execution in the cloud -
Recent advances to the tavaxy workflow system

Authors
Abouelhoda M., Issa S.

Abstract
Cloud-based scientific workflow systems can play an important role in the
development of cost effective bioinformatics analysis applications. So far, most efforts
for supporting cloud computing in such workflow systems have focused on simply
porting them to the cloud environment. The next due steps are to optimize these
systems to exploit the advantages of the cloud computing model, basically in terms of
managing resource elasticity and the associated business model. In this paper, we
introduce new advancements in designing scalable and cost-effective workflows in the
cloud using the Tavaxy workflow system, focusing on genome analysis applications.
We provide an overview of the system and describe its key cloud features including the
configuration and execution of complete workflows and/or specific sub-workflows in
the cloud. Taking real world examples, we demonstrate the key elasticity management
features of the system. These features are designed to support two common scenarios:
(1) minimizing workflow execution time under budget constraints and (2) minimizing
budget spend under workflow deadline constraints. We evaluate the effectiveness of
our approach by conducting experiments on the Amazon EC2 cloud with dynamic
pricing and variable heterogeneous resource allocation.
Abstract
This paper presents improved automatic moving target detection and tracking framework that is suitable for UAV imagery. The framework is comprised of motion compensation phase to detect moving targets from a moving camera, target state estimation with Kalman filter, and overlap-rate-based data association. Finally, P-N learning is used to maintain target appearance by utilizing novel structural constraints to select positive and negative samples, where data association decisions are used as positive (P) constraints. After learning target appearance, a cascaded classifier is employed to detect the target in case of association failure. The proposed framework enables to recapture targets after being out of camera field of view and helps discriminating between targets with similar appearance while alleviating drift problems. Experimental results obtained with publicly available DARPA aerial datasets demonstrate that the proposed tracker with automatic detection feedback achieves better recall and average overlap than existing manually-initialized trackers. © IFAC.
Abstract
Spatial domain facial recognition Modular IMage Principal Component Analysis (MIMPCA) has an improved recognition rate compared to the conventional PCA. In the MPCA, face images are divided into smaller sub-images and the PCA approach is applied to each of these sub-images. In this work, the Transform Domain implementation of MPCA is presented. The facial image has two representations. The Two Dimensional MPCA (TD-2D-MPCA) and the Diagonal matrix MPCA (TD-Dia-MPCA). The sub-images are processed using both non-overlapping and overlapping windows. All the test results, for noise free and noisy images, using ORL, Yale and FERET databases achieved; 99.5%, 99.58% and 97.42% recognition accuracy respectively. Transform Domain implementations yield, computational and storage savings of at least 75% and 99.98%, respectively, compared to spatial domain. Sample results are given. © 2013 IEEE.
Transmit and receive cooperative cognition: Protocol design and stability analysis

Authors
El Shafie A., El-Keyi A., Khattab T., Nafie M.

Abstract
In this paper, we investigate the stability of a cooperative cognitive system. We propose a cooperative secondary transmitter-receiver system (CSTR), where, the secondary transmitter (ST) and the secondary receiver (SR) increase the spectrum availability for the ST packets by relaying the unsuccessfully transmitted packets of the primary transmitter (PT). We assume receiving nodes with multipacket reception capability (MPR). We provide two inner bounds and two outer bounds on the stability region of the considered system. © 2013 ICST - The Institute for Computer Sciences, Social Informatics and Telecommunications Engineering.
VoIP performance evaluation over IPv4-6 and manually configured tunnels

Authors
Amr P., Abdelbaki N.

Abstract
IPv4 address space is exhausted. Internet Engineering Task Force (IETF) developed IPv6 -the upgrade of IPv4- to satisfy the continual increase of the IP address needs. The Internet is so ramified and enormous that the complete transition from IPv4 to IPv6 is slow. Therefore, their coexistence is inevitable. Manually configured tunnels are an important solution to allow this co-existence that allows transmitting native IPv6 packets over IPv4 networks. Meanwhile, VoIP is also gaining momentum with expectation to occupy considerable percentage of Internet traffic. In this paper, we compare the Voice over Internet Protocol (VoIP) network performance delivering Real-Time Quality-of-Service over manually configured tunnels versus conventional IPv4 and IPv6 networks. The measurements are collected out of probing a single call transferred over a network congested with HTTP, FTP or Video. The comparison performance criteria are jitter, network delay, throughput and packet loss percentage. Also the call user satisfaction is assessed by Mean Opinion Score. © 2013 IEEE.
A 16Gbps low power self-timed SerDes transceiver for multi-core communication

Authors
Hussein E.E.-D., Safwat S., Ghoneima M., Ismail Y.

Abstract
This paper presents a modified design for a self-timed SerDes transceiver that was recently published [1]. The new architecture overcomes the main problems that arise in [1], while offering the same advantages. Resistive termination is used instead of source matching to eliminate the need for Manchester coding in [1], this resistive termination increased the data rate to be 16Gbps compared to 12Gbps in [1]. Moreover, resistive termination removed the limitation on the minimum operating frequency that existed in [1], solving a lot of problems at the slow process corners. A single ended transmission line is used instead of the differential transmission line in [1]. A calibration circuit is implemented to control the switching threshold of the detector at the receiver side to account for voltage and process variations. The SerDes transceiver is implemented for a 3mm long on-chip transmission line in 65nm TSMC CMOS technology, which is the same as [1]. The total power consumed in the Tx/Rx pair with the transmission line is 18.1mWatt, compared to 15.5mWatt in [1]. The proposed architecture have the same advantages in [1] of being self timed, eliminating the need for complex power hungry blocks such as Clock and Data Recovery (CDR) at the receiver, and being insensitive to jitter accumulated during transmission. © 2012 IEEE.
A 5-10GHz low power bang-bang all digital PLL based on programmable digital loop filter

Authors
Safwat S., Lotfy A., Ghoneima M., Ismail Y.

Abstract
This paper presents the design and the implementation of a low power bang-bang all digital phase locked loop (BBADPLL). The design of the proposed architecture is based on the programmable coefficients of the digital loop filter (DLF) that manages the tradeoffs between stability and jitter of a closed loop. A proposed simple digital controlled oscillator (DCO) based on three stages ring oscillator provides a wide frequency range, and proven to be of lower area and power compared to arrayed DCO. The proposed design results in a significant reduction in the area and power compared to other time-to-digital converter (TDC) based ADPLL architectures. This reduction results from eliminating the need for complex, power, and area consuming TDC block, and arrayed DCO. A counter-based frequency acquisition loop using a binary search algorithm reduced the lock-in time significantly compared to similar work. The proposed BBADPLL architecture was implemented on TSMC CMOS 65nm technology with a frequency range 5-10GHz and a frequency resolution equals to 500MHz. The lock-in time is 2.4μs. The peak-to-peak period jitter and the RMS jitter at 10GHz are 1.49ps and 0.19ps, respectively. The total power consumed at 10GHz is only 2.7mWatt and the total area of the proposed ADPLL is 4372μm², which is very small compared to other published architectures. © 2012 IEEE.
A feedback-based access scheme for cognitive-relaying networks

Authors
Helal N.M., Seddik K.G., El-Keyi A., El Batt T.

Abstract
In this paper, we consider a cognitive relaying network in which the secondary user accesses the channel with a certain access probability that depends on the feedback information sent by the primary destination. In addition, the secondary user is granted relaying capabilities by which it can relay primary traffic that was unsuccessfully transmitted by the primary user. We show that this proposed scheme enhances the performance of the secondary user as well as the primary user, while the QoS requirements of the primary user is unviolated. The secondary user can avoid sure collisions with the primary transmissions exploiting the feedback information from the primary user. Also, due to the fact that relaying the unsuccessfully transmitted primary traffic increases the availability of the channel for its own packets, the secondary throughput is increased and the primary delay is decreased. © 2012 IEEE.
A hybrid method for the exact planted \((l, d)\) motif: Finding problem and its parallelization

Authors
Abbas M.M., Abouelhoda M., Bahig H.M.

Abstract
Background: Given a set of DNA sequences \(s_1, \ldots, s_t\), the \((l, d)\) motif problem is to find an \(l\)-length motif sequence \(M\), not necessary existing in any of the input sequences, such that for each sequence \(s_i\), \(1 \leq i \leq t\), there is at least one subsequence differing with at most \(d\) mismatches from \(M\). Many exact algorithms have been developed to solve the motif finding problem in the last three decades. However, the problem is still challenging and its solution is limited to small values of \(l\) and \(d\). Results: In this paper we present a new efficient method to improve the performance of the exact algorithms for the motif finding problem. Our method is composed of two main steps: First, we process \(q \leq t\) sequences to find candidate motifs. Second, the candidate motifs are searched in the remaining sequences. For both steps, we use the best available algorithms. Our method is a hybrid one, because it integrates currently existing algorithms to achieve the best running time. In this paper, we show how the optimal value of \(q\) is determined to achieve the best running time. Our experimental results show that there is about 24% speed-up achieved by our method compared to the best existing algorithm. Furthermore, we also present a parallel version of our method running on shared memory architecture. Our experiments show that the performance of our algorithm scales linearly with the number of processors. Using the parallel version, we were able to solve the \((21, 8)\) challenging instance using 8 processors in 20.42 hours instead of 6.68 days of the serial version. Conclusions: Our method speeds up the solution of the exact motif problem. Our method is generic, because it can accommodate any new faster algorithm based on traditional methods. We expect that our method will help to discover longer motifs. The software we developed is available for free for academic research at http://www.nubios.nileu.edu.eg/tools/hymotif. © 2012 Abbas et al.
A minimum-delay cross-layer transmission policy for cognitive multi-access networks with imperfect sensing

Authors
Saleh G., El-Keyi A., Nafie M.

Abstract
A cognitive network is considered in which a primary user and a secondary user are transmitting to a common receiver. Successive interference cancellation is performed at the common receiver to guarantee that no interference is experienced by the primary user. At the beginning of each time slot, the secondary user senses the channel of the primary user to determine if the primary user is active or idle. The sensing scheme is not perfect and thus there are nonzero probabilities of miss detection and false alarm. The secondary user transmits a variable number of packets in each time slot and the number of transmitted packets is determined via a probabilistic cross-layer algorithm which minimizes the average packet delay of the secondary user under an average power constraint. A constraint on the maximum collision probability is imposed to guarantee an acceptable quality of service for the primary user. The problem is shown to be quasi-convex, and thus, can be solved efficiently. Our results indicate that even with sensing errors, the throughput of the network increases significantly with increasing the number of transmitted packets. However this comes at the expense of increasing the average delay of the secondary user. © 2012 IEEE.
A new achievable DoF region for the 3-user $M \times N$ symmetric interference channel

Authors
Khalil M., El-Keyi A., Nafie M.

Abstract
In this paper, the 3-user Gaussian MIMO interference channel with $M$ antennas at each transmitter and $N$ antennas at each receiver is considered. It is assumed that the channel coefficients are constant and known to all transmitters and receivers. A novel scheme is presented that spans a new achievable degrees of freedom region. For some values of $M$ and $N$, the proposed scheme achieves higher number of DoF than those achieved by earlier schemes, while for other values it meets the best known upperbound. Simulation results are presented showing that the proposed schemes can achieve more DoF than earlier approaches. © 2012 IEEE.
A novel algorithm for simultaneous face detection and recognition

Authors
Abdelwahab M.M., Yousry I., Mikhael W.

Abstract
Face detection and recognition has been introduced in many real world applications. Several algorithms have been implemented for either detection or recognition. In this paper, a novel algorithm, which simultaneously detects and recognizes facial images employing the same method, is presented. The proposed algorithm is based on a new 2D representation for the Histogram of Oriented Gradients (2D-HOG) in conjunction with 2DPCA for feature extraction. Experimental results conducted on existing datasets, FERET, ORL, UMIST, JAFFE, and MIT-CMU, achieved better accuracy and running time compared with existing techniques. © 2012 IEEE.
A soft sensing-based cognitive access scheme exploiting primary feedback

Authors
Arafa A.M., Seddik K.G., Sultan A.K., Elbatt T., El-Sherif A.A.

Abstract
In this paper, we examine a cognitive spectrum access scheme in which secondary users exploit the primary feedback information. We consider an overlay secondary network employing a random access scheme in which secondary users access the channel by certain access probabilities that are function of the spectrum sensing metric. In setting our problem, we assume that secondary users can eavesdrop on the primary link's feedback. We study the cognitive radio network from a queuing theory point of view. Access probabilities are determined by solving a secondary throughput maximization problem subject to a constraint on the primary queues' stability. First, we formulate our problem which is found to be non-convex. Yet, we solve it efficiently by exploiting the structure of the secondary throughput equation. Our scheme yields improved results in, both, the secondary user throughput and the primary user packet delay. In addition, it comes very close to the optimal genie-aided scheme in which secondary users act upon the presumed perfect knowledge of the primary user's activity. © 2012 IFIP.
Accurate analysis of cardiac tagged MRI using combined HARP and optical flow tracking

Authors
Dallal A.H., Khalifa A.M., Fahmy A.S.

Abstract
In this work, we present a new method for analyzing cardiac tagged Magnetic Resonance Imaging (tMRI). The method combines two major tracking techniques: Harmonic Phase (HARP) and Optical Flow (OF). The results of the two techniques are fused together to accurately estimate the displacement of each myocardium point. The developed methods were tested using numerical MRI phantom at different SNR levels and deformation rates. The results show that the proposed method is more accurate and reliable than the HARP and the OF methods. © 2012 IEEE.
Active shape model with inter-profile modeling paradigm for cardiac right ventricle segmentation

Authors
ElBaz M.S., Fahmy A.S.

Abstract
In this work, a novel active shape model (ASM) paradigm is proposed to segment the right ventricle (RV) in cardiac magnetic resonance image sequences. The proposed paradigm includes modifications to two fundamental steps in the ASM algorithm. The first modification includes employing the 2D-Principal Component Analysis (PCA) to capture the inter-profile relations among shape’s neighboring landmarks and then model the inter-profile variations between the training set. The second modification is based on using a multi-stage searching algorithm to find the best profile match based on the best maintained profile’s relations and thus the best shape fitting in an iterative manner. The developed methods are validated using a database of short axis cine bright blood MRI images for 30 subjects with total of 90 images. Our results show that the segmentation error can be reduced by about 0.4 mm and contour overlap increased by about 4% compared to the classical ASM technique with paired Student’s t-test indicates statistical significance to a high degree for our results. Furthermore, comparison with literature shows that the proposed method decreases the RV segmentation error significantly. © Springer-Verlag Berlin Heidelberg 2012.
Abstract
This paper presents a case for adopting agent-based modeling (ABM) as a framework for representing the complex interactions that occur within the context of urban infrastructure management. A generic ABM is proposed with four key agents namely; assets, users, operators and politicians. For each agent a set of generic attributes, actions and behaviors are defined. A detailed behavioral model is adapted from the service quality domain to represent customer perceptions and actions related to infrastructure level of service. An illustrative example of 20 assets and 50 user agents is simulated to demonstrate emergent agent behavior. The simulation highlights how varying user social and psychological behavior influences their response to consuming municipal infrastructure services. The model is evaluated by contrasting with a tradition Markov Decision Process framework. Results demonstrate how socio-technical aspects can be included within the complex decision making process of urban infrastructure management. © 2012 Elsevier B.V. All rights reserved.
AiroDiag: A sophisticated tool that diagnoses and updates vehicles software over air

Authors
Mansour K., Farag W., ElHelw M.

Abstract
This paper introduces a novel method for diagnosing embedded systems and updating embedded software installed on the electronics control units of vehicles through the Internet using client and server units. It also presents the communication protocols between the vehicle and the manufacturer for instant fault diagnosis and software update while ensuring security for both parties. AiroDiag ensures maximum vehicle efficiency for the driver and provides the manufacturer with up-to-date vehicle performance data, allowing enhanced future software deployment and minimum loss in case of vehicle recalls. © 2012 IEEE.
Year:  2012

Assessing lean systems using variability mapping

Authors
Deif A.

Abstract
A new approach to assess lean manufacturing based on system's variability is proposed. The assessment utilizes a new tool called variability source mapping (VSMII) which focuses on capturing and reducing variability across the production system. The new tool offers a new metric called variability index to measure the overall variability level of the system. Based on the mapping and the new metric, VSMII suggests a variability reduction plan guided by a recommendation list of both lean techniques as well as production control policies. An industrial application is used to demonstrate the new tool. Results show that VSMII managed to reduce the overall variability level of the system as well as non-value added activities. Finally, the new variability index was successfully applied as a leanness assessment metric.© 2012 The Authors.
Bridge information modeling in sustainable bridge management

Authors
Marzouk M.M., Hisham M.

Abstract
Bridge Management Systems (BMS) play a crucial role in maintenance and rehabilitation decisions related to bridges. This paper presents using Bridge Information Modeling (BrIM) framework that adopts BMS features including; databases, inspection module, and condition assessment module. The proposed BrIM framework creates a database of bridges' components and generates inspection spreadsheets. It also visualizes bridge components considering the information stored in the database and inspection spreadsheets, using Structured Query Language (SQL) statements. The paper presents the integration of BrIM with advanced analysis technique to calculate the structural condition of bridges. This integration is achieved using C# programming language. © 2012 ASCE.
Buffer-aware power control for cognitive radio networks

Authors
Naguib E., Elbatt T., Nafie M.

Abstract
In this paper we study the problem of buffer-aware power control in underlay cognitive radio networks. In particular, we investigate the role of buffer state information, manifested through the secondary users’ queue lengths, along with channel state information in the cognitive radio power control problem. Towards this objective, we formulate a constrained optimization problem to find the set of secondary user transmit powers that maximizes the sum of rates weighted by the respective buffer lengths subject to signal-to-interference-and-noise-ratio (SINR) and maximum power constraints. Motivated by the problem’s non-convexity, we cast the problem into a sequential Geometric Programming formulation which can be solved efficiently using known solvers. Our simulation results confirm the throughput-delay trade-off via comparing the performance of the buffer-aware scheme, measured in terms of throughput and queue length, to a baseline, buffer-independent scheme that simply maximizes the sum rate of the secondary users. The gathered numerical results reveal interesting insights about the problem. It demonstrates almost two-fold reduction in the average secondary transmitter queue length for the proposed scheme over the baseline. This is attained at the expense of slight degradation (e.g. 15% in our scenario) in the secondary sum rate (throughput). This, in turn, confirms the key role buffer state information plays in balancing the fundamental throughput-delay trade-off in cognitive radio networks and opens ample room for future research on multiple access and optimal resource allocation in delay-constrained cognitive radio networks. © 2012 IEEE.
Cardiac magnetic resonance image classification and retrieval based on the image acquisition technique

Authors
Wael M., Fahmy A.S.

Abstract
Magnetic resonance imaging allows a number of imaging techniques and protocols that can be used to capture the different aspects of the cardiac function and structure. The produced amount of data is huge and its classification and/or retrieval based on its visual content are necessary for educational and training purposes. In this work, we propose a method for classification and retrieving cardiac magnetic resonance images based on the type of the acquisition technique. Preliminary results are obtained from two data sets of 3175 images acquired using five different cardiac imaging techniques. The average success rate for correctly classifying and retrieving all the images was found to be 98%. © 2012 IEEE.
CellSense: An accurate energy-efficient GSM positioning system

Authors
Ibrahim M., Youssef M.

Abstract
Context-aware applications have been gaining huge interest in the last few years. With cell phones becoming ubiquitous computing devices, cell phone localization has become an important research problem. In this paper, we present CellSense, which is a probabilistic received signal strength indicator (RSSI)-based fingerprinting location determination system for Global System for Mobile Communications (GSM) phones. We discuss the challenges of implementing a probabilistic fingerprinting localization technique in GSM networks and present the details of the CellSense system and how it addresses these challenges. We then extend the proposed system using a hybrid technique that combines probabilistic and deterministic estimations to achieve both high accuracy and low computational overhead. Moreover, the accuracy of the hybrid technique is robust to changes in its parameter values. To evaluate our proposed system, we implemented CellSense on Android-based phones. Results from two different testbeds, representing urban and rural environments, for three different cellular providers show that CellSense provides at least 108.57% enhancement in accuracy in rural areas and at least 89.03% in urban areas compared with current state-of-the-art RSSI-based GSM localization systems. In additional, the proposed hybrid technique provides more than 6 and 5.4 times reduction in computational requirements compared with state-of-the-art RSSI-based GSM localization systems for rural and urban testbeds, respectively. We also evaluate the effect of changing the different system parameters on the accuracy-complexity tradeoff and how the cell tower and fingerprint densities affect system performance. © 2011 IEEE.
Chitosan/carbon nanotube composite beads: Preparation, characterization, and cost evaluation for mercury removal from wastewater of some industrial cities in Egypt

Authors

Abstract
Composite beads composed of chitosan (CS) with different carbon nanotubes (CNTs) were prepared by the incorporation of single-walled carbon nanotubes (SWCNTs), multiwalled carbon nanotubes (MWCNTs), and carboxylic multiwalled carbon nanotubes (MWCNT-COOHs). A protected crosslinking method was used for the preparation of the CS/CNTs beads by the reaction of the beads with Hg(II) as the protector. Scanning electron microscopy, Fourier transform infrared spectroscopy, and thermogravimetric analysis were used to characterize the prepared beads. The adsorption performance of the prepared beads was investigated for the removal of Hg(II). The results show that beads prepared by the protected crosslinking technique removed 2.5 times more Hg(II) from solution than beads prepared by normal crosslinking. The maximum Hg(II) removal values were 148.7, 183.2, 167.5, and 172.7 mg/g by CS, MWCNT-COOH-impregnated CS beads, MWCNT-impregnated CS beads, and SWCNT-impregnated CS composite beads, respectively. The optimum removal conditions were pH = 4, contact time = 40 min, and temperature = 70°C. The equilibrium adsorption isotherm data of the beads exhibited a better fit to the Langmuir isotherm model. The reusability of Hg(II) sorption by the prepared beads was investigated to evaluate their repeated availability performance in water treatment. Quantitative removal of mercury from industrial wastes was demonstrated. A statistical analysis of the replacement cost of these sorbents revealed that SWCNTs, MWCNTs, and MWCNT-COOH could possibly be cost-effective sorbents in water treatment, regardless of their high unit cost at this time. © 2011 Wiley Periodicals, Inc.
Complementary feature splits for co-training

Authors
Salaheldin A., El-Gayar N.

Abstract
In many data mining and machine learning applications, data may be easy to collect. However, labeling the data is often expensive, time consuming or difficult. Such applications give rise to semi-supervised learning techniques that combine the use of labelled and unlabelled data. Co-training is a popular semi-supervised learning algorithm that depends on splitting the features of a data set into two redundant and independent views. In many cases however such sets of features are not naturally present in the data or are unknown. In this paper we test feature splitting methods based on maximizing the confidence and the diversity of the views using genetic algorithms, and compare their performance against random splits. We also propose a new criterion that maximizes the complementary nature of the views. Experimental results on six different data sets show that our optimized splits enhance the performance of co-training over random splits and that the complementary split outperforms the confidence, diversity and random splits. © 2012 IEEE.
Computing the burrows-wheeler transform of a string and its reverse

Authors
Ohlebusch E., Beller T., Abouelhoda M.I.

Abstract
The contribution of this paper is twofold. First, we provide new theoretical insights into the relationship between a string and its reverse: If the Burrows-Wheeler transform (BWT) of a string has been computed by sorting its suffixes, then the BWT and the longest common prefix array of the reverse string can be derived from it without suffix sorting. Furthermore, we show that the longest common prefix arrays of a string and its reverse are permutations of each other. Second, we provide a parallel algorithm that, given the BWT of a string, computes the BWT of its reverse much faster than all known (parallel) suffix sorting algorithms. Some bioinformatics applications will benefit from this. © 2012 Springer-Verlag.
Cooperative cognitive relaying with ordered cognitive multiple access

Authors
El Shafie A., Sultan A.

Abstract
We investigate a cognitive radio system with two secondary users who can cooperate with the primary user in relaying its packets to the primary receiver. In addition to its own queue, each secondary user has a queue to keep the primary packets that are not received correctly by the primary receiver. The secondary users accept the unreceived primary packets with a certain probability and transmit randomly from either of their queues if both are nonempty. These probabilities are optimized to expand the maximum stable throughput region of the system. Moreover, we suggest a secondary multiple access scheme in which one secondary user senses the channel for $\tau$ seconds from the beginning of the time slot and transmits if the channel is found to be free. The other secondary user senses the channel over the period $[0, 2\tau]$ to detect the possible activity of the primary user and the first-ranked secondary user. It transmits, if possible, starting after $2\tau$ seconds from the beginning of the time slot. It compensates for the delayed transmission by increasing its transmission rate so that it still transmits one packet during the time slot. We show the potential advantage of this ordered system over the conventional random access system. We also show the benefit of cooperation in enhancing the network's throughput. © 2012 IEEE.
Cost-effective networking for mobile healthcare

Authors
Khazbak Y., Izz M., ElBatt T., Youssef M.

Abstract
Today, the ubiquity of mobile phones and the growing need for enhanced medical services worldwide provide a unique opportunity to develop various types of mobile healthcare (mHealth) applications and services. In this chapter, we introduce the novel concept of cost-effective mobile healthcare, with emphasis on networking and data transfer, to bridge this gap for low-income communities. The targeted system leverages the multiple wireless interfaces on board most mobile phones available today. We aim to develop a ubiquitous healthcare system based on the use of the widespread sensor-rich mobile phones along with emerging wireless-enabled medical devices. We begin by presenting the problem of uploading medical data using the "optimal" wireless interface, from a cost perspective. Towards this objective, we present a simple Wireless Interface Selection Algorithm (WISA) which targets the wireless interface yielding minimum cost, depending on the data size, modality and QoS (particularly delay) constraints. Afterwards, we study the problem of cost-effective advisory message dissemination (from the health authorities to a group of co-located mobile phones). This gives rise to an interesting cost-delay trade off when leveraging the free device-device direct communication interface (e.g., Bluetooth). We build a proof-of-concept testbed, coined CellChek, which showcases the proposed concepts and algorithms and demonstrates their operation with exemplary wireless-enabled medical devices, namely pulse oximeter and blood pressure monitor, and plausible use cases. The concepts explored in this chapter along with the proposed schemes and testbed hold great promise for this rapidly growing area of research within the mobile healthcare arena that is of equal importance to developing and developed countries. © 2013 by Nova Science Publishers, Inc. All rights reserved.
Cross-layer transmission rate/power policy for cognitive multi-access networks with imperfect sensing

Authors
Saleh G., El-Keyi A., Nafiey M.

Abstract
We consider an underlay cognitive radio network with a primary user and a secondary user transmitting to a common receiver. The secondary user senses the primary user's channel to determine whether the primary user is active or idle. The secondary user's transmission policy is determined via a probabilistic cross-layer algorithm in which the secondary user's average packet delay is minimized subject to constraints on its average transmission power and the maximum probability of collision at the primary user. The proposed cross-layer algorithm determines the number of packets the secondary user transmits and the power policy used to transmit these packets. © 2012 IEEE.
Degrees of freedom for separated and non-separated half-duplex cellular MIMO two-way relay channels

Authors
Khafagy M., El-Keyi A., Nafie M., Elbatt T.

Abstract
We study a cellular setting in which an introduced multiple-antenna relay station (RS) can possibly assist the bidirectional communication between a multiple-antenna base station (BS) and a set of single-antenna mobile stations (MSs). Through a proposed six-phase communication protocol with arbitrary number of antennas and MSs, we characterize the maximum number of degrees of freedom (DoF) that can be attained when the BS-MSs direct link is active or down. When the direct link is available, we show that the introduction of a multiple-antenna RS cannot increase the maximum DoF regardless of the number of antennas it is equipped with. In the absence of a BS-MSs direct link, the maximum DoF can be limited by the number of RS antennas since all ongoing communication takes place through the RS. It is also shown that the characterized maximum DoF is achieved via recently proposed network-coding based two-way relaying techniques. Finally, we conclude that a widely used two-phase multiple access/broadcast (MABC) two-way relaying protocol can be DoF-limiting in some cases due to its inherent inability to exploit the possibly available BS-MSs direct-link. © 2012 IEEE.
Year: 2012

Demo: Cellchek: Demonstrating a cost-effective cell phone-based patient monitoring and advising system

Authors
Izz M., Khazbak Y., Elbatt T., Youssef M.

Abstract
[No abstract available]
Design methodology for square wave resonant clock generators

Authors
El Mahalawy M.W., Ismail Y.

Abstract
Resonant clocking is a promising low power alternative for conventional clocking method. In this work, a design methodology is presented for square wave resonant clocking technique to assure minimum power consumption. These equations were verified by designing a differential clock generator which showed 55% power savings compared to conventional clocking. © 2012 IEEE.
Distributed component-based framework for Unmanned Air Vehicle systems

Authors
El-Sayed A., ElHelw M.

Abstract
Unmanned Air Vehicles (UAVs) are gaining increased importance in a variety of applications, both military and civilian, due to their ability to carry out critical missions with reduced costs and minimal risks to human life. However, a UAV system is essentially a complex distributed system involving multiple heterogeneous software and hardware modules. The seamless integration of such components is one of the key challenges facing UAV systems. Furthermore, developing and maintaining a UAV system is a highly expensive and time consuming process. In this paper we present the framework a novel distributed component-based software framework that facilitates rapid development, seamless integration and run-time maintenance of UAV systems. The framework is composed of four main components: the Mission Planner, the Task Executer, the World Model, and DicoCom. Whereas the first three components facilitate the creation and execution of UAV missions, the latter is a generic component model that constitutes the basis for creating distributed components with different interaction patterns. Furthermore, the framework provides a scripting language, called DicoScript, used for binding the distributed components together and describing high level UAV missions. This paper presents the framework design goals and architecture, elucidates the main framework components and the DicoScript language, and describes the use of the framework to create UAV-based search and rescue application. © 2012 IEEE.
Distributed cooperative q-learning for power allocation in cognitive femtocell networks

Authors
Saad H., Mohamed A., Elbatt T.

Abstract
In this paper, we propose a distributed reinforcement learning (RL) technique called distributed power control using Q-learning (DPC-Q) to manage the interference caused by the femtocells on macro-users in the downlink. The DPC-Q leverages Q-Learning to identify the sub-optimal pattern of power allocation, which strives to maximize femtocell capacity, while guaranteeing macrocell capacity level in an underlay cognitive setting. We propose two different approaches for the DPC-Q algorithm: namely, independent, and cooperative. In the former, femtocells learn independently from each other, while in the latter, femtocells share some information during learning in order to enhance their performance. Simulation results show that the independent approach is capable of mitigating the interference generated by the femtocells on macro-users. Moreover, the results show that cooperation enhances the performance of the femtocells in terms fairness and aggregate femtocell capacity. © 2012 IEEE.
Distributed spectrum sensing with sequential ordered transmissions to a cognitive fusion center

Authors
Hesham L., Sultan A., Nafie M., Digham F.

Abstract
Cooperative spectrum sensing is a robust strategy that enhances the detection probability of primary licensed users. However, a large number of detectors reporting to a fusion center for a final decision causes significant delay and also presumes the availability of unreasonable communication resources at the disposal of a network searching for spectral opportunities. In this paper, we employ the idea of sequential detection to obtain a quick, yet reliable, decision regarding primary activity. Local detectors take measurements, and only a few of them transmit the log likelihood ratios (LLR) to a fusion center in descending order of LLR magnitude. The fusion center runs a sequential test with a maximum imposed on the number of sensors that can report their LLR measurements. We calculate the detection thresholds using two methods. The first achieves the same probability of error as the optimal block detector. In the second, an objective function is constructed and decision thresholds are obtained via backward induction to optimize this function. The objective function is related directly to the primary and secondary throughputs with possible privilege for primary operation. Simulation results demonstrate the enhanced performance of the approaches proposed in this paper. We also investigate the case of fading/shadowing channels between the local sensors and the fusion center, and the situation in which the sensing cost is negligible. © 1991-2012 IEEE.
Dynamic analysis of a lean cell under uncertainty

Authors
Deif A.M.

Abstract
One of the ultimate targets of lean manufacturing paradigm is to balance production and produce at takt time in production cells. This paper investigates the performance of a lean cell that implements the previous lean goals under uncertainty. The investigation is based on a system dynamics approach to model a dynamic lean cell. Backlog is used as a performance metric that reflects the cell's responsiveness. The cell performance is compared under certain and uncertain external (demand) and internal (machine availability) conditions. Results showed that although lean cell is expected to be responsive to external demand with minimum waste, however, this was not the case under the considered uncertain conditions. The paper proposes an approach to mitigate this problem through employing dynamic capacity policy. Furthermore, the paper explores the effect of the delay associated with the proposed capacity policies and how they affect the lean cell performance. Finally, various recommendations are presented to better manage the dynamics of lean manufacturing systems. © 2012 Taylor & Francis.
EEG spectral analysis for attention state assessment: Graphical versus classical classification techniques

Authors
Fathy A., Fahmy A., Elhelw M., Eldawlatly S.

Abstract
Advances in Brain-computer Interface (BCI) technology have opened the door to assisting millions of people worldwide with disabilities. In this work, we focus on assessing brain attention state that could be used to selectively run an application on a hand-held device. We examine different classification techniques to assess brain attention state. Spectral analysis of the recorded EEG activity was performed to compute the Alpha band power for different subjects during attentive and non-attentive tasks. The estimated power values were used to train a number of classical classifiers to discriminate among the two attention states. Results demonstrate a classification accuracy of 70% using both individual- and multi-channel data. We then utilize a graphical approach to assess the causal influence among EEG electrodes for each of the two attention states. The inferred graphical representations for each state were used as signatures for state classification. A classification accuracy of 83% was obtained using the graphical approach outperforming the examined classical classifiers. © 2012 IEEE.
Effect of boundary on controlled memristor-based oscillator

Authors
Fouda M.E., Radwan A.G., Salama K.N.

Abstract
Recently, the applications of memristors have spread into many fields and especially in the circuit theory. Many models have been proposed for the HP-memristor based on the window functions. In this paper, we introduce a complete mathematical analysis of the controlled reactance-less oscillator for two different window functions of Joglekar's model (linear and nonlinear dopant drift) to discuss the effect of changing the window function on the oscillator's behavior. The generalized necessary and sufficient conditions based on the circuit elements and control voltages for both the linear and nonlinear models are introduced. Moreover, closed form expressions for the oscillation frequency and duty cycle are derived for these models and verified using PSPICE simulations showing an excellent matching. Finally a comparison between the linear and nonlinear models which shows their effect on the oscillation frequency and conditions of oscillation is introduced. © 2012 IEEE.
Efficient alignment of next generation sequencing data using MapReduce on the cloud

Authors
Alsaad R., Malluhi Q., Abouelhoda M.

Abstract
This paper presents a methodology for running NGS read mapping tools in the cloud environment based on the MapReduce programming paradigm. As a demonstration, the recently developed and robust sequence alignment tool, BFAST, is used within our methodology to handle massive datasets. The results of our experiments show that the transformation of existing read mapping tools to run within the MapReduce framework dramatically reduces the total execution time and enables the user to utilize the resources provided by the cloud. © 2012 IEEE.
Efficient distributed computation of maximal exact matches

Authors
Abouelhoda M., Seif S.

Abstract
Given two long strings $S$ and $T$, representing two genomic sequences, and given a user defined threshold $\ell$, the problem of computing maximal exact matches (MEMs) is to find each triple $(p_1, p_2, l)$ specifying two matching substrings $S[p_1..p_1 + l - 1] = T[p_2..p_2 + l - 1]$, such that $l \geq \ell$ and $S[p_1 - 1] \neq T[p_2 - 1]$ and $S[p_1 + 1] \neq T[p_2 + 1]$.

Computing MEMs is a major problem in bioinformatics, because it is a primary step in identifying regions of common similarity among genomic sequences. Faster solutions to this problem are still demanded to overcome the ever increasing amount of genomic sequences to be compared to each other. In this paper, we present a parallel version of the MEM algorithm running on a computer cluster. Our experimental results show that our algorithm is efficient and scalable. © 2012 Springer-Verlag.
Evaluation of the cardiac global function from tagged magnetic resonance images

Authors
Sayed M.R., Fahmy A.S.

Abstract
Tagged Magnetic Resonance (MR) images are considered the gold standard for evaluating the cardiac regional function. Nevertheless, the low myocardium-to-blood contrast in tagged MR images prevents accurate segmentation of the myocardium, and hence, hinders the quantitative assessment of the global function of the heart. In this work, a method for enhancing the myocardium-to-blood contrast in tagged MR images is proposed. First, the tag pattern in each input tagged MR image is removed using a technique based on the image texture and the frequency components of the tag pattern to produce two tagless images. Then, these two images are combined to obtain a tagless MR image with high blood-to-myocardium contrast. The proposed method is applied to five patients where the global functional parameters are calculated and compared to those calculated from standard untagged cine MR images of the same subject. The results show that the proposed method has a high potential to be used in evaluating the global functional parameters from tagged MR images.
Formation principles and ligand dynamics of nanoassemblies of CdSe quantum dots and functionalised dye molecules

Authors
Blaudeck T., Zenkevich E.I., Abdel-Mottaleb M., Szwaykowska K., Kowerko D., Cichos F., Von Borczyskowski C.

Abstract
Functional dye molecules, such as porphyrins, attached to CdSe quantum dots (QDs) through anchoring meso-pyridyl substituents, form quasi-stable nanoassemblies. This fact results in photoluminescence (PL) quenching of the QDs both due to Förster resonance energy transfer (FRET) and the formation of non-radiative surface states under conditions of quantum confinement (non-FRET). The formation process is in competition with the ligand dynamics. At least two timescales are found for the formation of the assemblies: 1) one faster than 60 s attributed to saturation of empty attachment sites and 2) one slower than 600 s, which is attributed to a reorganisation of the tri-n-octylphosphine oxide (TOPO) ligand shell. Finally, this process results in almost complete exchange of the TOPO shell by porphyrin dye molecules. Following a Stern-Volmer analysis, we established a microscopic description of PL quenching and assembly formation. Based on this formalism, we determined the equilibrium constant for assembly formation between QDs and the pyridyl-functionalised dye molecules to be $K \approx 10^5-10^7$ M$^{-1}$, which is several orders of magnitude larger than that of the TOPO ligands. Our results give additional insights into the non-FRET PL quenching processes involved and show that the QD surface is inhomogeneous with respect to the involved attachment and detachment processes. In comparison with other methods, such as NMR spectroscopy, the advantage of our approach is that ligand dynamics can be investigated at extremely low ratios of dye molecules to QDs. Quenching the glow! The size-dependent photoluminescence quenching of semiconductor quantum dots by functionalised dye molecules in solution is analysed with respect to Förster resonance energy transfer (FRET) and non-FRET contributions (see picture). By this approach, assembly formation and ligand dynamics can be studied at extremely low concentrations of quantum dots and dye molecules. Copyright © 2012 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.
Year: 2012

Fractional-order RC and RL circuits

Authors
Radwan A.G., Salama K.N.

Abstract
This paper is a step forward to generalize the fundamentals of the conventional RC and RL circuits in fractional-order sense. The effect of fractional orders is the key factor for extra freedom, more flexibility, and novelty. The conditions for RC and RL circuits to act as pure imaginary impedances are derived, which are unrealizable in the conventional case. In addition, the sensitivity analyses of the magnitude and phase response with respect to all parameters showing the locations of these critical values are discussed. A qualitative revision for the fractional RC and RL circuits in the frequency domain is provided. Numerical and PSpice simulations are included to validate this study. © Springer Science+Business Media, LLC 2012.
Abstract

Renewable Energy sources are the center of attraction for research and development all over the world nowadays, the demand of a lasting cheap source of energy that is environmental friendly, is the main challenge recently. Energy Harvesting is a new technology that is going to make a revolution in the coming decade. Energy Harvesting is a technique to provide alternative sources of energy that are environmental friendly and low in cost. Radio Frequency Energy Harvesting is one of the methods to provide electrical energy from the ambient Radio Frequency waves that already exists in the environment. Radio Frequency Energy Harvesting can provide a world with battery less devices. With Radio Frequency (RF) Energy Harvesting, the true mobility can be achieved where mobile devices do not depend on centralized power sources for charging, instead they make use of the existing energy in the environment. This paper presents a simulation survey on different frequencies and the effect of these frequencies on the output power efficiency. The simulation results provide an optimum novel relationship between the frequency used and the size of the circuit for a radio frequency energy harvesting model with optimum output efficiency. © 2012 IEEE.
Year: 2012

Image encryption in the fractional-order domain

Authors
Radwan A.G., Abd-El-Hafiz S.K., Abdelhaleem S.H.

Abstract
This paper presents a new image encryption scheme based on the fractional-order Lorenz system which gives more degrees of freedom in key generation. In the modified fractional-order system, the key length is doubled using the three fractional-order parameters beside the three initial conditions, which makes it invulnerable to brute-force attacks. In addition, using a very simple algorithm, based on pixel confusion only, strongly encrypted images are produced. Such an algorithm can be used in real-time applications. To evaluate the algorithm and analyze the encryption results, a standard image is used. A comparison of the colored correlation coefficients (horizontal, vertical, diagonal) for different cases with respect to a fractional-order parameter and another system parameter are introduced. Moreover, the encrypted image shows high sensitivity to the fractional-order key, which appears from the wrong decryption with 0.1% change of the fractional-order parameter. © 2012 IEEE.
Abstract

Ad hoc networks are peer mobile nodes that self configure to form a network. In these types of networks there is no routing infrastructure, and usually nodes have limited resources. This imposes a serious problem due to some nodes’ selfishness and willingness to preserve their resources. Many approaches have been proposed to deal with this problem and mitigate the selfishness; amongst these approaches are reputation systems. This paper proposes a reputation system scheme that helps isolating misbehaving nodes and decreasing their ability to launch an attack on the network. The idea of this scheme is based on the torrent algorithm that is used in other applications. © 2012 IEEE.
Year: 2012

Left ventricular diastolic function in type 2 diabetes mellitus is associated with myocardial triglyceride content but not with impaired myocardial perfusion reserve

Authors

Abstract
Purpose: To study myocardial perfusion reserve and myocellular metabolic alterations indicated by triglyceride content as possible causes of diastolic dysfunction in patients with type 2 diabetes mellitus, preserved systolic function, and without clinically evident coronary artery disease. Materials and Methods: Patients with type 2 diabetes mellitus (n = 42) underwent cardiac magnetic resonance (CMR) for quantification of 1) myocardial contractility by strain-encoded MR (SENC); 2) myocardial triglyceride content by proton magnetic resonance spectroscopy (1H-MRS); and 3) myocardial perfusion reserve during pharmacologic hyperemia. Age-matched healthy volunteers (n = 16) also underwent CMR to acquire normal values for myocardial strain and perfusion reserve. Results: Stress CMR procedures were successfully performed in all subjects, and no regional inducible perfusion defects were observed in type 2 diabetes mellitus patients. Diastolic strain rate and myocardial perfusion reserve were significantly impaired in patients with type 2 diabetes mellitus compared to control subjects (P < 0.001 for both). Interestingly, impaired diastolic function in type 2 diabetes mellitus was not associated with impaired myocardial perfusion reserve (r = 0.12, P = NS). Conversely a significant association was observed between diastolic dysfunction and myocardial triglyceride content (r = -0.71, P < 0.001), which proved to be independent of age, gender, diabetes duration, blood pressure, and fasting blood glucose. Conclusion: Myocardial steatosis may represent an early marker of diabetic heart disease, triggering subclinical myocardial dysfunction irrespective of myocardial perfusion reserve. © 2011 Wiley Periodicals, Inc.
Abstract
We consider a time-slotted primary system where both the primary channel and primary activity are modeled as two independent two-state Markov chains. The primary transmitter can be idle or busy, whereas the channel can be in erasure or not. Moreover, the sensing channel between the primary transmitter and secondary transmitter is modeled as a two-state Markov chain to represent two levels of sensing reliability. At the beginning of each time slot, the secondary transmitter may remain idle, transmit directly, or probe the channel and access the channel only if it is sensed to be free. At the end of the slot the secondary transmitter overhears the ARQ feedback from the primary receiver, which is used to update its belief regarding primary activity, primary channel state, and sensing channel state. We devise optimal transmission strategies for the cognitive radio so as to maximize secondary throughput with the primary throughput guaranteed to be above a certain specified value. The optimization accounts for the instantaneous reward and also the expected future reward given secondary action. © 2012 IEEE.
Light-ECV: An intelligent lightweight framework for embedded computer vision applications

Authors
El-Sayed A., El-Helw M.

Abstract
Recent developments in embedded systems open up a new realm of computer vision applications in surveillance and healthcare delivery, etc. However, such applications require high computational resources, which is challenging for embedded devices that are characterized by constrained processing power and limited memory capacity. In this paper we present a novel intelligent framework that enables building computer vision applications with optimal throughput and maintaining the performance of such applications at run-time.
MIMO VANETs: Research challenges and opportunities

Authors
El-Keyi A., ElBatt T., Bai F., Saraydar C.

Abstract
In this paper, we provide a review of the benefits of employing multiple-input multiple-output (MIMO) processing techniques in vehicular ad hoc networks VANETs. These benefits include increasing the range of communication via beamforming, improving the reliability of communication via spatial diversity, increasing the throughput of the network via spatial multiplexing, and managing multiuser interference due to the presence of multiple transmitting terminals. We also present a number of key research challenges facing MIMO VANETs. The first one is deriving statistical MIMO-V2V channel models that take into account the spatial correlation between the transmit and receive antennas and validating them via extensive channel measurement campaigns. Deriving channel estimation and tracking algorithms for MIMO inter-vehicular channels is another challenging problem due to their non-stationary behavior and high Doppler spread. Further research is also needed to fully reap the benefits of multiple antennas in VANETs via space-time and space-frequency processing. In addition, cross layer optimization spanning the medium access control (MAC) and networking layers besides the physical layer is essential to satisfy the emerging applications of VANETS ranging from safety, convenience to infotainment. © 2012 IEEE.
MIMO vehicular networks: Research challenges and opportunities

Authors
Attia A., ElMoslimany A.A., El-Keyi A., ElBatt T., Bai F., Saraydar C.

Abstract
In this paper, we provide a review of the benefits of employing multiple-input multiple-output (MIMO) signal processing techniques in vehicular ad hoc networks (VANETs). These benefits include increasing the range of communication via beamforming, improving the reliability of communication via spatial diversity, increasing the throughput of the network via spatial multiplexing, and managing multiuser interference due to the presence of multiple transmitting terminals. We also present a number of key research challenges facing MIMO VANETs. The first one is deriving statistical MIMO vehicular channel models that take into account the spatial correlation between the transmit and receive antennas and validating them via extensive channel measurement campaigns. Deriving channel estimation and tracking algorithms for MIMO intervehicular channels is another challenging problem due to their non-stationary behavior and high Doppler spread. Further research is also needed to fully reap the benefits of multiple antennas in VANETs via space-time and spacefrequency processing. In addition, cross layer optimization spanning the medium access control (MAC) and networking layers besides the physical layer is essential to satisfy the emerging applications of VANETS ranging from safety, convenience to infotainment. © 2012 ACADEMY PUBLISHER.
Molecular prognostic profile of Egyptian HCC cases infected with hepatitis C virus

Authors

Abstract
Background: Hepatocellular carcinoma (HCC) is a common and aggressive malignancy. Despite of the improvements in its treatment, HCC prognosis remains poor due to its recurrence after resection. This study provides complete genetic profile for Egyptian HCC. Genome-wide analyses were performed to identify the predictive signatures. Patients and Methods: Liver tissue was collected from 31 patients with diagnosis of HCC and gene expression levels in the tumours and their adjacent non-neoplastic tissues samples were studied by analyzing changes by microarray then correlate these with the clinico-pathological parameters. Genes were validated in an independent set by qPCR. The genomic profile was associated with genetic disorders and cancer focused on gene expression, cell cycle and cell death. Molecular profile analysis revealed cell cycle progression and arrest at G2/M, but progression to mitosis; unregulated DNA damage check-points, and apoptosis. Result: Nine hundred fifty eight transcripts out of the 25,000 studied cDNAs were differentially expressed; 503 were up-regulated and 455 were down-regulated. A total of 19 pathways were up-regulated through 27 genes and 13 pathways were down-regulated through 19 genes. Thirty-seven genes showed significant differences in their expression between HCC cases with high and low Alpha Feto Protein (AFP≥600 IU/ml). The validation for the microarray was done by real time PCR assay in which PPP3CA, ATG-5, BACE genes showed down-regulation and ABCG2, RXRA, ELOVL2, CXR3 genes showed up-regulation. cDNA microarrays showed that among the major upregulated genes in HCC are sets. Conclusion: The identified genes could provide a panel of new diagnostic and prognostic aids for HCC.
Human action recognition is an important area of research in computer vision. Its applications include surveillance systems, patient monitoring, human-computer interaction, just to name a few. Numerous techniques have been developed to solve this problem in 2D and 3D spaces. However most of the existing techniques are view-dependent. In this paper we propose a novel view-independent action recognition algorithm based on the motion history of skeletons in 3D. First, we compute a skeleton for each volume and a motion history for each action. Then, alignment is performed using cylindrical coordinates-based Fourier transform to form a feature vector. A dimension reduction step is subsequently applied using Principle Component Analysis and action classification is carried out by using Euclidian distance, Mahalonobis distance, and Linear Discernment analysis. The proposed algorithm is evaluated on the benchmark IXMAS and i3DPost datasets where the proposed motion history of skeletons is compared against the traditional motion history of volumes. Obtained results demonstrate that skeleton representations improve the recognition accuracy and can be used to recognize human actions independent of view point and scale. © 2012 Springer-Verlag.
Multiobjective genetic algorithm to allocate budgetary resources for condition assessment of water and sewer networks

Authors
Atef A., Osman H., Moselhi O.

Abstract
This paper presents a framework for optimizing condition assessment policies by balancing the revealed value of information with the cost of obtaining such information. The computational platform is based on augmenting the asset condition state with an expected level of accuracy. Inaccuracies due to condition assessment reliability are evaluated using the partially observable Markov decision process. The single objective genetic algorithm is used to select the most cost-effective assets to assess considering information inaccuracy under a fixed budget. The model is extended using multiobjective genetic algorithms and fuzzy set theory to include minimizing the risk exposure based on asset consequence of failure. This methodology takes into consideration direct and indirect costs of sudden infrastructure failure and reduced level of service costs. A case study is presented using the City of Hamilton, Canada, water network to demonstrate the capabilities of the model.
Myocardial segmentation using contour-constrained optical flow tracking

Authors
Fahmy A.S., Al-Agamy A.O., Khalifa A.

Abstract
Despite the important role of object tracking using the Optical Flow (OF) in computer graphics applications, it has a limited role in segmenting speckle-free medical images such as magnetic resonance images of the heart. In this work, we propose a novel solution of the OF equation that allows incorporating additional constraints of the shape of the segmented object. We formulate a cost function that include the OF constraint in addition to myocardial contour properties such as smoothness and elasticity. The method is totally different from the common naïve combination of OF estimation within the active contour model framework. The technique is applied to dataset of 20 patients and comparison with manual segmentation shows sensitivity and specificity levels of 93% and 99% respectively is obtained through the challenge validation system. © 2012 Springer-Verlag.
Abstract

Energy and Environment, both are the main concern for every researcher all over the world. Alternative energy sources that are environmental friendly became the challenge to satisfy world needs. Oil and Gas are no more the main source of Energy, consequently the demand of an everlasting cheap source of energy that is environmental friendly, is the main goal recently. During the last decade, power consumption has decreased opening the field for energy harvesting to become a real time solution for providing different sources of electrical power. Energy Harvesting is a new technology that is going to make a revolution in the coming decade. Energy Harvesting is a technique to provide alternative sources of energy that are environmental friendly and low in cost. Future applications need wireless devices to operate for longer durations away from centralized power sources or the amount of power that can be supplied to these wireless devices to be increased. Currently, many technologies have been developed that attempt to overcome the limitations imposed on wireless devices. Radio Frequency Energy Harvesting is one of these types of energy harvesting that is able to convert Radio Frequency waves from ambient air to electrical energy. This paper presents a model for harvesting radio frequency energy waves. The presented model is directed towards different applications and targeting mainly Radio Frequency Identification (RFID) applications, where it works on frequencies in the range of 2.1 - 2.45 GHz. The recommended model faces size and efficiency problems presenting a very small radio frequency energy-harvesting model that can be implemented easily inside Radio Frequency Identification (RFID) applications. A final model for Radio Frequency Energy Harvesting is proposed based on different types of simulations and experiments. © 2012 IEEE.
On the ARQ protocols over the Z-interference channels: Diversity- multiplexing-delay tradeoff

Authors
Nafea M.S., Hamza D., Seddik K.G., Nafie M., Gamal H.E.

Abstract
We characterize the achievable three-dimensional tradeoff between diversity, multiplexing, and delay of the single antenna Automatic Retransmission reQuest (ARQ) Z-interference channel. Non-cooperative and cooperative ARQ protocols are adopted under these assumptions. Considering no cooperation exists, we study the achievable tradeoff of the fixed-power split Han-Kobayashi (HK) approach. Interestingly, we demonstrate that if the second user transmits the common part only of its message in the event of its successful decoding and a decoding failure at the first user, communication is improved over that achieved by keeping or stopping the transmission of both the common and private messages. Under cooperation, two special cases of the HK are considered for static and dynamic decoders. The difference between the two decoders lies in the ability of the latter to dynamically choose which HK special-case decoding to apply. Cooperation is shown to dramatically increase the achievable first user diversity. © 2012 IEEE.
On the diversity gain region of the Z-interference channels

Authors
Nafea M.S., Seddik K.G., Nafie M., Gamal H.E.

Abstract
In this work, we analyze the diversity gain region (DGR) of the single-antenna Rayleigh fading Z-Interference channel (ZIC). More specifically, we characterize the achievable DGR of the fixed-power split Han-Kobayashi (HK) approach under these assumptions. Our characterization comes in a closed form and demonstrates that the HK scheme with only a common message is a singular case, which achieves the best DGR among all HK schemes for certain multiplexing gains. Finally, we show that generalized time sharing, with variable rate and power assignments for the common and private messages, does not improve the achievable DGR. © 2012 IEEE.
On the role of vehicular mobility in cooperative content caching

Authors
Attia O., Elbatt T.

Abstract
In this paper, we analyze the performance of cooperative content caching in vehicular ad hoc networks (VANETs). In particular, we characterize, using analysis and simulations, the behavior of the probability of outage (i.e. not finding a requested data chunk at a neighbor) under freeway vehicular mobility. First, we introduce a formal definition for the probability of outage in the context of cooperative content caching. Second, we characterize, analytically, the outage probability under vehicular and random mobility scenarios. Next, we verify the analytical results using simulations and compare the performance under a number of plausible mobility scenarios. This provides key insights into the problem and the involved trade-offs and enable us to assess the potential opportunity offered by the, somewhat structured, vehicular mobility that can be exploited by cooperative content caching schemes. The presented numerical results exhibit complete agreement between the analytical and simulation studies. Finally, we observe that vehicular mobility creates opportunities for enhanced outage performance under practically relevant scenarios. © 2012 IEEE.
On-board multiple target detection and tracking on camera-equipped aerial vehicles

Authors
Siam M., Elsayed R., Elhelw M.

Abstract
This paper presents a novel automatic multiple moving target detection and tracking framework that executes in real-time with enhanced accuracy and is suitable for UAV imagery. The framework is deployed for on-board processing and tested over datasets collected by our UAV system. The framework is based on image feature processing and projective geometry and is carried out on the following stages. First, FAST corners are detected and matched, and then outlier features are computed with least median square estimation. Moving targets are subsequently detected by using a density-based spatial clustering algorithm. Detected targets' states are estimated using Kalman filter, while an overlap-rate-based data association mechanism followed by tracking persistency check are used to discriminate between true moving targets and false detections. The proposed framework doesn't involve explicit application of image transformations to detect potential targets resulting in enhanced computational time and reduction of registration errors. Furthermore, the selective template update mechanism that's based on the data association decision ensures sustaining a representative target template. Also, using BRIEF descriptors for target localization enhances framework robustness and significantly improves the overall tracking precision. Quantitative results are carried out on real-world UAV video sequences collected by our UAV system and on publicly available DARPA datasets. The experiments prove the robustness of the proposed framework for practical UAV target detection and tracking applications. © 2012 IEEE.
Optimal random access and random spectrum sensing for an energy harvesting cognitive radio

Authors
El Shafie A., Sultan A.

Abstract
We consider a secondary user with energy harvesting capability. We design access schemes for the secondary user which incorporate random spectrum sensing and random access, and which make use of the primary automatic repeat request (ARQ) feedback. The sensing and access probabilities are obtained such that the secondary throughput is maximized under the constraints that both the primary and secondary queues are stable and that the primary queueing delay is kept lower than a specified value needed to guarantee a certain quality of service (QoS) for the primary user. We consider spectrum sensing errors and assume multipacket reception (MPR) capabilities. Numerical results are presented to show the enhanced performance of our proposed system over a random access system, and to demonstrate the benefit of leveraging the primary feedback. © 2012 IEEE.
Abstract
Condition assessment is an integral component in any infrastructure asset management system. Without condition information, asset managers lack the ability to make appropriate decisions regarding needed maintenance, rehabilitation, and replacement of infrastructure. Existing and emerging technologies for assessing the condition of water and sewer pipes provide a better picture of the state of these buried assets. Unfortunately, many of these technologies are costly and provide results that are not always highly reliable. This paper presents a methodology to assist asset managers in balancing the value of information revealed by a condition assessment technology with the cost of obtaining this information. The paper describes the computational platform of the developed methodology and focuses primarily on the optimization process that utilizes the partially observable Markov decision process (POMDP) and genetic algorithms. This policy determines the most appropriate condition assessment technology and interval between inspections. The developed methodology takes into consideration direct and indirect costs of infrastructure failure. Optimization models are developed at both the asset and network levels. A case study of the water distribution network for the city of Hamilton, Canada, is presented to demonstrate the use and capabilities of the developed methodology. At the asset level, results allow the asset manager to select the most suitable condition assessment technology and inspection interval for a particular pipe. At the network level, results enable the proper allocation of a condition assessment budget across all pipes in the system. © 2012 American Society of Civil Engineers.
Organizational risk assessment based on attacks repetition

Authors
Azer M., Shaker A., Nagy S., Raafat A., Abuzaid M.

Abstract
Risk assessment is a very critical and important process to protect the organization assets and reputation against security threats and risks. It provides a clear picture of the current threats that the organization is facing and helps the top management to take the right decision to eliminate or mitigate those risks. Usually if the vulnerability is exploited, the same attack may be happen twice or more in a different time periods because the vulnerability has been exploited and not mitigated. In this paper, we are illustrating our observation of the relation between the risk value and the number of attacks targeting this risk. © 2012 IEEE.
Performance evaluation of transform domain diagonal principal component analysis for facial recognition employing different pre-processing spatial domain approaches

Authors
Chehata R.C.G., Mikhael W.B., Abdelwahab M.M.

Abstract
Facial recognition using spatial domain Diagonal Principal Component Analysis (DiaPCA) algorithm produces better accuracy compared to the Two Dimensional PCA (2DPCA). Transform Domain - 2DPCA (TD2DPCA) retains the high recognition accuracy of the 2DPCA while considerably reducing storage requirements and computational complexity. In this work, the Transform Domain PCA implementation of the DiaPCA (TDDiaPCA) is presented. All the test results, for noise free and noisy images, consistently confirm the considerable storage and computational savings for different spatial domain pre-processing scenarios while retaining the high recognition rate. The performance is evaluated using ORL, Yale and FERET databases. Sample results are given. © 2012 IEEE.
Person name extraction from modern standard Arabic or colloquial text

Authors
Zayed O.H., El-Beltagy S.R.

Abstract
Person Name extraction from Arabic text is a challenging task. While most existing Arabic texts are written in Modern Standard Arabic Text (MSA) the volume of Arabic Colloquial text is increasing progressively with the wide spread use of social media examples of which are Facebook, Google Moderator and Twitter. Previous work addressed extracting persons' names from MSA text only and especially from news articles. Previous work also relied on a lot of resources such as gazetteers for places, organizations, verbs, and person names. In this paper we introduce a system for extracting persons' names from any type of Arabic text whether it is MSA or Colloquial using very few resources. In our system, Natural Language Processing (NLP) is integrated with a limited set of dictionaries to extract a person's name from Arabic text. The paper also presents the results of evaluating the system on two datasets, one for MSA and the other for Colloquial Arabic. The results achieved were found to be satisfactory in terms of precision, recall and f-measure. © 2012 Cairo University.
QOS-constrained multiuser peer-to-peer amplify-and-forward relay beamforming

Authors
Fadel M., El-Keyi A., Sultan A.

Abstract
A wireless communication scenario is considered with K single-antenna source-destination pairs communicating through several half-duplex amplify-and-forward MIMO relays where each source is targeting only one destination. The relay beamforming matrices are designed in order to minimize the total power transmitted from the relays subject to quality of service constraints on the received signal to interference-plus-noise ratio at each destination node. Due to the nonconvexity of this problem, several approximations have been used in the literature to find a computationally efficient solution. A novel solution technique is developed in which the problem is decomposed into a group of second-order cone programs (SOCPs) parameterized by K phase angles; each associated with one of the constraints. An iterative algorithm is proposed to search for the phase angles and the relay beamforming matrices sequentially. However, convergence to the global optimal beamforming matrices cannot be guaranteed. Two methods for searching for the optimal values of the phase angles are proposed (from which the optimal beamforming matrices can be obtained) using grid search and bisection and the convergence of these methods to the global optimal solution of the problem is proved. Numerical simulations are presented showing the superior performance of the proposed algorithms compared to earlier suboptimal approximations at the expense of a moderate increase in the computational complexity. © 2011 IEEE.
Year: 2012

Quantitative assessment of age-related macular degeneration using parametric modeling of the leakage transfer function: Preliminary results

Authors
Eldeeb S.M., Abdelmoula W.M., Shah S.M., Fahmy A.S.

Abstract
Age-related macular degeneration (AMD) is a major cause of blindness and visual impairment in older adults. The wet form of the disease is characterized by abnormal blood vessels forming a choroidal neovascular membrane (CNV), that result in destruction of normal architecture of the retina. Current evaluation and follow up of wet AMD include subjective evaluation of Fluorescein Angiograms (FA) to determine the activity of the lesion and monitor the progression or regression of the disease. However, this subjective evaluation prevents accurate monitoring of the disease progression or regression in response to a pharmacologic agent. In this work, we present a method that allows objective assessment of the activity of a CNV lesion which can be statistically compared across different patient and time points. The method is based on a hypothesis that the discrepancy in the time-intensity signals among the diseased and normal retinal areas are due to an implicit transfer function whose parameters can be used to characterize the retina. The method begins with parametric modeling of the temporal variation of the lesion and background intensities. Then, the values of the model parameters are used to evaluate the change in the activity of the disease. Preliminary results on five datasets show that the calculated parameters are highly correlated with the Visual Acuity (VA) of the patients. © 2012 IEEE.
Quantitative assessment of age-related macular degeneration using parametric modeling of the leakage transfer function: preliminary results.

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Abstract
Age-related macular degeneration (AMD) is a major cause of blindness and visual impairment in older adults. The wet form of the disease is characterized by abnormal blood vessels forming a choroidal neovascular membrane (CNV), that result in destruction of normal architecture of the retina. Current evaluation and follow up of wet AMD include subjective evaluation of Fluorescein Angiograms (FA) to determine the activity of the lesion and monitor the progression or regression of the disease. However, this subjective evaluation prevents accurate monitoring of the disease progression or regression in response to a pharmacologic agent. In this work, we present a method that allows objective assessment of the activity of a CNV lesion which can be statistically compared across different patient and time points. The method is based on a hypothesis that the discrepancy in the time-intensity signals among the diseased and normal retinal areas are due to an implicit transfer function whose parameters can be used to characterize the retina. The method begins with parametric modeling of the temporal variation of the lesion and background intensities. Then, the values of the model parameters are used to evaluate the change in the activity of the disease. Preliminary results on five datasets show that the calculated parameters are highly correlated with the Visual Acuity (VA) of the patients.
Quantitative assessment of Diabetic Macular Edema using fluorescein leakage maps

Authors
Magdy E., Agbedia O.O., Ibrahim M., Nguyen Q.D., Fahmy A.S.

Abstract
Diagnosis of Diabetic Macular Edema (DME) from Fundus Fluorescein Angiography (FFA) image sequences is a standard clinical practice. Nevertheless, current methods depend on subjective evaluation of the amount of fluorescein leakage in the images which lack reproducibility and require well-trained grader. In this work, we present a method for processing FFA images to generate a fluorescein leakage map that can be used for quantitative evaluation of DME. An essential step in the proposed method is to model the spatial distribution of the image intensity within the macula. This model, which represents the non-leaking structures, is then subtracted from the late timeframe image to enhance the areas of fluorescein leakage. The resulting difference image is then mapped with empirical linear transformation to produce a color Fluorescein Leakage Map (FLM) that can be used for quantitative assessment and detection of DME. The method was applied to 13 image sequences for 13 different patients. The resulting FLM maps were found to be correlated with the thickness maps produced by Optical Coherence Tomography (OCT). The relatively high correlation between the FLM and OCT maps show the potential and of using the developed method for quantitatively assess the DME in FFA image sequences. © 2012 IEEE.
Abstract
This work introduces Maxwell's equations in their time domain fractional derivatives form. Some special cases of fractional order wave equations are shown. Studying the effect of fractional-order derivatives with respect to time on the generalized analysis and fundamentals of the rectangular waveguide is the main focus of this work. The effect of the fractional-order parameters on the waveguide properties is shown. Some of these properties are cutoff frequency and attenuation that are no longer fixed but controllable by the fractional parameters. Also, the intrinsic impedance is shown to be complex in value. The analysis of the conventional rectangular waveguide as a special case from the fractional-order study when the fractional-orders equal '1' is verified. © 2012 IEEE.
Year: 2012

Reduced-complexity SFBC-OFDM for vehicular channels with high mobility

Authors
Abotabl A.A., El-Keyi A., Mohasseb Y., Elbatt T.

Abstract
Space frequency block coding with orthogonal frequency division multiplexing (SFBC-OFDM) suffers from the effect of inter-carrier interference (ICI) in doubly-selective communication channels. In this paper, a scheme is proposed in which windowing is applied to the received signal to reduce the effect of ICI to a limited number of neighboring sub-carriers. The sub-carriers holding the SFBC components of each codeword are separated by a number of sub-carriers larger than the ICI range, and hence, they do not interfere with each other. In order to preserve the structure of the SFBC, the separation between the codeword components is also selected within the coherence bandwidth of the channel. As a result, the diversity gain of the SFBC is preserved. A decision feedback equalizer is proposed to estimate the transmitted data symbols with low complexity. Simulation results are presented showing the ability of the proposed scheme to significantly improve the performance of SFBC-OFDM and preserve its diversity gain. © 2012 IEEE.
Remote prognosis, diagnosis and maintenance for automotive architecture based on least squares support vector machine and multiple classifiers

Authors
Taie M.A., Diab M., Elhelw M.

Abstract
Software issues related to automotive controls account for an increasingly large percentage of the overall vehicles recalled. To alleviate this problem, vehicle diagnosis and maintenance systems are increasingly being performed remotely, that is while the vehicle is being driven without need for factory recall and there is strong consumer interest in Remote Diagnosis and Maintenance (RD&M) systems. Such systems are developed with different building blocks/elements and various capabilities. This paper presents a novel automotive RD&M system and prognosis architecture. The elements of the proposed system include vehicles, smart phones, maintenance service centers, vehicle manufacturer, RD&M experts, RD&M service centers, logistics carry centers, and emergency centers. The system promotes the role of smart phones used to run prognosis and diagnosis tools based on Least Squares Support Vector Machine (LS-SVM) multiple classifiers. During the prognosis phase, the smart phone stores the history of any forecast failures and send them, only if any failure already occurred during the diagnosis, to the RD&M service centre. The later will then forward it to RD&M experts as a real failure data to improve the training data used in prognosis classification and predication of the remaining useful life (RUL). The (LS-SVM) is used widely in prognostics and system health management of spacecraft in-orbit and it is applied to monitor spacecraft’s performance, detect faults, identify the root cause of the fault, and predict RUL. The same approach is applied in this paper. Finally, the RD&M software architectures for the vehicle and the smart phone are presented. © 2012 IEEE.
Resource allocation for throughput enhancement in cellular shared relay networks

Authors
Fadel M., Hindy A., El-Keyi A., Nafie M., Koyluoglu O.O., Tulino A.M.

Abstract
The downlink frame of a cellular relay network is considered, where a shared MIMO decode-and-forward relaying is used to serve the users at the edge of the cell. The relay employs zero-forcing beamforming to manage the interference among the mobile stations (MSs) at the edge of the cell. A non-cooperative scheme is considered where there is no coordination between the base stations (BSs) and the relay station (RS), and a power control algorithm for the RS is developed that maximizes the rate of the relayed users. A cooperative setting which allows the coordination of a power allocation between BSs and RSs is also considered. For this setting, based on the proposed achievable scheme, an optimization formulation is derived to maximize the total throughput of the MSs subject to a constraint on the total power of the system. The problem is solved iteratively as a sequence of geometric programs. Simulation results are provided showing that a significant increase in the network throughput can be achieved via the proposed schemes compared to a conventional cellular system with no relays. © 2012 IEEE.
Robust autonomous visual detection and tracking of moving targets in UAV imagery

Authors
Siam M., Elhelw M.

Abstract
The use of Unmanned Aerial Vehicles (UAVs) for reconnaissance and surveillance applications has been steadily growing over the past few years. The operations of such largely autonomous systems rely primarily on the automatic detection and tracking of targets of interest. This paper presents a novel automatic multiple moving target detection and tracking framework that executes in real-time and is suitable for UAV imagery. The framework is based on image feature processing and projective geometry and is carried out on the following stages. First, outlier image features are computed with least median square estimation. Moving targets are subsequently detected by using a spatial clustering algorithm. Detected targets are tracked by using Kalman filtering while persistency check is used to discriminate between true moving targets and false detections. The proposed framework doesn't involve the explicit application of image transformations to detect potential targets resulting in enhanced computational time and reduction of registration errors. Furthermore, the use of data association to correlate detected and tracked targets along with the selective template update that's based on the data association decision significantly improves the overall tracking precision. © 2012 IEEE.
Shapiro and parametric resonances in coupled Josephson junctions

Authors
Gaafar Ma.A., Shukrinov Yu.M., Foda A.

Abstract
The effect of microwave irradiation on the phase dynamics of intrinsic Josephson junctions in high temperature superconductors is investigated. We compare the current-voltage characteristics for a stack of coupled Josephson junctions under external irradiation calculated in the framework of CCJJ and CCJJ+DC models.
Abstract
Analysis and optimization of switched-capacitor (SC) dc-dc converters with a series inductive filter are developed. The steady-state output impedance of such SC resonant converters is calculated for a 21 conversion ratio. In addition, the necessary conditions for proper application of the output inductive filter are derived. The proposed optimization methodology applies numerical optimization to evaluate different loss components in order to find the optimal design point of highest conversion efficiency. This optimization method is verified through SPICE simulations on a 21 SC power stage in 65-nm CMOS process. © 2012 IEEE.
**Year:** 2012

**Tavaxy: Integrating Taverna and Galaxy workflows with cloud computing support**

**Authors**
Abouelhoda M., Issa S.A., Ghanem M.

**Abstract**

Background: Over the past decade the workflow system paradigm has evolved as an efficient and user-friendly approach for developing complex bioinformatics applications. Two popular workflow systems that have gained acceptance by the bioinformatics community are Taverna and Galaxy. Each system has a large user-base and supports an ever-growing repository of application workflows. However, workflows developed for one system cannot be imported and executed easily on the other. The lack of interoperability is due to differences in the models of computation, workflow languages, and architectures of both systems. This lack of interoperability limits sharing of workflows between the user communities and leads to duplication of development efforts.

Results: In this paper, we present Tavaxy, a stand-alone system for creating and executing workflows based on using an extensible set of re-usable workflow patterns. Tavaxy offers a set of new features that simplify and enhance the development of sequence analysis applications: It allows the integration of existing Taverna and Galaxy workflows in a single environment, and supports the use of cloud computing capabilities. The integration of existing Taverna and Galaxy workflows is supported seamlessly at both run-time and design-time levels, based on the concepts of hierarchical workflows and workflow patterns. The use of cloud computing in Tavaxy is flexible, where the users can either instantiate the whole system on the cloud, or delegate the execution of certain sub-workflows to the cloud infrastructure.

Conclusions: Tavaxy reduces the workflow development cycle by introducing the use of workflow patterns to simplify workflow creation. It enables the re-use and integration of existing (sub-) workflows from Taverna and Galaxy, and allows the creation of hybrid workflows. Its additional features exploit recent advances in high performance cloud computing to cope with the increasing data size and complexity of analysis. The system can be accessed either through a cloud-enabled web-interface or downloaded and installed to run within the user's local environment. All resources related to Tavaxy are available at http://www.tavaxy.org. © 2012 Abouelhoda et al.; licensee BioMed Central Ltd.
Abstract
The widespread use of social media tools and forums has led to the production of textual data at unprecedented rates. Without summarization, classification or other form of analysis, the sheer volume of this data will often render it useless and human analysis on this scale is next to impossible. The work presented in this paper focuses on investigating an approach for classifying large volumes of data when no training data and no classification scheme are available. Motivation for this work lies in encountering a real life problem which is further described in the paper. The presented system TopicAnalyzer combines different features extraction, selection and classification methods to accommodate any textual data. The results of evaluating the presented system show that its accuracy is comparable to existing supervised classification systems. The paper also suggests an emergence of promising future work that can further enhance the presented results. © 2012 IEEE.
Towards characterising and classifying communication-based automotive applications from a wireless networking perspective

**Authors**
Bai F., Krishnan H., Elbatt T., Holland G.

**Abstract**

Together, the Dedicated Short Range Communication (DSRC) and Vehicular Ad Hoc Network (VANET) technologies provide a unique opportunity to develop and introduce various types of communication-based automotive technologies to the marketplace. To date, many applications have been identified by the automotive community. Given the large number and diverse nature of these applications, it is advantageous to develop a systematic classification methodology to facilitate future DSRC and VANET research. Toward this objective, in this paper, we present a study that goes through two major steps: characterisation and classification. First, we focus on a set of representative applications and characterise them with respect to plausible application- and networking-related attributes. The characterisation process not only strengthens our understanding of the applications but also sets the stage for the classification step since it reveals numerous application commonalities. Thus, we have categorised the given applications into seven generic classes, with the consideration of balancing the trade-off between exploiting as many application similarities as possible while preserving their salient differences. This is of paramount importance to facilitate performance analysis of newly designed protocols. Finally, we have identified key performance metrics for each class of applications, which, we hope, could bridge the gap between the automotive and wireless networking communities. Accordingly, the proposed classes are envisioned to play a dual-role: facilitate application simulation and performance evaluation and guide DSRC and VANET protocol research and development. © 2012 Inderscience Enterprises Ltd.
Transmission power adaptation for cognitive radios

Authors
Afifi W., Sultan A., Nafie M.

Abstract
In cognitive radio (CR) networks, determining the optimal transmission power for the secondary users (SU) is crucial to achieving the goal of maximizing the secondary throughput while protecting the primary users (PU) from service disruption and interference. In this paper, we propose an adaptive transmission power scheme for cognitive terminals opportunistically accessing a primary channel. The PU operates over the channel in an unslotted manner switching activity at random times. The secondary transmitter (STx) adapts its transmission power according to its belief regarding the PU’s state of activity. The objective is to maximize a utility function that is related to the secondary throughput. The function has also a term that penalizes collision with the PU. We quantify and demonstrate, via numerical simulations, the enhanced CR system performance relative to fixed transmission power operation. © 2012 IEEE.
Year: 2012

Visual analytics for network security

Authors
Shurkhovetskyy G., Bahey A., Ghoniem M.

Abstract
To visualize the VAST 2012 Mini Challenge 2 datasets, we use the InfoVis Toolkit (IVTK). Custom visualizations as well as extra interaction capabilities have been added to the toolkit. Custom-made Python scripts are used for data preprocessing purposes. In this work, we show how visualization tools may be combined to leverage network forensic analysis tasks. © 2012 IEEE.
A 12Gbps all digital low power SerDes transceiver for on-chip networking

Authors
Safwat S., Hussein E.E.-D., Ghoneima M., Ismail Y.

Abstract
In this paper, a new self-timed signaling technique for reliable low-power on-chip SerDes (Serialization and DeSerialization) links is presented. The transmitter serializes 8 parallel bits at 1.5GHz, and multiplexes the 12Gbps serial data stream with a 24GHz clock on a single line using three level signaling. This new signaling technique enables the receiver to recover the clock from the data with a simple phase detector circuitry. Moreover, this technique is insensitive to jitter accumulated during signal propagation or at the receiver input because the clock signal is extracted from the multiplexed data stream. Hence, timing errors in the received signal reflects in both the data and the extracted clock, and the data will be sampled correctly. The SerDes transceiver was implemented for a 3mm long lossy on-chip differential transmission line in 65nm TSMC CMOS technology. A primary advantage of building an all digital SerDes transceiver is the ease of scaling with technology, and the power and area reduction. The total power consumed in the Tx/Rx pair with the transmission line is 15.5mWatt, which is very small as compared to similar published signaling architectures. © 2011 IEEE.
A distributed data collection algorithm for wireless sensor networks with persistent storage nodes

Authors
Aly S.A., Ali-Eldin A., Poor H.V.

Abstract
A distributed data collection algorithm to accurately store and forward information obtained by wireless sensor networks is proposed. The proposed algorithm does not depend on the sensor network topology, routing tables, or geographic locations of sensor nodes, but rather makes use of uniformly distributed storage nodes. Analytical and simulation results for this algorithm show that, with high probability, the data disseminated by the sensor nodes can be precisely collected by querying any small set of storage nodes.
A dynamic calibration scheme for on-chip process and temperature variations

Authors
Raymond M., Ghoneima M., Ismail Y.

Abstract
A process and temperature variation calibration scheme is proposed in this paper. The proposed system uses the supply voltage and body bias to calibrate the device parameters to match those of a certain process corner that is determined by the system designer. This scheme is characterized by its ability to dynamically change the desired mapping target according to the computational load. Moreover, the proposed system provides the ability to detect and control the n- and p-type variations independently through the use of an all-n and all-p ring oscillators. The calibration system has been implemented and simulated in TSMC 90-nm technology. Simulation results show that the system was able to reduce frequency spread (sigma) from 75 MHz to an average of 10 MHz and frequency variations from 34% to 3.1%. The results also show the system's ability to compensate for dynamic load variations. © 2011 IEEE.
A feedback-based access scheme for cognitive radio systems

Authors
Seddik K.G., Sultan A.K., El-Sherif A.A., Arafa A.M.

Abstract
In this paper, we consider the design of access schemes for secondary users in cognitive radio systems based on the primary user feedback information. We consider a secondary user employing a random access scheme with an access probability that depends on the primary user feedback state. We show that the proposed scheme can enhance the system performance in terms of the secondary throughput and/or primary user delay while guaranteeing a certain quality of service (QoS) for the primary user; this is due to the fact that the proposed scheme avoids sure collisions between the primary and secondary users. The proposed scheme can be deployed with any other random access based scheme and it always results in a performance gain using the extra piece of information coming from the primary user feedback. © 2011 IEEE.
A hidden Markov model for localization using low-end GSM cell phones

Authors
Ibrahim M., Youssef M.

Abstract
Research in location determination for GSM phones has gained interest recently as it enables a wide set of location based services. RSSI-based techniques have been the preferred method for GSM localization on the handset as RSSI information is available in all cell phones. Although the GSM standard allows for a cell phone to receive signal strength information from up to seven cell towers, many of today's cell phones are low-end phones, with limited API support, that gives only information about the associated cell tower. In addition, in many places in the world, the density of cell towers is very small and therefore, the available cell tower information for localization is very limited. This raises the challenge of accurately determining the cell phone location with very limited information, mainly the RSSI of the associated cell tower. In this paper we propose a Hidden Markov Model based solution that leverages the signal strength history from only the associated cell tower to achieve accurate GSM localization. We discuss the challenges of implementing our system and present the details of our system and how it addresses the challenges. To evaluate our proposed system, we implemented it on Android-based phones. Results for two different testbeds, representing urban and rural environments, show that our system provides at least 156% enhancement in median error in rural areas and at least 68% enhancement in median error in urban areas compared to current RSSI-based GSM localization systems. © 2011 IEEE.
A multiple performance analysis of market-capacity integration policies

Authors
Deif A.M., ElMaraghy H.A.

Abstract
A model that uses simulation augmented with Design of Experiments (DOE) is presented to analyse the performance of a Make-to-Order (MTO) reconfigurable manufacturing system with scalable capacity. Unlike the classical capacity scaling policies, the proposed hybrid capacity scaling policy is determined using multiple performance measures that reflect cost, internal stability and responsiveness. The impact of both tactical capacity and marketing policies and their interaction on the overall performance was analysed using DOE techniques and real case data. In addition to the different insights about the trade-offs involved in capacity planning decisions, the presented results challenged the conventional capacity planning wisdoms in MTO about the negative role of the capacity scalability delay time. Finally the analysis demonstrated the importance of inter-functional integration between capacity and marketing policies. Copyright © 2011 Inderscience Enterprises Ltd.
Year: 2011

A novel control technique to eliminate output-voltage-ripple in switched-capacitor DC-DC converters

Authors
Salem L.G., Jain R.

Abstract
A novel ripple mitigation technique is proposed for switched-capacitor voltage regulators (SCVR), which eliminates the output voltage ripple without using multi-phase interleaving. An inner control loop matches the SCVR's switch current to the load current on a cycle by cycle basis. A 2-phase 32 SCVR is designed in 45-nm CMOS process with the proposed control. For a 1.8 V to 1.05 V /40 mA converter, the proposed mitigation loop reduces the peak-to-peak output ripple from 330 mVp-p to 17 mVp-p, using total output capacitance of 4 nF/A. In addition, the proposed technique yields excellent regulation transient response. © 2011 IEEE.
Abstract
In this paper a novel power gated digitally controlled oscillator (DCO) is presented. The DCO is suitable for integration in various systems such as clock generation circuits, clock and data recovery, and clocking schemes for high speed links. Simulations of the proposed DCO on 65nm TSMC technology show frequency range of 2.5 GHz to 6.8 GHz across all corners. The proposed DCO consumes only 1.7 mW at 3 GHz and 3.2 mW at 6.8 GHz with estimated layout area of 70 *70 m^2. The phase noise of the free running DCO is 92 dBc/Hz measured at 1 MHz offset from a 3.4 GHz center frequency. © 2011 IEEE.
A novel segmentation method to identify left ventricular infarction in short-axis composite strain-encoded magnetic resonance images

Authors
Algohary A.O., Metwally M.K., El-Bialy A.M., Kandil A.H., Osman N.F.

Abstract
Composite Strain Encoding (CSENC) is a new Magnetic Resonance Imaging (MRI) technique for simultaneously acquiring cardiac functional and viability images. It combines the use of Delayed Enhancement (DE) and the Strain Encoding (SENC) imaging techniques to identify the infarcted (dead) tissue and to image the myocardial deformation inside the heart muscle. In this work, a new unsupervised segmentation method is proposed to identify infarcted left ventricular tissue in the images provided by CSENC MRI. The proposed method is based on the sequential application of Bayesian classifier, Otsu's thresholding, morphological opening, radial sweep boundary tracing and the fuzzy C-means (FCM) clustering algorithm. This method is tested on images of twelve patients with and without myocardial infarction (MI) and on simulated heart images with various levels of superimposed noise. The resulting clustered images are compared with those marked up by an expert cardiologist who assisted in validating results coming from the proposed method. Infarcted myocardium is correctly identified using the proposed method with high levels of accuracy and precision. © 2011 Copyright Society of Photo-Optical Instrumentation Engineers (SPIE).
Year:  2011

A semi-supervised learning-based method for adaptive shadow detection

Authors
El-Zahhar M.M., Karali A., Elhelw M.

Abstract
In vision-based systems, cast shadow detection is one of the key problems that must be alleviated in order to achieve robust segmentation of moving objects. Most methods for shadow detection require significant human input and they work in static settings. This paper proposes a novel approach for adaptive shadow detection by using semi-supervised learning which is a technique that has been widely utilized in various pattern recognition applications and exploits the use of labeled and unlabeled data to improve classification. The approach can be summarized as follows: First, we extract color, texture, and gradient features that are useful for differentiating between moving objects and their shadows. Second, we use a semi-supervised learning approach for adaptive shadow detection. Experimental results obtained with benchmark video sequences demonstrate that the proposed technique improves both the shadow detection rate (classify shadow points as shadows) and the shadow discrimination rate (not to classify object points as shadows) under different scene conditions. © 2011 IEEE.
A source authentication scheme using network coding

Authors
Fathy A., El Batt T., Youssef M.

Abstract
In this paper, we explore the security merits of network coding and potential trade-offs with the widely accepted throughput benefits, especially in multicast scenarios. In particular, we propose a novel Source Authentication using Network Coding (SANC) scheme. Towards this objective, we propose a general framework for embedding the authentication information within the network coding Global Encoding Vector. First, we illustrate the proposed concept using a simple mapping function. Second, we present a detailed security analysis that reveals the security merits of the proposed scheme, contrasted against two baseline schemes. Finally, we present simulation results pertaining to the network coding performance. © 2011 Inderscience Enterprises Ltd.
A system model for green manufacturing

Authors
Deif A.M.

Abstract
Manufacturing systems evolution is a function in multiple external and internal factors. With today's global awareness of environmental risks as well as the pressing needs to compete through efficiency, manufacturing systems are evolving into a new paradigm. This paper presents a system model for the new green manufacturing paradigm. The model captures various planning activities to migrate from a less green into a greener and more eco-efficient manufacturing. The various planning stages are accompanied by the required control metrics as well as various green tools in an open mixed architecture. The system model is demonstrated by an industrial case study. The proposed model is a comprehensive qualitative answer to the question of how to design and/or improve green manufacturing systems as well as a roadmap for future quantitative research to better evaluate this new paradigm. © 2011 Elsevier Ltd. All rights reserved.
Achievable degrees of freedom of the $K$-user interference channel with partial cooperation

Authors
Naguib A.A., Elsayed K., Nafie M.

Abstract
In this paper, we consider the $K$-user interference channel with partial cooperation, where a strict subset of the $K$ users cooperate. For the $K$-user interference channel with cooperating subsets of length $M$, the outer bound of the total degrees of freedom is $KM/(M+1)$. In this paper, we propose a signal space-based interference alignment scheme that proves the achievability of these degrees of freedom for the case $K = M+2$. The proposed scheme consists of a design for the transmit precoding matrices and a processing algorithm which we call the Successive Interference Alignment (SIA) algorithm. The decoder of each message uses the SIA algorithm to process the signals received by the $M$ cooperating receivers in order to get the maximum available degrees of freedom. © 2011 IEEE.
Adaptive sensing and transmission durations for cognitive radios

Authors
Afifi W., Sultan A., Nafie M.

Abstract
In a cognitive radio setting, secondary users opportunistically access the spectrum allocated to primary users. Finding the optimal sensing and transmission durations for the secondary users becomes crucial in order to maximize the secondary throughput while protecting the primary users from interference and service disruption. In this paper an adaptive sensing and transmission scheme for cognitive radios is proposed. We consider a channel allocated to a primary user which operates in an unslotted manner switching activity at random times. A secondary transmitter adapts its sensing and transmission durations according to its belief regarding the primary user state of activity. The objective is to maximize a secondary utility function. This function has a penalty term for collisions with primary transmission. It accounts for the reliability-throughput tradeoff by explicitly incorporating the impact of sensing duration on secondary throughput and primary activity detection reliability. It also accounts for throughput reduction that results from data overhead. Numerical simulations of the system performance demonstrate the effectiveness of adaptive sensing and transmission scheme over non-adaptive approach in increasing the secondary user utility. © 2011 IEEE.
Admission and power control for spectrum sharing cognitive radio networks

Authors
Tadrous J., Sultan A., Nafie M.

Abstract
We investigate the problem of admission and power control considering a scenario where licensed, or primary, users and cognitive radios, or secondary users, are transmitting concurrently over the same band. The primary users share a common receiver and the interference on this receiver from secondary users should be strictly limited to a certain level. Each secondary link is assumed to have a minimum quality of service (QoS) requirement that should be satisfied together with the interference limit constraint, otherwise the secondary link is not admitted. Under those constraints, admission and power control for secondary users are investigated for two main optimization objectives. First, we maximize the number of admitted secondary links. Second, we maximize the sum throughput of the admitted secondary links. The first problem is NP-hard, hence we provide a distributed close-to-optimal solution based on local measurements at each user and a limited amount of signaling. For the second problem, which is non-convex, we propose a suboptimal algorithm based on sequential geometric programming. The proposed algorithms are compared with previously related work to demonstrate their relative efficiency in terms of outage probability, complexity and achievable throughput. © 2011 IEEE.
An integrated framework for advanced hotel revenue management

Authors
El Gayar N.F., Saleh M., Atiya A., El-Shishiny H., Zakhary A.A.Y.F., Habib H.A.A.M.

Abstract
Purpose: This paper aims to present an integrated framework for hotel revenue room maximization. The revenue management (RM) model presented in this work treats the shortcomings in existing systems. In particular, it extends existing optimization techniques for hotel revenue management to address group reservations and uses "forecasted demand" arrivals generated from the real data.

Design/methodology/approach: The proposed forecasting module attempts to model the hotel reservation process from first principles. In particular, it models hotel arrivals as an interrelated process of stochastic parameters like reservations, cancellations, duration of stay, no shows, seasonality, trend, etc. and simulates forward in time the actual process of reservations to obtain the forecast. On the other hand, the proposed optimization module extends existing optimization techniques for hotel revenue management to address group reservations, while including integrality constraints and using "forecasted demand" arrivals generated from the data. The optimization model is based on large-scale integer programming model to optimize decision rules for accepting reservations.

Findings: A case study based on three different sets of reservation records of simulated hotel data was conducted to test the operation of the system on real data. Results showed that the model is able to generate effective recommendations to maximize revenue.

Originality/value: The main value of this paper is that it presents an integrated framework for hotel room revenue maximization. The novelty introduced in this approach is that it is based on an advanced room demand forecast model that simulated the reservation process from its first principles and produces demand scenarios that are used by an optimization model to generate proper recommendations. © Emerald Group Publishing Limited.
An interactive multimedia-based learning architecture: A Generic Virtual Lab

Authors
Gaber A., Naseef O.A., Abdelbaki N.

Abstract
The use of multimedia technology has offered an alternative successful and innovative way of delivering teaching and education. With interactive multimedia, the learning process becomes active, not passive and it ensures that users are doing, not simply watching. This paper describes the research, design, and implementation of the interactive learning environment to be used by children or students of ages 8-15 to increase their interactivity with as well as learning and understanding of some difficult subjects. We elaborate more on our concept of designing a Generic Virtual Lab (GVL) and its architecture. It is a comprehensive easy-to-use architecture that also enables teachers to create labs and experiments in different fields and subjects to ease the way of education.
AROMA: Automatic generation of radio maps for localization systems

Authors
Eleryan A., Elsabagh M., Youssef M.

Abstract
Current methods for building radio maps for wireless localization systems require a tedious, manual and error-prone calibration of the area of interest. Each time the layout of the environment is changed or different hardware is used, the whole process of location fingerprinting and constructing the radio map has to be repeated. The process gets more complicated in the case of localizing multiple entities in a device-free scenario, since the radio map needs to take all possible combinations of the location of the entities into account. In this demo, we present a novel system (AROMA) that is capable of generating accurate radio maps for a given site of interest. AROMA constructs radio maps for both deterministic and probabilistic wireless localization systems. According to our knowledge, AROMA is the first system to generate radio maps for device-free localization. It uses 3D ray tracing enhanced with the uniform theory of diffraction (UTD) to model the electric field behavior and the human shadowing effect. AROMA also automates a number of routine tasks, such as importing building models and automatic sampling of the area of interest. © 2011 Authors.
Censoring for improved performance of distributed detection in wireless sensor networks

Authors
Seddik K.G., Sultan A.K., El-Sherif A.A.

Abstract
In this paper, we consider the problem of binary hypothesis testing for distributed detection in wireless sensor networks in which a transmission censoring scheme is employed. The sensor nodes transmit binary decisions to the fusion center (FC) for final decision making. Sensor nodes with unreliable observation samples censor transmission to FC. By having two thresholds at each sensor node, a sensor node censors transmission if its log-likelihood ratio (LLR) falls between the two thresholds, whereas the more informative sensor nodes transmit their decisions to the FC. In this case of censoring some of the less-informative sensor nodes, and under our system model assumptions, we demonstrate that censoring can lower the probability of error at FC even if there is enough power and rate to support the transmissions of the less-informative sensor nodes. © 2011 IEEE.
Combating sybil attacks in vehicular ad hoc networks

Authors
Rabieh K.M., Azer M.A.

Abstract
Vehicular Ad Hoc Networks (VANETs) are considered as a promising approach for facilitating road safety, traffic management, and infotainment dissemination for drivers and passengers. However, they are subject to an attack that has a severe impact on their security. This attack is called the Sybil attack, and it is considered as one of the most serious attacks to VANETs, and a threat to lives of drivers and passengers. In this paper, we propose a detection scheme for the Sybil attack. The idea is based on public key cryptography and aims to ensure privacy preservation, confidentiality, and non-repudiation. In addition, we suggest a scalable security and privacy solution using short-lived and authenticated certificates that must be issued from the national certification authority in order to guarantee trust among vehicles. © 2011 Springer-Verlag.
Compact lumped element model for TSV in 3D-ICs

Authors
Salah K., El Rouby A., Ragai H., Amin K., Ismail Y.

Abstract
A wide-band lumped element model for a through silicon via (TSV) is proposed based on electromagnetic simulations. Closed form expressions for the TSV parasitics based on the dimensional analysis method are introduced. The proposed model enables direct extraction of the TSV resistance, self-inductance, oxide capacitance, and parasitic elements due to the finite substrate resistivity. The model's compactness and compatibility with SPICE simulations allows the fast investigation of a TSV impact on a 3-D circuit performance. The parameters' values of the proposed TSV model are fitted to the simulated S-parameters up to 10 GHz with an error less than 5%. It is shown that a TSV capacitance is highly dependent on the positions of ground contacts and has a value of tens of femto farads in a typical current technology. This value is much higher than a minimum device capacitance and requires special design methodologies such as cascaded buffers. Coupling between TSVs will be handled in another paper. © 2011 IEEE.
Year: 2011

Comparison of statistical deterioration models for water distribution networks

Authors
Osman H., Bainbridge K.

Abstract
The use of water main break history as a proxy for condition has become common practice because of the high costs associated with direct assessments. Statistical deterioration models predict future water main breaks on the basis of historical patterns. Many municipalities are beginning to understand the value of utilizing water pipe break histories to manage their noncritical distribution networks via deterioration models. This paper presents a generic IDEF0 process model for developing water main deterioration models. Two common statistical deterioration models for water pipes are compared: rate-of-failure models (ROF) and transition-state (TS) models. ROF models extrapolate the breakage rate for a particular cohort of pipes and do not differentiate between the times between successive failures. On the other hand, transition-state models attempt to model the time between successive failures for pipes. This paper presents a comparison and analysis of ROF models and transition-state models by using a single data set for cast- and ductile-iron pipes in the City of Hamilton, Ontario, Canada. The paper compares the models’ ability to support breakage forecasting, long-term strategic planning, and short-term tactical planning. Best practices for pipe segmentation in support of water main deterioration models are presented. © 2011 American Society of Civil Engineers.
Conceptual cost estimation of pump stations projects using fuzzy clustering

Authors
Marzouk M., Omar M.

Abstract
Conceptual cost estimates, are prepared at the very early stages of a project, and generally before the construction drawings and specifications are available. At this stage, cost estimates are needed by the owner, contractor, designer, or funding agencies for determination of the feasibility of a project, financial evaluation of a number of alternative projects, or establishment of an initial budget. Traditional approaches rely heavily on experienced engineers. This paper presents a method using fuzzy clustering technique for pump station projects cost estimation. The proposed conceptual cost estimating methodology provides fast and reliable results that can be very useful in the early stages of a project. The main cost drivers are identified using stepwise regression. Collected data are utilized to build the fuzzy clustering model. A training data set and a testing data set are used to calibrate the model. Sensitivity analysis is conducted to determine the appropriate model and the corresponding number of clusters that provides minimum error.
Constrained interference alignment and the spatial degrees of freedom of mimo cognitive networks

Authors
Amir M., El-Keyi A., Nafie M.

Abstract
An interference alignment (IA) scheme is presented that allows multiple opportunistic transmitters (secondary users) to use the same frequency band of a pre-existing primary link without generating any interference. The primary and secondary transmit-receive pairs are equipped with multiple antennas. Under power constraints on the primary transmitter, the rate of the primary user is maximized by water-filling on the singular values of its channel matrix leaving some eigen modes unused, and hence, the secondary users can align their transmitted signals to produce a number of interference-free dimensions at each secondary receiver without causing any interference to the primary user. An outer bound is developed on the degrees of freedom (DoF) of the secondary users. In the case of a symmetric secondary network with time-varying channel coefficients having $M$ antennas at each node and operating in the presence of a primary link with $d_0$ active eigen modes, a precoding scheme is presented for the secondary transmitters that can asymptotically achieve the available $(M-d_0)/2$DoF per secondary user. An iterative algorithm is also presented that utilizes channel reciprocity to achieve the proposed cognitive IA scheme. For a cognitive 3-user secondary network with constant channel coefficients, a novel closed-form solution is derived for the precoding matrices of the secondary users. © 2011 IEEE.
Abstract
Successful spectrum sharing in a cognitive radio network depends on the correct and quick detection of primary activity. Cooperative spectrum sensing is therefore suggested to enhance the reliability of such detection. However, it renders another significant problem of increased detection delay and traffic burden. Moreover, efficient schemes for multi-sensor data fusion should be designed. In this paper, we employ sequential detection scheme together with ordered transmissions from cognitive detectors. We derive two sequential schemes, one that is capable of achieving the minimum probability of error, and another that trades-off performance with delay. For the latter we derive expressions for the likelihood functions of ordered observations and compute the thresholds via backward induction. Simulation results demonstrate the relative performance of the approaches proposed in the paper. © 2011 IEEE.
Year: 2011

DPSK receiver-sensitivity enhancement using an SOA in front of the receiver

Authors
Awad E.

Abstract
A technique for DPSK receiver-sensitivity improvement is demonstrated using numerical simulations. It is based on reshaping and reamplifying of received 80 Gbit/s DPSK using an SOA before a one bit delay interferometer. The SOA re-amplifies data without adding amplitude or differential phase noise due to its gain-compression. The system is tested using 231-1 PRBS RZ-DPSK (NRZ-DPSK) loaded with both phase and amplitude noise. It shows 2dB (1.7dB) quality-factor improvement. The estimated BER by error-counting shows receiver-sensitivity improvement of ≅3dB in case of single-ended detection and ≅2dB (≅2.5dB) in case of balanced-detection. This single-ended improvement is comparable to that of common DPSK balanced-detection technique. © 2010 COPYRIGHT SPIE - The International Society for Optical Engineering.
Equivalent lumped element models for various n-port through silicon vias networks

Authors
Salah K., Ragai H., Ismail Y., El Rouby A.

Abstract
This paper proposes an equivalent lumped element model for various multi-TSV arrangements and introduces closed form expressions for the capacitive, resistive, and inductive coupling between those arrangements. The closed form expressions are in terms of physical dimensions and material properties and are driven based on the dimensional analysis method. The model's compactness and compatibility with SPICE simulators allows the electrical modeling of various TSV arrangements without the need for computationally expensive field-solvers and the fast investigation of a TSV impact on a 3-D circuit performance. The proposed model accuracy is tested versus a detailed electromagnetic simulation and showed less than 6% difference. Finally, the proposed model can be a possible solution to the industrial need for broadband electrical modeling of TSVs interconnections arising in 3-D integration. Also, our presented work provides valuable insight into creating guidelines for TSV macro-modeling. ©2011 IEEE.
Guest editorial special issue on ISCAS 2010

Authors
Ghoneima M.M., Lian Y., Manganaro G., Mirabbasi S., Piguet C., Serdijn W.A.

Abstract
[No abstract available]
Abstract

Human action recognition is considered as a challenging problem in the field of computer vision. Most of the reported algorithms are computationally expensive. In this paper, a novel system for human action recognition based on Two-Dimensional Principal Component Analysis (2DPCA) is presented. This method works directly on the optical flow and / or silhouette extracted from the input video in both the spatial domain and the transform domain. The algorithm reduces the computational complexity and storage requirements, while achieving high recognition accuracy, compared with the most recent reports in the field. Experimental results performed on the Weizmann action and the INIRIA IXMAS datasets confirm the excellent properties of the proposed algorithm. © 2011 IEEE.
Immunizing the SAODV protocol against routing information disclosure

Authors
Hanafy A.A., Noureldin S.H., Azer M.A.

Abstract
Secure routing protocols presents one of the most important challenges of Mobile Ad hoc Networks (MANETs). This is due to their special characteristics such as shared wireless medium, stringent resource constraints and highly dynamic network topology. This paper presents a solution to the problem of routing information disclosure and traffic analysis in a new way that doesn't require exchanging a group secret key between one-hop neighbors. In addition, the proposed solution maintains the routing data integrity and node authentication features. Furthermore, the solution provides a new method for securing neighborhood discovery (ND) using PKI. © 2011 ICITST.
Impact of the human motion on the variance of the received signal strength of wireless links

Authors
El-Kafrawy K., Youssef M., El-Keyi A.

Abstract
Human motion has strong impact on the received signal strength (RSS) of indoor wireless links that can be exploited for variance-based device-free positioning. In this paper, we investigate the effect of human motion on the variance of the RSS of wireless local area networks (WLAN) operating at 2.4 GHz. Using measurements, the RSS variance for human in-place motion is determined as a function of the human position in a corridor setting. We provide ray tracing and empirical models to capture this effect. The accuracy of the different models is compared under different scenarios. Furthermore, we investigate the effect of having multiple-entities in the same area of interest on the RSS variance and provide models for it. © 2011 IEEE.
Improved strain measuring using fast strain-encoded cardiac MR

Authors
Motaal A.G., Osman N.F.

Abstract
The strain encoding (SENC) technique encodes regional strain of the heart into the acquired MR images and produces two images with two different tunings so that longitudinal strain, on the short-axis view, or circumferential strain on the long-axis view, are measured. Interleaving acquisition is used to shorten the acquisition time of the two tuned images by 50%, but it suffers from errors in the strain calculations due to inter-tunings motion of the heart, which is the motion between two successive acquisitions. In this work, a method is proposed to correct for the inter-tunings motion by estimating the motion-induced shift in the spatial frequency of the encoding pattern, which depends on the strain rate. Numerical data is generated to test the proposed method and real images of human subjects are used for validation. The results show an improvement in strain calculations so as to relax the imaging constraints on spatial and temporal resolutions and improve image quality. © 2011 IEEE.
Interference alignment for secrecy

Authors
Koyluoglu O.O., El Gamal H., Lai L., Poor H.V.

Abstract
This paper studies the frequency/time selective K-user Gaussian interference channel with secrecy constraints. Two distinct models, namely the interference channel with confidential messages and the interference channel with an external eavesdropper, are analyzed. The key difference between the two models is the lack of channel state information (CSI) of the external eavesdropper. Using interference alignment along with secrecy precoding, it is shown that each user can achieve non-zero secure degrees of freedom (DoF) for both cases. More precisely, the proposed coding scheme achieves $K-2/2K-2$ secure DoF with probability one per user in the confidential messages model. For the external eavesdropper scenario, on the other hand, it is shown that each user can achieve $K-2/2K$ secure DoF in the ergodic setting. Remarkably, these results establish the positive impact of interference on the secrecy capacity region of wireless networks. © 2011 IEEE.
Joint power allocation and beamforming for multiuser MIMO two-way relay networks

Authors
Khafagy M., El-Keyi A., ElBatt T., Nafie M.

Abstract
In this paper, a multiuser cellular two-way relaying scenario is considered where multiple single-antenna mobile stations (MSs) and one multiple-antenna base station (BS) communicate, bidirectionally, via one half-duplex multiple-antenna relay station (RS). Furthermore, the case when the number of antennas at the RS is not sufficient to decode the individual messages is addressed. For this case, a two-phase two-way relaying scenario is considered. In the first phase, the multiple access, a minimum Mean Square Error (MSE) optimization problem is formulated which is found to be non-convex. Thus, an iterative scheme is proposed to compute the MS transmit powers, the BS beamforming vectors, and the corresponding RS linear receivers to minimize the maximum MSE for multiple pairs subject to power constraints on the transmitting terminals. In the second phase, the broadcast phase, the beamforming vectors at the RS are designed to minimize the maximum MSE at the MSs subject to relay power constraints, and the receivers at the BS are designed accordingly. In a two-pair scenario, simulation results are provided showing the superior performance of the proposed methods compared to earlier approaches in terms of the bit-error rate. Also, it is shown that as the system scales up in terms of signal space dimensions and number of accommodated pairs, the performance gap between the proposed scheme and the earlier approaches increases. © 2011 IEEE.
Kalman filter-based tracking of a device-free passive entity in wireless environments

Authors
Seifeldin M.A., El-Keyi A.F., Youssef M.A.

Abstract
Device-free passive (DfP) localization has been recently proposed to allow localizing a stationary entity that neither carries a device nor participates actively in the localization process. In this paper, we present a Kalman filter-based system that enables tracking a continuously moving entity in a typical wireless environment rich in multipath. The concept behind DfP tracking is that the received signal strength at monitoring points in a wireless environment is influenced by any changes in the environment. These changes include the movement of an entity, such as a human being, within the environment. This can be utilized to track an entity in many military and civil applications. We evaluate the performance of our system by conducting experiments in a typical office environment rich in multipath. Our results show that we were able to track a passive entity in a long corridor with a 1.2m median distance error and a less than 4.6m distance error with probability one. © 2011 ACM.
Keys through ARQ: Theory and practice

Authors
Abdallah Y., Abdel Latif M., Youssef M., Sultan A., El Gamal H.

Abstract
This paper develops a novel framework for sharing secret keys using the Automatic Repeat reQuest (ARQ) protocol. We first characterize the underlying information theoretic limits, under different assumptions on the channel spatial and temporal correlation function. Our analysis reveals a novel role of dumb antennas in overcoming the negative impact of spatial correlation on the achievable secrecy rates. We further develop an adaptive rate allocation policy, which achieves higher secrecy rates in temporally correlated channels, and explicit constructions for ARQ secrecy coding that enjoy low implementation complexity. Building on this theoretical foundation, we propose a unified framework for ARQ-based secrecy in Wi-Fi networks. By exploiting the existing ARQ mechanism in the IEEE 802.11 standard, we develop security overlays that offer strong security guarantees at the expense of only minor modifications in the medium access layer. Our numerical results establish the achievability of nonzero secrecy rates even when the eavesdropper channel is less noisy, on the average, than the legitimate channel, while our Linux-based prototype demonstrates the efficiency of our ARQ overlays in mitigating all known, passive and active, Wi-Fi attacks at the expense of a minimal increase in the link setup time and a small loss in throughput. © 2011 IEEE.
Knowledge has been identified to be a significant organizational resource, which if used effectively can provide competitive advantage. Construction contract administration is a complex, knowledge-intensive process that if properly managed can mitigate the contractor's risk exposure. Challenges in proper knowledge management of contract administration are due to: 1) Large amount of fragmented information that is required to manage a construction contract, 2) Information located in heterogeneous sources (Request For Information (RFIs), site notices, schedules, contracts, etc...), 3) Information is handled by many actors in the organization (planners, schedulers, site supervisors, etc...), and 4) Concentration of knowledge related to construction contract administration within a select few in the organization. Knowledge management can play a vital role in the formalizing, sharing and reuse of knowledge related to the contract administration process. This paper presents domain ontology for the construction contract administration process. The ontology formalizes knowledge in contract administration in the form of five main concepts (processes, events, actors, products and constraints). The ontology is modeled according to the contractual conditions of the Federation Internationale des Ingenieurs Conseils (FraFIDIC) Conditions of Contract for Construction for Buildings and Engineering Works Designed by the Owner (1999). Formal ontological engineering methodologies are used to develop the ontology and domain experts validated the concepts and relationships.
Labour productivity in building construction: A field study

Authors
Moselhi O., Aly R., Hassanein A.

Abstract
This paper describes a field study conducted over a period of 11-months on labour productivity observed during the construction of a new university campus in Cairo, Egypt. The campus is being built on 127 acres and the field study was conducted during the construction of two main buildings; each of 20,000 m$^2$ built up area. The study utilized work sampling (WS), craftsman questionnaire (CQ), and foreman delay survey (FDS) methods to analyze labour productivity of three indicative and labour-intensive trades, namely formwork, masonry work, and HVAC duct installation. The results were also compared to studies conducted in the USA in 1977 and in 2004 and revealed close similarities. The percentage of productive time for the first and the latter study were 32% and 29% respectively, whereas the current study revealed about 34%.
Year: 2011

Low power FPAA design based on OTA using 90nm CMOS technology

Authors

Abstract
This paper presents a low power Field programmable Analog Array (FPAA) based on operational transconductance amplifier (OTA) implemented in 90nm 1.2V CMOS technology achieving an operating frequency of 288MHz. Different continuous time filters in a frequency range from 52MHz to 282MHz can be implemented on that FPAA design achieving a max power of 62 mWatt for a 6th order band pass filter. © 2011 IEEE.
Maximum likelihood estimator for signal intensity in STEAM-based MR imaging techniques

Authors
Fahmy A.S., Osman N.F., Shalaby H.A.

Abstract
Stimulated echo acquisition mode (STEAM) is a generic imaging technique that lies at the core of many magnetic resonance imaging (MRI) techniques such MRI tagging, displacement encoded MRI, black-blood cardiac imaging. Nevertheless, tissue deformation causes frequency shift of the MR signal and leads to severe signal attenuation. In this work, a maximum likelihood estimator for the signal amplitude is proposed and used to correct the image artifacts. Numerical simulation and real MR data are used to test and validate the proposed method. © 2011 IEEE.
Modeling the impacts of information and communication technologies and virtual activities on activity and travel behavior: Case study of Cairo, Egypt

Authors
Mosa A.

Abstract
The boom in telecommunications is expected to have many impacts on peoples' activities and travel behavior. Recent advances in information and communication technologies (ICTs) make it possible to conduct activities virtually. Thus the need for physical travel for some types of activities is obviated. Accordingly, the use of ICT may contribute to reducing urban congestion and alleviating air quality problems. However, ICT may generate significant additional travel because of the increased connectivity and access to resources. Empirical insights on how the growing use of ICT affects travel patterns and vice versa have important application in planning, travel demand forecasting, and environmental analysis. The effects of ICT on household members' daily activity-travel patterns were studied in Cairo, Egypt, by using an activity and telecommunication diary survey. Structural equation models were developed to determine the relationship between ICT use, virtual participation in in-home activity, physical participation in in-home and out-of-home activity, and observed travel dimensions. The information analyzed included personal and household sociodemographics, ICT use, and effect of vehicle availability on activity patterns among household members. Virtual participation in in-home activity had both substitution and complementary impacts on out-of-home activity and travel patterns. The results have important implications for activity-travel demand estimation and forecasting, given the growing adoption of ICT among various segments of the population.
Modeling user behavior and infrastructure level of service: An agent-based simulation approach

Authors
Osman H., Atef A., Zaki M., Naguib L.

Abstract
Traditional modeling frameworks used for infrastructure asset management have suffered from two main shortcomings. Most approaches have focused their modeling efforts on the infrastructure asset itself, thereby ignoring the multitude of interactions that occur between other entities. In addition, an a-priori behavior of all elements in the modeling environment has always been assumed. This paper argues that these shortcomings have significantly limited the decision-making capabilities of infrastructure asset management systems by limiting their ability to simulate emergent behavior that is typical of all complex systems. One of the less-understood dynamics that is well known to asset managers is how infrastructure users react to changing Level of Service (LOS). This paper presents an agent-based model that simulates the behavior of various user categories to variations in the LOS they receive. User socio-economic characteristics that are analyzed include user expectations and tolerance levels. Political decision-makers are modeled as agents that have the ability to change infrastructure funding levels according to the satisfaction levels perceived by users. The models are formalized using the AnyLogic 6.5 simulation toolkit. A hypothetical example is used to demonstrate the how the interactions among agents in the model results in emergent system behavior. A sensitivity analysis is conducted to demonstrate how changing user socio-economic and psychological characteristics will influence potential intervention strategies by system operators.
Multiuser MIMO relaying under quality of service constraints

Authors
Fadel M., El-Keyi A., Sultan A.

Abstract
We consider a wireless communication scenario with K source-destination pairs communicating through several half-duplex amplify-and-forward relays. We design the relay beamforming matrices by minimizing the total power transmitted from all the relays subject to quality of service constraints on the received signal to interference-plus-noise ratio at each destination node. We propose a novel method for solving the resulting nonconvex optimization problem in which the problem is decomposed into a group of second-order cone programs (SOCPs) parameterized by K real parameters. Grid search or nested bisection can be used to search for the optimal values of these parameters. We provide numerical simulations showing the superior performance of the proposed algorithms compared to earlier suboptimal approximations and their ability to approach the globally optimal solution of the non-convex problem. © 2011 IEEE.
Multi-view human action recognition system employing 2DPCA

Authors
Naiel M.A., Abdelwahab M.M., El-Saban M.

Abstract
A novel algorithm for view-invariant human action recognition is presented. This approach is based on Two-Dimensional Principal Component Analysis (2DPCA) applied directly on the Motion Energy Image (MEI) or the Motion History Image (MHI) in both the spatial domain and the transform domain. This method reduces the computational complexity by a factor of at least 66, achieving the highest recognition accuracy per camera, while maintaining minimum storage requirements, compared with the most recent reports in the field. Experimental results performed on the Weizmann action and the INIRIA IXMAS datasets confirm the excellent properties of the proposed algorithm, showing its robustness and ability to work with small number of training sequences. The dramatic reduction in computational complexity promotes the use in real time applications. © 2010 IEEE.
Novel 3D memory-centric NoC architecture for transaction-based SoC applications

Authors
Wassal A.G., Sarhan H.H., Elsherief A.

Abstract
Large and complex system-on-chip devices consisting of many processor cores, accelerators, DSP functions and many other processing and memory elements are becoming common in the semiconductor industry nowadays. To communicate, these processing and memory elements need to have a network-on-chip (NoC) that is scalable enough to support large number of elements and large bandwidth among other requirements. This paper evaluates the performance of the 2D memory-centric NoC architecture from throughput and latency perspective versus the Mesh topology. We also propose a memory-centric architecture that takes advantage of developments in 3D integration technologies. The advantages of 3D memory-centric NoCs from physical design, performance and manufacturing points of view are discussed. The proposed architecture is based on a shared-memory pool that is suitable for transaction-based applications. Also, as the crossbar is a critical component in the memory-shared NoC, special 3D crossbar architecture has been proposed. © 2011 IEEE.
On the enhancement of LDPC codes used in WiMAX

Authors
ElMahgoub K., Nafie M.

Abstract
In this paper the low density parity check (LDPC) codes used in the IEEE 802.16 standard physical layer are studied, and two novel techniques to enhance the performance of such codes are introduced. In the first technique, a novel parity check matrix for LDPC codes over GF(4) with the non-zero entries chosen to maximize the entropy is proposed, the parity check matrix is based on the binary parity check matrix used in the IEEE 802.16 standard. The proposed code is proven to outperform the binary code used in the IEEE 802.16 standard over both additive white Gaussian noise (AWGN) and Stanford University Interim (SUI-3) channel models. In the second technique, a high rate LDPC code is used in a concatenated coding structure as an outer code with a convolutional code as an inner code. The Convolutional codes are decoded using two techniques: bit-based maximum a posteriori probability (Log-MAP) decoder with its soft outputs feed into a binary LDPC decoder, and a symbol-based Log-MAP decoder with its soft outputs feed into a non-binary Galois Field LDPC decoder. The performance of such LDPC-CC concatenated codes is compared with the commonly used concatenated convolutional Reed-Solomon codes over the standard SUI-3 channel model, and the LDPC-CC codes showed better performance. © ElMahgoub and Nafie.
On the feasibility of centrally-coordinated Peer-to-Peer live streaming

Authors
Roverso R., Naiem A., Reda M., El-Beltagy M., El-Ansary S., Franzen N., Haridi S.

Abstract
In this paper we present an exploration of central coordination as a way of managing P2P live streaming overlays. The main point is to show the elements needed to construct a system with that approach. A key element in the feasibility of this approach is a near real-time optimization engine for peer selection. Peer organization in a way that enables high bandwidth utilization plus optimized peer selection based on multiple utility factors make it possible to achieve large source bandwidth savings and provide high quality of user experience. The benefits of our approach are also seen most when NAT constraints come into play. © 2011 IEEE.
On the utility of primary side information in cognitive sensing

Authors
Moussa M., Nafie M., El Gamal H., Naguib A.

Abstract
In this paper, we study the impact of the knowledge of primary side information on the efficiency of spectrum sensing for cognitive radio networks. In particular, assuming that the secondary transmitter knows the modulation and/or coding scheme used in the primary transmissions, we evaluate the efficiency of spectrum sensing in terms of maximizing the overall achievable throughput of the system. We present the results for both block-based and sequential detection techniques. We show that in sequential detection, and when the cognitive transmitter has knowledge of the primary codebook, the detection threshold should be adaptive based on the previous observations. Our results show the gains achieved over energy based techniques. © 2011 IEEE.
Optimization of channel sensing time and order for cognitive radios

Authors
Ewaisha A., Sultan A., Elbatt T.

Abstract
In this paper we consider a single cognitive radio seeking a transmission opportunity by sequentially sensing a number of statistically independent primary channels. We study the joint optimization of the time spent to sense a channel, the decision threshold to determine whether the channel is free or busy, together with the order with which the channels are sensed. The sensing time and decision threshold are assumed to be the same for all channels. The design objective is to maximize the expected secondary throughput taking sensing errors into account and penalizing for collisions that may disrupt the primary transmission. Motivated by the computational complexity of the problem, we propose suboptimal solutions that significantly reduce the complexity without sacrificing accuracy. Our results reveal a fundamental trade-off between minimizing the probability of collision with the primary user via reducing the sensing errors, which favors a longer sensing time, and increasing the secondary user's throughput, which favors shorter sensing time. The suboptimal approach, for plausible simulation scenarios, is found to reduce the computational complexity by more than 89%, while maintaining a near-optimal throughput within 0.28% of the optimal performance. © 2011 IEEE.
Optimizing budget allocation for condition assessment of water and sewer infrastructures

Authors
Atef A., Osman H., Moselhi O.

Abstract
Much research has focused on the development of optimal strategies for rehabilitation and replacement of water and sewer infrastructures. Condition assessment is an integral component in any asset management program for assessing the asset physical condition. Determining the condition of buried infrastructure tends to be cumbersome, costly and error-prone. As such, decision makers must balance the value of obtained information through condition assessments with the cost of obtaining this information. Such decisions must balance between conflicting needs and need to consider the sought level of service (LOS), asset criticality and the cost of conducting the assessment. This paper presents a decision support system utilizing Partially Observable Markov Decision Process (POMDP) to compare between the reliability and cost of the condition assessment technology. For the DSS, two models were developed to find the optimum policy at asset level and network level. At asset level, the developed model examines and selects the suitable inspection reliability to minimize the impact on failure and recued LOS costs. At network level, the model utilizes a genetic algorithm to find near optimum policy on non-stationary bases with budget constraints. The DSS and G.A. model are implemented on VBA code running in Excel environment and linked to GIS. The system is demonstrated on the City of Hamilton, Canada, water and sewer networks.
Polarization in bistatic radar probing of planetary surfaces: Application to Mars Express data

Authors

Abstract
Spacecraft-to-ground bistatic radar provides a straightforward method for surveying planetary surfaces on scales of importance to landers and rovers. Centimeter wavelengths, currently in use for deep-space telecommunications, interact with surface structure of similar to somewhat larger scales. For the quasi-specular component of scattering and for surfaces uniformly illuminated by monochromatic signals from an orbiting or flyby vehicle, the echo Doppler dispersion is proportional to the root mean square (rms) surface slope. When the specular condition occurs within 10°20° of the Brewster angle, the surface dielectric constant can be derived from relative echo power measured simultaneously in orthogonal polarizations and the Fresnel reflection laws. Cross spectra, computed from outputs of the orthogonally polarized receivers, may be used to calculate a complete description of the polarization properties of the scattered fields. Application to planetary studies requires accurate amplitude and phase calibration of the polarization channels, including correction for any leakage between the two receiving paths, such as from imperfectly isolated antenna feed. We illustrate these techniques using Mars Express results from Stealth (Medusae Fossae), a region on Mars that has not previously been detected by Earth-based radar, and from a long profile including Acidalia Planitia. Single-location Stealth observations support previous conclusions that the surface is rough and porous (dielectric constant ≈1.4). But the longest experiment (in which the specular point was followed for an hour) yields relatively high dielectric constants (2.8), suggesting that the model is incomplete. The surface of Acidalia Planitia has low dielectric constants (≈2.6) over 6090 W at 50 N and higher values (≈3.6) as the specular point moves south and crosses the equator. © 2010 IEEE.
Practical provably secure communication for half-duplex radios

Authors
Elmorsy A., Yasser M., Elsabagh M., Youssef M.

Abstract
In this paper, we present a practical and provably secure two-way wireless communication scheme in the presence of a passive eavesdropper. The scheme implements a randomized scheduling and power allocation mechanism, where each legitimate node transmits in random time slots and with random transmit power. Such randomization results in ambiguity at the eavesdropper with regard to the origin of each transmitted frame. The scheme is analyzed in a time-varying binary block erasure channel model and secrecy outage probabilities are derived and empirically evaluated. The scheme is implemented over an IEEE 802.15.4-enabled Sun SPOT sensor motes. The results show that the proposed scheme achieves significant secrecy gains with a vanishing outage probability, at the expense of slight decrease in throughput, even when the eavesdropper is equipped with a receive power based classifier and is located too close to the transmitter node. © 2011 IEEE.
Proactive resource allocation in cognitive networks

Authors
Tadrous J., Eryilmaz A., El Gamal H., Nafie M.

Abstract
Recently we have introduced the notion of proactive resource allocation and predictive wireless networks, where intelligent wireless networks are capable of tracking and exploiting the repetition patterns in human behavior while accessing the network resources. This predictability advantage grants the network more flexibility to schedule users' requests over a longer time horizon, and thereby significantly improves the quality of service (QoS) defined as outage probability. In this paper we extend our analysis to consider a network of two different QoS classes. The first is a primary class which is assumed to have the right to access the network, whereas the other is a secondary class with cognitive radio capabilities which opportunistically accesses the network resources to improve its utilization. Assuming that the cognitive radio requests are unpredictable, we analyze the diversity gain performance of both classes when the primary requests are non-predictable and when they are. We show that under selfish behavior of the predictive primary network, the outage probability of the secondary network cannot be improved over its non-predictive counterpart. However, we introduce another less-selfish scheduling policy for the primary that maintains the same diversity gain for the primary selfish network and, at the same time, improves the diversity gain of the secondary user, which is called the good citizen behavior. We also provide numerical simulations to support the analytical results. © 2011 IEEE.
Year:  2011

Reconstruction of High Resolution image from a set of blurred, warped, undersampled, and noisy measured images

Authors

Abstract
This paper proposes an algorithm to reconstruct a High Resolution (HR) image from a set of blurred, warped, undersampled, and noisy measured images. The proposed algorithm uses the affine block-based algorithm in the maximum likelihood (ML) estimator. It is tested using synthetic images, where the reconstructed image can be compared with its original. A number of experiments were performed with the proposed algorithm to evaluate its behavior before and after noise addition and also compared with its behavior after noise removal. The proposed system results show that the enhancement factor is better after noise removal than in case of no noise is additive, and show that PSNR difference is better in comparison with the results of another system. © 2011 IEEE.
Year: 2011

Replica placement in peer-assisted clouds: An economic approach

Authors
Ali-Eldin A., El-Ansary S.

Abstract
We introduce NileStore, a replica placement algorithm based on an economical model for use in Peer-assisted cloud storage. The algorithm uses storage and bandwidth resources of peers to offload the cloud provider's resources. We formulate the placement problem as a linear task assignment problem where the aim is to minimize time needed for file replicas to reach a certain desired threshold. Using simulation, we reduce the probability of a file being served from the provider's servers by more than 97.5% under realistic network conditions. © 2011 IFIP International Federation for Information Processing.
Resonant square-wave clock generator for low power applications

Authors
Wahba M., Ismail Y.

Abstract
Power reduction is the main challenge facing circuit designers in their quest to utilize the full performance of new process technologies. A major portion of the power consumed in today's systems is due to the clock generation and distribution. Resonant clocking has been a promising technique to reduce the clock power dramatically. In this paper, a novel resonant clock generator circuit is proposed to reduce the dynamic power used for clock generation by almost 75%. Two configurations of the circuit are presented. The merit of this generator is most obvious in the ease of its implementation and insertion into nowadays systems and the huge power savings it achieves with minimal area overhead. © 2011 IEEE.
**Abstract**

In this paper, we explore the security merits of network coding and potential trade-offs with the widely accepted throughput benefits, especially in multicast scenarios. In particular, we propose a novel Source Authentication using Network Coding (SANC) scheme that can either complement state-of-the-art application-layer authentication schemes proposed in the literature or be used as a stand-alone scheme in network coding-based networks. Towards this objective, we propose a general framework for embedding the authentication information within the network coding Global Encoding Vector. This is attained using a mapping function that enforces a structure on the Global Encoding Vector to facilitate authentication at the destination. First, we illustrate the proposed concept using a simple mapping function, namely a parity bit within each network coding coefficient. Second, we present a detailed security analysis that reveals the security merits of the proposed scheme, contrasted against two baseline schemes that solely adopt application-layer authentication. Finally, we present simulation results pertaining to the network coding performance. Simulation results show that, for plausible scenarios, SANC achieves the same throughput as regular network coding. Furthermore, the results reveal that, for the same packet header, stronger security can be attained. This is confirmed for small as well as scalable networks encountered in practice. © 2011 IEEE.
Segmentation of Choroidal Neovascularization lesions in fluorescein angiograms using parametric modeling of the intensity variation

Authors
Fahmy A.S., Abdelmoula W.M., Mahfouz A.E., Shah S.M.

Abstract
Choroidal Neovascularization (CNV) is a severe retinal disease characterized by abnormal growth of blood vessels in the choroidal layer. Current diagnosis of CNV depends mainly on qualitative assessment of a temporal sequence of fundus fluorescein angiography images. Automated segmentation and identification of the CNV lesion types (either occult or classic) is required to reduce the inter-and intra-observer variability and also to reduce the manual segmentation effort and time. In this work, we present automatic segmentation method for the CNV lesions. The method is based on developing a novel model to describe the temporal intensity variation of the image sequence. The model parameters at each pixel are used to construct a feature vector that is used to classify the different pixels into areas of classic CNV, occult CNV and background. Preliminary results on four datasets show the potential and effectiveness of the method to segment and identify the different types of CNV lesions. © 2011 IEEE.
Abstract

Fundus Fluorescein Angiography (FA) is a powerful tool for imaging and evaluating Diabetic Macular Edema (DME), where the fluorescein dye leaks and accumulates in the diseased areas. Currently, the assessment of FA images is qualitative and suffers from large inter-observer variability. A necessary step towards quantitative assessment of DME is automatic segmentation of fluorescein leakage. In this work, we present an automatic method for segmenting DME areas in FA images. The method is based on modeling the macular image in the early time frame using 2D Gaussian surfaces, which is then subtracted from the late time frame image of the macula to enhance the DME areas. The resulting difference image is then automatically segmented using a Gaussian mixture model classification algorithm. The method was applied to 32 datasets and the results are compared to manual segmentation done by two ophthalmology experts. The results show the potential of the developed method to automatically segment DME. © 2011 IEEE.
Year: 2011

Segmentation of strain-encoded magnetic resonance images using graph-cuts

Authors
Al-Agamy A.O., Fahmy A.S.

Abstract
Imaging of the heart anatomy and function using Strain Encoded (SENC) magnetic resonance imaging (MRI) is a powerful tool for diagnosing a number of heart diseases. Despite excellent sensitivity to tissue deformation, the technique inherently suffers from elevated noise level which hinders proper automatic segmentation using conventional techniques. In this work, we propose a method to accurately segment the left ventricle myocardium from strain encoded-MR short axis images. The method is based on a modified formulation of the graph cuts algorithm. A novel cost function based on a probabilistic model for blood and tissue signals is used to achieve proper segmentation results. The method is tested on datasets for eleven human subjects (5 normal and 6 patients). Quantitative evaluation of the proposed method is compared against manual segmentation and the native graph cut algorithm. The results show that the adopted probabilistic model significantly improves the segmentation accuracy compared to the typical cost function of the native graph cuts algorithm. A True Positive and True Negative rates of 92% and 95% respectively have been achieved using the proposed method. © 2011 IEEE.
Simultaneous human detection and action recognition employing 2DPCA-HOG

Authors
Naiel M.A., Abdelwahab M.M., Elsaban M., Mikhael W.B.

Abstract
In this paper a novel algorithm for Human detection and action recognition in videos is presented. The algorithm is based on Two-Dimensional Principal Components Analysis (2DPCA) applied to Histogram of Oriented Gradients (HOG). Due to simultaneous Human detection and action recognition employing the same algorithm, the computational complexity is reduced to a great deal. Experimental results applied to public datasets confirm these excellent properties compared to most recent methods. © 2011 IEEE.
Year: 2011

Slow-switching-limit loss removal in SC DC-DC converters using adiabatic charging

Authors
Salem L., Ismail Y.

Abstract
A novel technique to remove the slow-switching-limit (SSL) loss in switched-capacitor (SC) dc-dc converters is presented. A small series inductor is cascaded with an SC converter causing adiabatic charging of the converter's energy-transfer capacitors. In this work, the theory and necessary conditions for SSL loss elimination through an inductive output filter are derived. The new topology enables high efficiency for on-die dc-dc converters while maintaining reasonable energy density. A 2:1 SC converter is built in 65-nm CMOS process to validate the analysis methods and assess the proposed technique. The proposed adiabatic charging enhances the SC efficiency by 3.3 % with only 13 % area overhead, which otherwise requires doubling the capacitor area. © 2011 IEEE.
Strain-encoded cardiac magnetic resonance during high-dose dobutamine stress testing for the estimation of cardiac outcomes: Comparison to Clinical Parameters and Conventional Wall Motion Readings

Authors

Abstract
Objectives: The purpose of this study was to determine the prognostic value of strain-encoded magnetic resonance imaging (SENC) during high-dose dobutamine stress cardiac magnetic resonance imaging (DS-MRI) compared with conventional wall motion readings. Background: Detection of inducible ischemia by DS-MRI on the basis of assessing cine images is subjective and depends on the experience of the readers, which may influence not only the diagnostic classification but also the risk stratification of patients with ischemic heart disease. Methods: In all, 320 consecutive patients with suspected or known coronary artery disease underwent DS-MRI, using a standard protocol in a 1.5T MR scanner. Wall motion abnormalities (WMA) and myocardial strain were assessed at baseline and during stress, and outcome data including cardiac deaths, nonfatal myocardial infarctions ("hard events"), and revascularization procedures performed >90 days after the MR scans were collected. Results: Thirty-five hard events occurred during a 28 ± 9 month follow-up period, including 10 cardiac deaths and 25 nonfatal myocardial infarctions, and 32 patients underwent coronary revascularization. Using a series of Cox proportional-hazards models, both resting and inducible WMA offered incremental information for the assessment of hard cardiac events compared to clinical variables (chi-square = 13.0 for clinical vs. chi-square = 26.1 by adding resting WMA, p < 0.001, vs. chi-square = 39.3 by adding inducible WMA, p < 0.001). Adding visual SENC or quantitative strain rate reserve to this model further improved the prediction of outcome (chi-square = 50.7 vs. chi-square = 52.5, p < 0.001 for both). In a subset of patients (n = 175) who underwent coronary angiography, SENC yielded significantly higher sensitivity for coronary artery disease detection (96% vs. 84%, p < 0.02), whereas specificity and accuracy were not significantly different (88% vs. 94% and 93% vs. 88%, p = NS for both). Conclusions: Strain-encoded MRI aids the accurate identification of patients at high risk for future cardiac events and revascularization procedures, beyond the assessment of conventional atherogenic risk factors and resting or inducible WMA on cine images. (Strain-Encoded Cardiac Magnetic Resonance Imaging as an Adjunct for Dobutamine Stress Testing; NCT00758654) © 2011 American College of Cardiology Foundation.
Year: 2011

Synthetic generation of radio maps for device-free passive localization

Authors
Eleryan A., Elsabagh M., Youssef M.

Abstract
In this paper, we present the design, implementation, and evaluation of a system that automatically constructs accurate radio maps for device-free WLAN localization systems. The system is capable of generating deterministic and probabilistic radio maps for localization systems. Our system uses 3D ray tracing enhanced with the uniform theory of diffraction (UTD) to model the electric field behavior and the human shadowing effect. We present our system architecture and describe the details of its different components. We also propose an optional module, location-0 correction, that can significantly enhance the system accuracy and reduces its dependence on the 3D model details by using just one signal strength sample. Our experiments in a real testbed show that the predicted signal strength differs from the measurements by a maximum average absolute error of 2.77 dB achieving a maximum localization error of 3.13m and 2.84m for both the deterministic and probabilistic radio maps, respectively. In addition, the results show that our system is not sensitive to the 3D model details. © 2011 IEEE.
Year: 2011

Technology and financial innovation

Authors
Betz F., Khalil T.M.

Abstract
This case study examines the global financial debacle of 2007-2008 to see the roles in which technology played in new financial schemes. It uses theory about social-technical systems and applications of technology to analyze the case. It identifies theoretical issues in which MOT can relate to classical economic theory. © 2011 World Scientific Publishing Company.
The valuation premium of the common stocks of Islamic financial institutions

Authors
Omran M.F.

Abstract
The study examines the valuation premiums paid by investors for the common stocks of Islamic financial institutions in the United Arab Emirates (UAE). The UAE stock markets, during the period 2001-2005, were dominated by financial institutions which counted for 58% of all listed stocks. The study employs the price to book and the price to sales valuation multiples. Valuation by price to book value is more relevant and accurate for financial firms due to the high liquidity of their assets. It is found that there is a strong clientele preference for Islamic stocks despite the modest financial performance achieved in comparison with other financial institutions and insurance companies. The clientele preference in the UAE, measured by higher valuation premium, is for Islamic financial institutions first followed by commercial banks and last by traditional insurance companies and financial services companies. © 2011 Berkeley Electronic Press. All rights reserved.
Towards mature temporal accuracy assessment of processors models and simulators for real-time systems development

Authors
Massoud R.H., Abdelhalim M.B., Allam M.

Abstract
Modeling and simulation are becoming extensively used in embedded and Real-Time Systems (RTSs) development throughout the development life-cycle, from the system-level design space exploration to the fine grained time analysis and evaluation of the system and even its components performance. At the core of these systems lies the processor which has been also the center of attention for most of the modeling and simulation efforts related to RTS simulation. Although the temporal accuracy of such models and simulators is of critical importance for Real-Time (RT) applications, it is not yet mature how this accuracy can be expressed and assessed to enable correct design decisions making during the different development phases to satisfy the RTS requirements. In this paper, we present a robust methodology for temporal accuracy assessment of any processor's simulator through its bus transactions logged on a cycle accurate basis. The proposed methodology suggests projection of RTS requirements on models and simulators to extract RT-related requirements. The proposed temporal accuracy assessment approach is introduced and justified via a set of preliminary experiments. © 2011 Society for Modeling & Simu.
3D motion tracking of the heart using Harmonic Phase (HARP) isosurfaces

Authors
Soliman A.S., Osman N.F.

Abstract
Tags are non-invasive features induced in the heart muscle that enable the tracking of heart motion. Each tag line, in fact, corresponds to a 3D tag surface that deforms with the heart muscle during the cardiac cycle. Tracking of tag surfaces deformation is useful for the analysis of left ventricular motion. Cardiac material markers (Kerwin et al, MIA, 1997) can be obtained from the intersections of orthogonal surfaces which can be reconstructed from short- and long-axis tagged images. The proposed method uses Harmonic Phase (HARP) method for tracking tag lines corresponding to a specific harmonic phase value and then the reconstruction of grid tag surfaces is achieved by a Delaunay triangulation-based interpolation for sparse tag points. Having three different tag orientations from short- and long-axis images, the proposed method showed the deformation of 3D tag surfaces during the cardiac cycle. Previous work on tag surface reconstruction was restricted for the "dark" tag lines; however, the use of HARP as proposed enables the reconstruction of isosurfaces based on their harmonic phase values. The use of HARP, also, provides a fast and accurate way for tag lines identification and tracking, and hence, generating the surfaces. © 2010 Copyright SPIE - The International Society for Optical Engineering.
3D/TSV enabling technologies for SoC/NoC: Modeling and design challenges

Authors
Salah K., El Rouby A., Ragai H., Ismail Y.

Abstract
According to the International Technology Roadmap for Semiconductors (ITRS), the traditional scaling will no longer meet the performance and integration requirements of systems-on-chip (SoC) in the long term. Therefore, new I/O and packaging paradigms are needed. Three-dimensional integration is a promising alternative option to traditional 2D planar chips. 3D integration is mainly restricted by the communication infrastructure between different stacked dies of future multi-core SoC and network-on-chip (NoC). Among several 3D integration technologies, the TSV (Through-Silicon-Via) approach is the most promising one and therefore is the focus of the majority of 3D integration R&D activities. However, there are challenges that should be overcome before the production of TSV-based 3D ICs becomes possible, e.g., electrical modeling challenges, thermal and power challenges, technological challenges, design methodology challenges and CAD tool development challenges.
A deterministic large-scale device-free passive localization system for wireless environments

Authors
Seifeldin M., Youssef M.

Abstract
The widespread usage of wireless local area networks and mobile devices has fostered the interest in localization systems for wireless environments. The majority of research in the context of wireless-based localization systems has focused on device-based active localization, in which a device is attached to tracked entities. Recently, device-free passive localization (DfP) has been proposed where the tracked entity is neither required to carry devices nor participate actively in the localization process. DfP systems are based on the fact that RF signals are affected by the presence of people and objects in the environment. Previous studies have focused on small areas with direct line of sight (LOS) and/or controlled environments. In this paper, we present the design, implementation and analysis of Nuzzer, a large-scale non-LOS DfP localization system, which tracks a single entity in real environments, rich in multipath. Without any additional hardware, Nuzzer makes use of the already-installed wireless data networks to monitor and process changes in the received signal strength (RSS) at one or more monitoring points transmitted from access points. The Nuzzer system enables many applications which support the elderly, including smart homes automation which can be used to assist the elderly, and intrusion detection which is used to protect the elderly's homes. We present deterministic techniques for DfP localization and evaluate their performance in a building, rich in multipath, with an area of 750 square meters. Our results show that the Nuzzer system gives device-free location estimates with less than 7 meters median distance error using only two monitoring laptops and three access points. This indicates the suitability of Nuzzer to a number of application domains. Copyright 2010 ACM.
A dynamic power-aware process variation calibration scheme

Authors
Raymond M., Ghoneima M., Ismail Y.

Abstract
In this paper, a power-aware process variation calibration scheme is proposed. The proposed calibration system provides the ability to detect and control the n- and p-type variations independently through the use of all-n and all-p ring oscillators. Calibration is then carried out through the use of the supply voltage and body bias to alter the device parameters to match those of a certain process corner that is determined by the system designer. This scheme is characterized by its ability to dynamically change the desired mapping target according to the computational load. The calibration system has been implemented and simulated in TSMC 90-nm technology. Simulation results show that the maximum variation in the operating frequency was reduced from 44.3% to 3.1% and worst-case leakage current reduced by 21%. The results also show the system's ability to compensate for dynamic load variations. ©2010 IEEE.
A GPU-enabled solver for time-constrained linear sum assignment problems

Authors
Roverso R., Naiem A., El-Beltagy M., El-Ansary S., Haridi S.

Abstract
This paper deals with solving large instances of the Linear Sum Assignment Problems (LSAPs) under realtime constraints, using Graphical Processing Units (GPUs). The motivating scenario is an industrial application for P2P live streaming that is moderated by a central tracker that is periodically solving LSAP instances to optimize the connectivity of thousands of peers. However, our findings are generic enough to be applied in other contexts. Our main contribution is a parallel version of a heuristic algorithm called Deep Greedy Switching (DGS) on GPUs using the CUDA programming language. DGS sacrifices absolute optimality in favor of a substantial speedup in comparison to classical LSAP solvers like the Hungarian and auctioning methods. We show the modifications needed to parallelize the DGS algorithm and the performance gains of our approach compared to a sequential CPU-based implementation of DGS and a mixed CPU/GPU-based implementation of it.
A new signaling technique for a low power on-chip SerDes transceivers

Authors
Hussein E.E.-D., Safwat S., Ghoneima M., Ismail Y.

Abstract
This paper represents a new self timed signaling technique for low power SerDes transceiver. A three level coding technique enables extracting the clock from the data using simple phase detector rather than using complex power hungry blocks such as Clock Data Recovery (CDR) or a Phase Locked Loop (PLL). This SerDes transceiver was implemented using 90nm TSMC technology. The transmitter serializes 8 parallel bits at 1.125GHz, and multiplexes the 10Gbps serial data stream with a 20GHz clock on a single line using three level signaling. The total power consumed in the Tx/Rx pair with the transmission line is 15 mWatt, which is very small as compared to other conventional architectures. ©2010 IEEE.
A novel scheme for relay cooperation in interweave cognitive radio systems

Authors
Naguib A.A., Elezabi A., Nafie M.

Abstract
In this paper, we investigate the benefits of using cooperative relays in interweave (opportunistic) cognitive radio systems. A novel distributed space frequency (DSF) code for relay cooperation is presented. The code is designed to be a multi-user multi-OFDM channels code. It achieves a cooperative diversity gain of order NL for all users, where N is the number of relays and L is the number of paths in the multi-path fading channel. Simulation results show that using this DSF code by relays in the proposed system significantly increases system throughput. This code depends on transmitting the signal of each secondary user on a number of channels. Hence, each source will be less sensitive to spatial and temporal variations in channels availability which is one of the main problems in interweave cognitive radio systems. ©2010 IEEE.
A novel variation insensitive clock distribution methodology

Authors
Hussein E.E.-D.O., Ismail Y.I.

Abstract
A new clock distribution technique is introduced in this paper. The technique avoids repeaters completely and distributes the clock directly on the passive interconnect network. The wires can be highly lossy, yet the clock is delivered with a very good shape and eye. The technique uses the characteristics of the interconnect to attenuate all frequency components equally. The resulting clock at the sinks does not depend on supply variations at all and only depends on the LC time constant of the wires. Interestingly, the technique works even better with higher clock frequencies. Signal equalization and boosting at the clock source is applied to further improve the clock shape at the receivers. ©2010 IEEE.
A semi-supervised learning approach for soft labeled data

Authors
El-Zahhar M.M., El-Gayar N.F.

Abstract
In some machine learning applications using soft labels is more useful and informative than crisp labels. Soft labels indicate the degree of membership of the training data to the given classes. Often only a small number of labeled data is available while unlabeled data is abundant. Therefore, it is important to make use of unlabeled data. In this paper we propose an approach for Fuzzy-Input Fuzzy-Output classification in which the classifier can learn with soft-labeled data and can also produce degree of belongingness to classes as an output for each pattern. Particularly, we investigate the case where only a few soft labels are available and data can be represented by different views. We investigate two semi-supervised multiple classifier frameworks for this classification purpose. Results show that semi supervised multiple classifiers can improve the performance of fuzzy classification by making use of the unlabeled data.

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Adaptive linearly constrained minimum variance beamforming for multiuser cooperative relaying using the kalman filter

Authors
El-Keyi A., Champagne B.

Abstract
In this paper, we consider a wireless communication scenario with multiple source-destination pairs communicating through several cooperative amplify-and-forward relay terminals. The relays are equipped with multiple antennas that receive the source signals and transmit them to the destination nodes. We develop two iterative relay beamforming algorithms that can be applied in real-time. In both algorithms, the relay beamforming matrices are jointly designed by minimizing the received power at all the destination nodes while preserving the desired signal at each destination. The first algorithm requires the existence of a local processing center that computes the beamforming coefficients of all the relays. In the second algorithm, each relay can compute its beamforming coefficients locally with the help of some common information that is broadcasted from the other relays. This is achieved at the expense of enforcing the desired signal preservation constraints non-cooperatively. We provide two extensions of the proposed algorithms that allow the relays to control their transmission power and to modify the quality of service provided to different sources. Simulation results are presented validating the ability of the proposed algorithms to perform their beamforming tasks efficiently and to track rapid changes in the operating environment. © 2010 IEEE.
Ambient and wearable sensing for gait classification in pervasive healthcare environments

Authors
ElSayed M., Alsebai A., Salaheldin A., El Gayar N., ElHelw M.

Abstract
Pervasive healthcare environments provide an effective solution for monitoring the wellbeing of the elderly where the general trend of an increasingly ageing population has placed significant burdens on current healthcare systems. An important pervasive healthcare system functionality is patient motion analysis where gait information can be used to detect walking behavior abnormalities that may indicate the onset of adverse health problems, for quantifying post-operative recovery, and to observe the progression of neurodegenerative diseases. The development of accurate motion analysis models, however, requires the integration of multi-sensing modalities and the utilization of appropriate data analysis techniques. This paper describes a simple and robust framework for improved patient motion analysis based on an ambient and a wearable sensor. Using visual information from a single vision sensor, target segmentation is first carried out and a skeleton extraction procedure is subsequently applied to quantify the target internal motion by computing two metrics, spatiotemporal cyclic motion between leg segments and head trajectory. Extracted accelerometer information from a wearable body sensor is fused with the extracted metrics at the feature level by using K-Nearest Neighbor algorithm to classify target's walking gait into normal or abnormal. The potential value of the proposed framework for patient monitoring is demonstrated and the results obtained from practical experiments are described. © 2010 IEEE.
An achievable rate region for a primary network shared by a secondary link

Authors
Tadrous J., Sultan A., Nafie M.

Abstract
We consider a multiple access primary network with N transmitters. A secondary link of one transmitter and a corresponding receiver causes interference to the primary network. An achievable rate region for the primary network and the secondary link is obtained given the following mode of operation. The secondary transmitter employs rate-splitting so that the primary receiver can decode part of the secondary's signal and cancel it. The secondary receiver, on the other hand, treats primary interference as noise. Given a Gaussian channel model, we investigate the effect of rate-splitting on the rate region for two cases. The first case is when the link between the secondary transmitter and the primary receiver supports a higher data rate than that of the link between the secondary transmitter and its corresponding receiver. The second case is the opposite scenario. For each case we determine the optimal rate-splitting that maximizes the sum throughput of the primary network and the secondary link subject to a constraint on primary rate. The optimal solution for the first case does not require rate-splitting. For the second, rate-splitting is needed and the primary rate constraint is met with equality. © 2009 IEEE.
An application of ELECTRE III to contractor selection

Authors
Marzouk M.

Abstract
Contractor selection is carried out in order to choose a competent and capable contractor to do the work. To help in this selection, baselines are established to ensure that the contractors have the required skills, resources, and abilities to execute the project. Contractor selection is a multiple criteria decision making wherein several criteria are required to be evaluated simultaneously. This paper proposes a decisionmaking model for contractor selection utilizing ELECTRE III modeling. The steps of ELECTRE III model include; estimation of concordance indices, estimation of discordance indices, estimation of credibility scores, performing distillation procedure, and performing complete ranking. To assess alternatives via ELECTRE III, three associated thresholds are defined which are indifference (q), preference (p), and veto (v). These thresholds produce outranking relations with an allowance for data uncertainly. The complete procedure of ELECTRE III modeling is described in the paper. The proposed model is generic and can be used as a tool to evaluate alternatives in several applications such as value engineering, optimum organization structure, and constructability analysis. It enables its users to define the criteria that are deemed important for evaluation. The proposed multiple criteria decision making is novel to construction can be utilized as a successful tool in contractor selection problem. A numerical example is presented to demonstrate the use of the proposed methodology. Copyright 2010 ASCE.
An innovative approach for the wormhole attack detection and prevention in wireless ad hoc networks

Authors
Azer M.A., El-Kassas S.M., El-Soudani M.S.

Abstract
Due to their diverse applications, ad hoc networks are appealing for use in many domains. However, their features of open medium, absence of infrastructure, dynamic changing network topology, cooperative algorithms, lack of centralized monitoring and management point, resource constraints and lack of a clear line of defense, they are vulnerable to many attacks. Therefore, there is a major concern about their security. Amongst attacks we are particularly interested in a severe attack called the wormhole attack. In this paper, we propose a scheme for the wormhole attack detection and prevention. This scheme is based on a social science theory called the diffusion of innovations and serves all network nodes in detecting and preventing the attack even without prior interaction with malicious nodes. In order to implement this scheme, the routing protocol must be modified such as to allow the route selection based on nodes' opinions in each others. This is done by allowing each node to assign weights to other nodes in the network through different phases that will be explained in details. The scheme is totally decentralized and does not add an extra computational complexity to the nodes; which is one of the most important requirements for such networks. ©2010 IEEE.
An Intelligent Geographical Information System for Vehicle Routing (IGIS-VR):
A modeling framework

Authors
Mostafa T.S., Talaat H.

Abstract
In Egypt, freight movement relies heavily on road transport. Commercial vehicles constitute a major segment of the vehicle population that travels the country's roads contributing to (and suffering from) daily congestion. Enhancing CV operations by minimizing their en-route travel times benefits both traffic network users as well as CV's business owners. The absence of traffic data collection infrastructure, in many developing countries, hampers the usage of readily available vehicle routing systems. This paper introduces a modeling framework of an Intelligent Geographical Information System for Vehicle Routing (IGISVR). IGIS-VR integrates a Geographic information system (GIS) and a Reinforcement learning (RL) system to address the Capacitated Vehicle Routing Problems with Time Windows (CVRPTW). The developed model uses CVs as probe vehicles for on-the-move data collection. Collected data is manipulated through a self-adaptive learning environment to capture traffic network dynamics. The Q-learning concepts of the Temporal Difference (TD) solution approach of RL are used in the model formulation. Different estimation procedures for the model main parameters are explored. ©2010 IEEE.
ARQ secrecy over correlated fading channels

Authors
Abdel Latif M., Sultan A., El Gamal H.

Abstract
In this paper, we develop novel Automatic Repeat reQuest (ARQ) key sharing protocols for correlated fading channels. In particular, a novel role of "dumb antennas" in overcoming the negative impact of spatial correlation, on the achievable secrecy rates, is unveiled. We further develop an adaptive rate allocation policy which achieves higher secrecy rates by exploiting the channel temporal correlation. The performance gains offered by the proposed schemes are demonstrated by a comprehensive set of numerical results.
ARQ security in Wi-Fi and RFID networks

Authors
Elsabagh M., Abdallah Y., Youssef M., El Gamal H.

Abstract
In this paper, we present two practical ARQ-Based security schemes for Wi-Fi and RFID networks. Our proposed schemes enhance the confidentiality and authenticity functions of these networks, respectively. Both schemes build on the same idea; by exploiting the statistical independence between the multipath fading experienced by the legitimate nodes and potential adversaries, secret keys are established and then are continuously updated. The continuous key update property of both schemes makes them capable of defending against all of the passive eavesdropping attacks and most of the currently-known active attacks against either Wi-Fi or RFID networks. However, each scheme is tailored to best suit the requirements of its respective paradigm. In Wi-Fi networks, we overlay, rather than completely replace, the current Wi-Fi security protocols. Thus, our Wi-Fi scheme can be readily implemented via only minor modifications over the IEEE 802.11 standards. On the other hand, the proposed RFID scheme introduces the first provably secure low cost RFID authentication protocol. The proposed schemes impose a throughput-security tradeoff that is shown, through our analytical and experimental results, to be practically acceptable. ©2010 IEEE.
Automated cardiac-tissue identification in composite strain-encoded (C-SECN) images using fuzzy K-means and bayesian classifier

Authors
Motaal A.G., El-Gayar N., Osman N.F.

Abstract
Composite Strain Encoding (C-SENC) is an MRI acquisition technique for simultaneous acquisition of cardiac tissue viability and contractility images. It combines the use of black-blood delayed-enhancement imaging to identify the infracted (dead) tissue inside the heart wall muscle and the ability to image myocardial deformation (MI) from the strain-encoding (SENC) imaging technique. In this work, we propose an automatic image processing technique to identify the different heart tissues. This provides physicians with a better clinical decision-making tool in patients with myocardial infarction. The technique is based on using Bayesian classifier to identify the background regions in the C-SENC images, and fuzzy clustering technique to identify the different types of the heart tissues. The proposed method is tested using numerical simulations of the heart C-SENC images with MI and real images of patients. The results show that the proposed technique is able to identify the different components of the image with a high accuracy. ©2010 IEEE.
Behavioral modeling of the static transfer function of ADCs using INL measurements

Authors
Guindi R.S., Saada N.H.

Abstract
In this paper, we present a modeling approach for analog-to-digital converters (ADCs) based on modeling the static transfer function using integral nonlinearity (INL) measurements. The methodology relies on applying a Fast Fourier Transform (FFT) test to the output of a real ADC circuit and extracting the significant harmonics. These are used in a behavioral functional model to approximate the INL using a polynomial function. The resulting model is independent of the ADC type or structure, and is suitable for bottom-up system verification. We compare the performance of the new model with other models based on different modeling approaches, and show a gain in simulation speed of up to 300×. © 2009 IEEE.
Body and visual sensor fusion for motion analysis in Ubiquitous healthcare systems

Authors
El Sayed M., Alsebai A., Salaheldin A., El Gayar N., ElHelw M.

Abstract
Human motion analysis provides a valuable solution for monitoring the wellbeing of the elderly, quantifying post-operative patient recovery and monitoring the progression of neurodegenerative diseases such as Parkinson's. The development of accurate motion analysis models, however, requires the integration of multi-sensing modalities and the utilization of appropriate data analysis techniques. This paper describes a robust framework for improved patient motion analysis by integrating information captured by body and visual sensor networks. Real-time target extraction is applied and a skeletonization procedure is subsequently carried out to quantify the internal motion of moving target and compute two metrics, spatiotemporal cyclic motion between leg segments and head trajectory, for each vision node. Extracted motion metrics from multiple vision nodes and accelerometer information from a wearable body sensor are then fused at the feature level by using K-Nearest Neighbor algorithm and used to classify target's walking gait into normal or abnormal. The potential value of the proposed framework for patient monitoring is demonstrated and the results obtained from practical experiments are described. © 2010 IEEE.
CellSense: A probabilistic RSSI-based GSM positioning system

Authors
Ibrahim M., Youssef M.

Abstract
Context-aware applications have been gaining huge interest in the last few years. With cell phones becoming ubiquitous computing devices, cell phone localization has become an important research problem. In this paper, we present CellSense, a probabilistic RSSI-based fingerprinting location determination system for GSM phones. We discuss the challenges of implementing a probabilistic fingerprinting localization technique in GSM networks and present the details of the CellSense system and how it addresses the challenges. To evaluate our proposed system, we implemented CellSense on Android-based phones. Results for two different testbeds, representing urban and rural environments, show that CellSense provides at least 23.8% enhancement in accuracy in rural areas and at least 86.4% in urban areas compared to other RSSI-based GSM localization systems. This comes with a minimal increase in computational requirements. We also evaluate the effect of changing the different system parameters on the accuracy-complexity tradeoff. ©2010 IEEE.
Year:  2010

Change analysis for gait impairment quantification in smart environments

Authors
Salaheldin A., ElSayed M., Alsebai A., El Gayar N., ElHelw M.

Abstract
Visual Sensor Networks (VSNs) open up a new realm of smart autonomous applications based on enhanced three-dimensional sensing and collaborative reasoning. An emerging VSN application domain is pervasive healthcare delivery where gait information computed from distributed vision nodes is used for observing the wellbeing of the elderly, quantifying post-operative patient recovery and monitoring the progression of neurodegenerative diseases such as Parkinson’s. The development of patient-specific gait analysis models, however, is challenging since it is unfeasible to obtain normal and impaired gait examples from the same patient before the operation in order to build supervised models for gait classification. This paper presents a novel VSN-based framework for quantification of patient-specific gait impairment and post-operative recovery by using change analysis. Real-time target extraction is first applied to VSN data and a skeletonization procedure is subsequently carried out to quantify the internal motion of moving target and compute two features; spatiotemporal cyclic motion between leg segments and head trajectory for each vision node. Change analysis is then used to measure the change, i.e. difference, between two unlabeled datasets collected pre- and post-operatively and quantify gait changes. The potential value of the proposed framework for patient gait monitoring is demonstrated and the results obtained from practical experiments are described. © 2010 IEEE.
Coarse spectrum sensing for LTE systems

Authors
Abdelmonem M., Ismail M.H., El-Soudani M.S., Nafie M.

Abstract
Spectrum sensing is one of the most challenging tasks required of a cognitive radio receiver. In this paper, we consider the first stage of spectrum sensing, where it is required to perform the sensing as fast as possible and with an acceptable performance under different channel conditions. The target signal to be sensed is a Long Term Evolution (LTE) signal. We first propose sensing the whole LTE signal bandwidth using the Fast Wavelet Transform (FWT) algorithm and then compare it to the Fast Fourier Transform (FFT)-based algorithm in terms of complexity and performance. A new algorithm is proposed that provides an intelligent stopping criterion for the FWT sensing to further reduce its complexity. This algorithm shows a major advantage for using FWT. We also propose a novel algorithm to go even deeper in the LTE signal band to sense at multiples of a Resource Block (RB) resolution and explain the challenges associated with the proposed algorithm. © 2009 IEEE.
Year: 2010

Compact TSV modeling for low power application

Authors
Salah K., El-Rouby A., Ismail Y., Ragai H., Amin K.

Abstract
[No abstract available]
Configurations of active acoustic metamaterial with programmable bulk modulus

Authors
Akl W., Baz A.

Abstract
Acoustic MetaMaterials (AMM) have been considered as effective means for controlling the propagation of acoustical wave energy through these materials. However, most of the currently exerted efforts are focused on studying passive metamaterials with fixed material properties. In this paper, the emphasis is placed on the development of a new class of one-dimensional acoustic metamaterials with effective bulk moduli that are programmed to vary according to any prescribed pattern along the volume of the metamaterial. Acoustic cavities coupled with either actively controlled Helmholtz or flush-mounted resonators are introduced to develop two possible configurations for obtaining Active AMM (AAMM) with programmable bulk modulus capabilities. The resonators are provided with piezoelectric boundaries to enable the control the overall bulk modulus of the acoustic cavity through direct acoustic pressure feedback. Theoretical analyses of these two configurations of the AAMM are presented using the lumped-parameter modeling approach. Numerical examples are presented to demonstrate the performance characteristics of the proposed AAMM configurations and their potential for generating prescribed spatial and spectral patterns of bulk modulus variation. © 2010 SPIE.
Cooperation incentives in wireless ad hoc networks

Authors
Raafat A.M., Fathy M., Yehia A., Azer M.A.

Abstract
Mobile ad hoc networks heavily rely on nodes' cooperation for packet forwarding. As a result, misbehaving, malicious, and selfish nodes can significantly degrade the performance of the network. To cope with this issue and to stimulate cooperation among selfish mobile nodes, a continuous research effort is done on identifying nodes trust and reputation. In this paper, we survey recently proposed reputation and incentive schemes for ad hoc networks. In order to help in the design of different reputation systems tailored to specific applications and network topologies, we classify the different approaches that have been used in the literature and present the different alternatives for each approach. Finally, we conclude this paper and present suggestions for future work. © 2010 IEEE.
Correction of left ventricle strain signals estimated from tagged MR images

Authors
Khalil M.E., Fahmy A.S., Osman N.F.

Abstract
Strain measurement is a quantity used for assessing the regional function of the left ventricular (LV) of the heart. They are computed by tracking the motion of the non-invasive, virtual tags in the cardiac muscle with time. Tracking these tags gives information for each region of the cardiac muscle by quantifying its deformation during contraction (systolic period) and relaxation (diastolic period). However, these strain measurements suffer from inaccuracies caused by the degradation of the tags and the image quality. In this work, numerical simulations are used to investigate the factors contributing to the error in measurements. An empirical model for the estimated strain values is deduced and presented. In addition, a correction method for the measurement errors is proposed based on the empirically-deduced model. The method was validated on real data, and showed potential enhancement by reducing the errors in strain measurements. © Springer-Verlag Berlin Heidelberg 2010.
Counter based CMOS temperature sensor for low frequency applications

Authors
Fathy O., Abdallah A., Wassal A., Ismail Y.

Abstract
A simple temperature sensor in Bi-CMOS technology is proposed for applications with low frequency temperature variations in addition to a complete analysis of each block in the system. Most CMOS temperature sensors are based on the temperature characteristics of parasitic bipolar transistors. Two important factors need to be met in the design of the sensor: the first is the accuracy of the sensor, and the second is the power consumption of the temperature sensor that needs to be reduced. A simplified counter approach is used here instead of the commonly used complex decimation filter techniques. This approach is appropriate for applications that have low sampling rate of the temperature. The design achieves one degree accuracy over the range 0°C to 85°C which is suitable for most applications. Using such approach saves power and area due to the simplicity of the counter design compared to the decimation filter. © 2010 IEEE.
Different regions identification in composite strain-encoded (C-SENC) images using machine learning techniques

Authors
Motaal A.G., El-Gayar N., Osman N.F.

Abstract
Different heart tissue identification is important for therapeutic decision-making in patients with myocardial infarction (MI), this provides physicians with a better clinical decision-making tool. Composite Strain Encoding (C-SENC) is an MRI acquisition technique that is used to acquire cardiac tissue viability and contractility images. It combines the use of blackblood delayed-enhancement (DE) imaging to identify the infarcted (dead) tissue inside the heart muscle and the ability to image myocardial deformation from the strain-encoding (SENC) imaging technique. In this work, various machine learning techniques are applied to identify the different heart tissues and the background regions in the C-SENC images. The proposed methods are tested using numerical simulations of the heart C-SENC images and real images of patients. The results show that the applied techniques are able to identify the different components of the image with a high accuracy. © 2010 Springer-Verlag.
Abstract
Earthmoving operations represent a sizable work in heavy civil engineering projects. Selecting optimum fleet configuration for an earthmoving operation is a very difficult process, especially when dealing with a multi loader type and multi truck type configurations. This paper presents a framework that can be used for the selection of optimum fleet for earthmoving operations. It enables the user to input the available loading and hauling equipment, then, it calculates the cost and total project time of each possible fleet combination, and finally it provides a list of the top-ten best fleet configurations. The direct cost and total project time are calculated for each fleet combination and the top-ten fleets are provided by the framework. The framework is developed in Microsoft environment. A numerical example is worked out to illustrate the practical features of the model. © 2010 EUROSI-ETI.
Ecosystems for the development of multi-core and many-core SoC models

Authors
Wassal A.G., Abdelfattah M.A., Ismail Y.I.

Abstract
Multi-core and many-core Systems-on-Chip (SoC) are growing more complex than ever. Consequently, developing system models for such SoCs to guide and validate architectural and implementation decisions is becoming a daunting task. It consumes a huge amount of time and effort just to get the model up and running. Although these system models can be fairly abstracted, they still require the setup of a complicated platform to model a homogeneous or a heterogeneous mix of processing cores, a network-on-chip, cache memories, input-output interfaces as well as several other functional units. The abstraction levels for the individual constituent models can be represented at different abstraction levels forcing the need for special interfacing and simulation tools. Moreover, unified benchmarks are needed to be able to have a fair comparison between different architectures and different implementation options while at the same time target the specific application domain the SoC is being developed for. This paper explores the availability of such ecosystems and discusses the important features and capabilities that need to be provided in them. The level of abstraction and the software support in this model is also examined. © 2009 IEEE.
EGEPT: Monitoring middle east genomic data

Authors
Ali A., Gad H., Ghanem M., Abouelhoda M.

Abstract
EGEPT (Middle East GenBank Post) is a database that monitors submissions to the GenBank nucleotide database from Middle East countries. The data in EGEPT is browsable by country, institute, author, organism, and related publications. Statistics about the dataset is provided and charts that compare the Middle East countries to each other are automatically generated. EGEPT revealed that Qatar, Egypt, Oman, Tunisia, and Morocco are leading in terms of sequence submissions and related publications. However, the total submissions of all Arab countries is greatly lagging behind other Middle East countries and the rest of the world; a fact that reflects the current state of genomics research in Arab countries, and one that calls for a strategic remedy to the situation. EGEPT is accessible at http://www.nubios.nileu.edu.eg/db/EGEPT © 2010 IEEE.
Year: 2010

Emotions analysis of speech for call classification

Authors
Ali Hassan E., El Gayar N., Ghanem M.M.

Abstract
Most existing research in the area of emotions recognition has focused on short segments or utterances of speech. In this paper we propose a machine learning system for classifying the overall sentiment of long conversations as being Positive or Negative. Our system has three main phases, first it divides a call into short segments, second it applies machine learning to recognize the emotion for each segment, and finally it learns a binary classifier that takes the recognized emotions of individual segments as features. We investigate different approaches for this final phase by varying how emotions for individual segments are aggregated and also by varying classification model used for the final phase. We present our experimental results and analysis based on a simulated data set collected specifically for this research. © 2010 IEEE.
Energy harvesting of gas pipeline vibration

Authors
Arafa M., Akl W., Majeed M., Al-Hussain K., Baz A.

Abstract
Pipelines conveying gas under pressure exhibit turbulence-induced vibrations. The current work is concerned with extracting useful power from pipelines operating well within their stability region. At such regions, the pipe vibrations exist in small magnitudes and are unlikely to cause structural failure, yet can be exploited to provide useful energy for low-power electronic devices. Accordingly, emphasis in the present work is placed on the development of an energy harvesting technique employing the omnipresent and inevitable flow-induced vibrations in gas pipelines. © 2010 SPIE.
Exploiting neural networks to enhance trend forecasting for hotels reservations

Authors
Zakhary A., El Gayar N., Ahmed S.E.-O.H.

Abstract
Hotel revenue management is perceived as a managerial tool for room revenue maximization. A typical revenue management system contains two main components: Forecasting and Optimization. A forecasting component that gives accurate forecasts is a cornerstone in any revenue management system. It simply draws a good picture for the future demand. The output of the forecast component is then used for optimization and allocation in such a way that maximizes revenue. This shows how it is important to have a reliable and precise forecasting system. Neural Networks have been successful in forecasting in many fields. In this paper, we propose the use of NN to enhance the accuracy of a Simulation based Forecasting system, that was developed in an earlier work. In particular a neural network is used for modeling the trend component in the simulation based forecasting model. In the original model, Holt's technique was used to forecast the trend. In our experiments using real hotel data we demonstrate that the proposed neural network approach outperforms the Holt's technique. The proposed enhancement also resulted in better arrivals and occupancy forecasting when incorporated in the simulation based forecasting system. © 2010 Springer-Verlag.
Fast localization of the optic disc using projection of image features

Authors
Mahfouz A.E., Fahmy A.S.

Abstract
Optic Disc (OD) localization is an important pre-processing step that significantly simplifies subsequent segmentation of the OD and other retinal structures. Current OD localization techniques suffer from impractically-high computation times (few minutes per image). In this work, we present a fast technique that requires less than a second to localize the OD. The technique is based upon obtaining two projections of certain image features that encode the x- and y- coordinates of the OD. The resulting 1-D projections are then searched to determine the location of the OD. This avoids searching the 2-D image space and, thus, enhances the speed of the OD localization process. Image features such as retinal vessels orientation and the OD brightness are used in the current method. Four publicly-available databases, including STARE and DRIVE, are used to evaluate the proposed technique. The OD was successfully located in 330 images out of 340 images (97%) with an average computation time of 0.65 s. © 2010 IEEE.
Year: 2010

Fully integrated fast response switched-capacitor DC-DC converter using reconfigurable interleaving

Authors
Salem L., Ismail Y.

Abstract
A novel double-bound hysteretic regulation scheme to control multi-phase interleaved Switched-Capacitor DC-DC converters is presented. The control scheme adjusts the number of interleaved phases with the SC converter's switching frequency to significantly reduce the required operating frequency of the control comparator, enabling the practical application of hysteretic control with large number of interleaved phases. A 16-phase 2:1 SC converter is designed in 65-nm TSMC low-power CMOS process using the proposed technique. The converter with the new hysteretic control achieves fast dynamic response under fast varying load currents. ©2010 IEEE.
Abstract
In the field of pattern recognition multiple classifier systems based on the combination of outputs from different classifiers have been proposed as a method of high performance classification systems. The objective of this work is to develop a fuzzy Gaussian classifier for combining multiple learners, we use a fuzzy Gaussian model to combine the outputs obtained from K-nearest neighbor classifier (KNN), Fuzzy K-nearest neighbor classifier and Multi-layer Perceptron (MLP) and then compare the results with Fuzzy Integral, Decision Templates, Weighted Majority, Majority Naïve Bayes, Maximum, Minimum, Average and Product combination methods. Results on two benchmark data sets show that the proposed fusion method outperforms a wide variety of existing classifier combination methods.
Gain-band self-clocked comparator for DC-DC converters hysteretic control

Authors
Salem L., Ismail Y.

Abstract
A novel digital comparator topology is presented. The proposed digital comparator cell uses transistors’ ratio to program a fixed comparison level. A double-bound hysteretic control comparator, for DC-DC converters, is built using the proposed digital comparator cell. The hysteretic-band width variation, due to process effects, decreases with increased preamplifier stage gain and constitutes a fixed ratio of the hysteretic-band width. The proposed comparator does not require offset cancellation circuits, which reduces power consumption as well as the die area and increases the comparison speed. In addition, one preamplifier and one reference generation circuit are needed to build the double-bound comparison levels. The proposed topology also does not require a sampling clock. A prototype hysteretic control comparator is implemented in 65-nm TSMC low-power CMOS process. The hysteretic-band width exhibits a maximum variation of 300 μV for a 10 mV width. The comparator dissipates 80 μA of ground current to sample a 1.5 GHz input signal. ©2010 IEEE.
Year: 2010

Guest editorial mission critical networking

Authors
Eltoweissy M., Du D.H.C., Gerla M., Giordano S., Gouda M., Schulzrinne H., Youssef M.

Abstract
[No abstract available]
Hidden anchor: A lightweight approach for physical layer location privacy

Authors
Youssef M., El-Badry R., Sultan A.

Abstract
In hybrid wireless sensor networks, where trusted and un-trusted nodes coexist, it becomes important to allow trusted nodes to share information, especially, location information and prevent un-trusted nodes from gaining access to this information. We focus on anchor-based localization algorithms in WSNs, where a small set of specialized nodes, that is, anchor nodes, broadcast their location to the network and other nodes can use the broadcast information to estimate their own location. The main challenge is that both trusted and un-trusted nodes can measure the physical signal transmitted from anchor nodes and use it to estimate their locations. In this paper, we propose Hidden Anchor, an algorithm that provides anchor physical layer location privacy for different classes of localization algorithms. The Hidden Anchor algorithm exploits the inherently noisy wireless channel and uses identity cloning of neighboring trusted nodes to make anchors unobservable to un-trusted nodes while providing complete information to trusted nodes. Evaluation of the Hidden Anchor algorithm through analysis and simulation shows that it can hide the identity, and hence the location, of anchor nodes with very low overhead. In addition, the results show that by adding artificial noise, we can achieve significant improvement in anchors location privacy. Copyright © 2010 Rania El-Badry et al.
Human action recognition employing 2DPCA and VQ in the spatio-temporal domain

Authors
Naiel M.A., Abdelwahab M.M., Mikhael W.B.

Abstract
In this paper a novel algorithm for human action recognition is presented. This approach is based on Two-Dimensional Principal Component Analysis (2DPCA) and Vector Quantization (VQ) in the spatial-temporal domain. This method reduces computational complexity by a factor of 98, while maintaining the storage requirement and the recognition accuracy, compared with some of the most recent approaches in the field. Experimental results applied on the Weizmann dataset confirm the excellent properties of the proposed algorithm. © 2010 IEEE.
Human action recognition employing TD2DPCA and VQ

Authors
Naiel M.A., Abdelwahab M.M., Mikhael W.B.

Abstract
A novel algorithm for human action recognition in the transform domain is presented. This approach is based on Two-Dimensional Principal Component Analysis (2DPCA) and Vector Quantization (VQ). This technique reduces the computational complexity and the storage requirement by at least a factor of 45.27, and 12 respectively, while achieving the highest recognition accuracy, compared with the most recently published approaches. Experimental results applied on the Weizmann dataset confirm the excellent properties of the proposed algorithm, which lends itself to real-time economic implementation. © 2010 IEEE.
HyberLoc: Providing physical layer location privacy in hybrid sensor networks

Authors
El-Badry R., Sultan A., Youssef M.

Abstract
In many hybrid wireless sensor networks' applications, sensor nodes are deployed in hostile environments where trusted and un-trusted nodes co-exist. In anchor-based hybrid networks, it becomes important to allow trusted nodes to gain full access to the location information transmitted in beacon frames while, at the same time, prevent un-trusted nodes from using this information. The main challenge is that un-trusted nodes can measure the physical signal transmitted from anchor nodes, even if these nodes encrypt their transmission. Using the measured signal strength, un-trusted nodes can still tri-laterate the location of anchor nodes. In this paper, we propose HyberLoc, an algorithm that provides anchor physical layer location privacy in anchor-based hybrid sensor networks. The idea is for anchor nodes to dynamically change their transmission power following a certain probability distribution, degrading the localization accuracy at un-trusted nodes while maintaining high localization accuracy at trusted nodes. Given an average power constraint, our analysis shows that the discretized exponential distribution is the distribution that maximizes location uncertainty at the untrusted nodes. Detailed evaluation through analysis, simulation, and implementation shows that HyberLoc gives trusted nodes up to 3.5 times better localization accuracy as compared to untrusted nodes. ©2010 IEEE.
Year: 2010

Impact of systolic and diastolic deformation indexes assessed by strain-encoded imaging to predict persistent severe myocardial dysfunction in patients after acute myocardial infarction at follow-up

Authors

Abstract
Objectives This study evaluated the value of systolic and diastolic deformation indexes determined by strain-encoded imaging to predict persistent severe dysfunction at follow-up in patients after reperfused acute myocardial infarction (AMI) in comparison with late gadolinium enhancement (LGE). Background Animal studies suggest that regional diastolic function provides information about myocardial viability after AMI. However, data in humans are sparse. Methods Twenty-six patients underwent magnetic resonance imaging 3 ± 1 days after successfully reperfused ST-segment elevation myocardial infarction and at a follow-up of 6 months. Cine, strain-encoded, and LGE images were acquired. Peak systolic circumferential strain (Ecc) and early diastolic strain rate (Ecc/s) were calculated for each segment at baseline and at follow-up. A cutoff Ecc value of 9% was used to define severe dysfunction at follow-up. Results A total of 312 segments were analyzed; 119 segments showed abnormal baseline function. Thirty-five segments showed severe dysfunction at follow-up, which was defined as Ecc at follow-up < 9%. The area under the curve for Ecc/s was 0.82 (95% confidence interval [CI]: 0.72 to 0.89), for Ecc 0.74 (95% CI: 0.64 to 0.83), and for LGE 0.85 (95% CI: 0.77 to 0.92). A comparison of receiver-operating characteristic curves demonstrates that LGE is not significantly different than Ecc/s but is significantly different than Ecc (p = 0.32 vs. p < 0.05) for prediction of severe dysfunction at follow-up. Conclusions Regional diastolic function provides similar accuracy to predict persistent severe dysfunction at follow-up to LGE and is superior to regional systolic function in patients after AMI. Diastolic deformation indexes may serve as a new parameter for assessment of viability in patients after AMI. (SENC in AMI Study; NCT00752713). © 2010 American College of Cardiology Foundation.
Improved technique to detect the infarction in delayed enhancement image using k-mean method

Authors
Metwally M.K., El-Gayar N., Osman N.F.

Abstract
Cardiac magnetic resonance (CMR) imaging is an important technique for cardiac diagnosis. Measuring the scar in myocardium is important to cardiologists to assess the viability of the heart. Delayed enhancement (DE) images are acquired after about 10 minutes following injecting the patient with contrast agent so the infarcted region appears brighter than its surroundings. A common method to segment the infarction from DE images is based on intensity Thresholding. This technique performed poorly for detecting small infarcts in noisy images. In this work we aim to identify the best threshold value to segment the infarction in case of segmentation using simple Threshold and propose a modified technique to improve the segmentation in noisy images. Our proposed technique is based on enhancing Thresholding using k-means clustering. We test our proposed model using computer simulated and real images with different contrast-to-noise ratio (CNR). We used F-score, which is a combined measure of the precision and sensitivity, to determine the performance of the proposed technique versus simple Thresholding. The results show that the proposed technique outperforms existing methods. © 2010 Springer-Verlag.
Interactive 3D visualization for wireless sensor networks

Authors
ElHakim R., ElHelw M.

Abstract
Wireless sensor networks open up a new realm of ubiquitous computing applications based on distributed large-scale data collection by embedded sensor nodes that are wirelessly connected and seamlessly integrated within the environment. 3D visualization of sensory data is a challenging issue, however, due to the large number of sensors used in typical deployments, continuous data streams, and constantly varying network topology. This paper describes a practical approach for interactive 3D visualization of wireless sensor network data. A regular 3D grid is reconstructed using scattered sensor data points and used to generate view-dependent 2D slices that are consequently rendered with commodity graphics hardware leading to smooth visualization over space and time. Furthermore, the use of efficient space partitioning data structures and the independent processing of sensor data points facilitates interactive rendering for large number of sensors while accommodating constantly changing network topology. The practical value of the proposed method is demonstrated and results obtained for visualizing time-varying temperature distributions in an urban area are presented. © Springer-Verlag 2010.
Investigating analysis of speech content through text classification

Authors
Ezzat S., El Gayar N., Ghanem M.M.

Abstract
The field of Text Mining has evolved over the past years to analyze textual resources. However, it can be used in several other applications. In this research, we are particularly interested in performing text mining techniques on audio materials after translating them into texts in order to detect the speakers’ emotions. We describe our overall methodology and present our experimental results. In particular, we focus on the different features selection and classification methods used. Our results show interesting conclusions opening up new horizons in the field, and suggest an emergence of promising future work yet to be discovered. © 2010 IEEE.
Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics): Preface

Authors
El Gayar N., Schwenker F.

Abstract
[No abstract available]
Low power clock generator using charge recycling

Authors
Wahba M., Wassal A., Ismail Y.I.

Abstract
A major portion of the power consumed in today's systems is due to the clock distribution network. Solutions attempted to reduce clocking power result in low efficiency systems or systems with high complexity control schemes. In this work, a low power clock generator is introduced that can reduce switching power of the clock by almost 75%. This circuit uses the charge recycling concept to achieve such power reduction while utilizing a simple control technique. ©2010 IEEE.
Meta-workflows: Pattern-based interoperability between Galaxy and Taverna

Authors
Abouelhoda M., Alaa S., Ghanem M.

Abstract
Taverna and Galaxy are two workflow systems developed specifically for bioinformatics applications. For sequence analysis applications, some tasks can be implemented easily on one system but would be difficult, or infeasible, to be implemented on the other. One solution to overcome this situation is to combine both tools in a unified framework that seamlessly makes use of the best features of each tool. In this paper, we present the architecture and implementation of a high-level system that provides such a solution. Our approach is based on meta-workflows and workflow patterns. We present a case study about the design of universal primers to demonstrate the capabilities of our system and to explain how the interplay between Taverna and Galaxy simplifies the analysis process. © 2010 ACM.
Methodology for analyzing case studies

Authors
Betz F.

Abstract
Case studies provide the basis for empirical grounding of management theory or management principles. But there needs to be a systematic methodology for constructing case histories so that theory and principles can be compared to case reality. I propose such a methodology and illustrate the use of the methodology in two famous business cases - the origin of Cisco Systems and the bankruptcy of Enron. © 2010 IEEE.
Microsimulation approach to evaluate the use of restricted lefts/through U-turns at major intersections - A case study of Cairo-Egypt urban corridor

Authors
ElAzzony T., Talaat H., Mosa A.

Abstract
The V-turn is an access management technique for at-grade intersection treatments; reducing conflicts and improving safety along arterial roads. The V-turn is mainly used as an alternative to direct left turns at intersections by replacing the full median opening with a directional median opening; this solution is called restricted lefts u-turn intersection treatment (Restricted Lefts V-turn). A full median blocking, with downstream directional openings is another type of V-turns, which called (Restricted LeftsItrough V - turn). In Egypt, many urban signalized intersections have been replaced by Restricted LeftsItrough V-turn, with the aim of improving traffic operations. Several benefits (safety as well as operational benefits) have been attributed to the V-turn solution. However, the effectiveness of any solution is contingent upon its proper use. Reduced capacity and increased accident exposure are direct outcomes of traffic flow turbulences around improperly designed (or ineffectively adopted) V-turn. This study investigates the potential of using a microscopic traffic simulation model for testing and evaluating different intersection treatments. A simulation model has been developed and calibrated for a typical urban intersection, in Cairo, using "Quadstone Paramics" software. The developed model was used to evaluate the operational impacts of different intersection treatments including different V-turn solutions for a case study of a major intersection with high traffic volumes. The simulation results showed that the u-turn solution is not the best solution for the adopted case study; other access management techniques such as signal control showed better performance results. Furthermore, the need for deducing guidelines for the effective deployment of V-turns could be clearly depicted. ©2010 IEEE.
Misfeasor classification and detection models using machine learning techniques

Authors
Sameh N., El Gayar N., Abdel-Baki N.

Abstract
Misfeasors (or insiders) are considered among the most difficult intruders to detect due to their knowledge and authorization within the organization. Machine learning techniques have been widely used for intrusion detection but only little work has addressed the use of machine learning for detecting and classifying different types of insiders. The aim of this study is to exploit different recognition models for misfeasors detection by adding the Mac address as a feature in classification. Three different recognition models (a Rule Based Model, a Hierarchical Classification Model and a Composite Feature Model) are proposed. The models differ mainly in the amount of prior knowledge required for the problem and hence how training data is used to construct the models. The Rule Based Model uses explicit domain classification rules given by expert to detect insiders. The Hierarchical Classification Model uses some domain specific knowledge to manufacture the training data in order to construct the hierarchy in the recognition model. The Composite Feature Model on the other hand attempts to discover classification rules directly from the training data without any prior knowledge. All three proposed classification models are tested on two benchmark data sets and are evaluated using different performance measures. Results for the different models are presented and compared for several classification techniques. Experiments reveal that using machine learning at different levels in the proposed models yield a good approximation for the classification rules for the problem of misfeasor detection. © 2010 IADIS.
Monitoring and visualization of large WSN deployments

Authors
ElHakim R., Orfy A., ElHelw M.

Abstract
Recent developments in wireless sensor networks have ushered in novel ubiquitous computing applications based on distributed large-scale data acquisition and interactive interpretation. However, current WSNs suffer from lack of effective tools to support large network deployment and administration as well as unavailability of interactive visualization techniques required to explore and analyze captured sensing data, which is hindering the development of real-life WSN-based ubiquitous systems. Sensor Explorer addresses the above problems by providing modular efficient stream management engine and novel volume visualization algorithm suitable for WSN data. ©2010 IEEE.
Myocardial segmentation using constrained multi-seeded region growing

Authors
Alattar M.A., Osman N.F., Fahmy A.S.

Abstract
Multi-slice short-axis acquisitions of the left ventricle are fundamental for estimating the volume and mass of the left ventricle in cardiac MRI scans. Manual segmentation of the myocardium in all time frames per each cross-section is a cumbersome task. Therefore, automatic myocardium segmentation methods are essential for cardiac functional analysis. Region growing has been proposed to segment the myocardium. Although the technique is simple and fast, non-uniform intensity and low-contrast interfaces of the myocardium are major challenges of the technique that limit its use in myocardial segmentation. In this work, we propose a modified region growing technique that ensures reliable and fast myocardial segmentation of short-axis images. The proposed technique initializes the region growing process using different seed points. Then two types of spatial constraints are used to guarantee fast and accurate segmentation. The technique has been tested and validated quantitatively using a large number of images of different qualities. The results confirm the reliability and accuracy of the proposed technique. © 2010 Springer-Verlag.
New achievable secrecy rate regions for the two way wiretap channel

Authors
El Gamal A., Koyluoglu O.O., Youssef M., El Gamal H.

Abstract
This work develops new achievable rate regions for the two way wiretap channel. In our setup, Alice and Bob wish to exchange messages securely in the presence of a passive eavesdropper Eve. In the full-duplex scenario, our achievability argument relies on allowing the two users to jointly optimize their channel prefixing distributions, such that the new channel conditions are favorable compared to that of Eve. Random binning and private key sharing over the channel are then used to exploit the secrecy advantage available in the equivalent cascade channel and to distribute the available secrecy rate among users. For the half-duplex case, we introduce the idea of randomized scheduling and establish the significant gain it offers in terms of the achievable secrecy sum-rate. We also quantify the gains that can be leveraged from the proposed schemes in the modulo-2 and Gaussian channels via numerical results in certain selected scenarios.
New feature splitting criteria for co-training using genetic algorithm optimization

Authors
Salaheldin A., El Gayar N.

Abstract
Often in real world applications only a small number of labeled data is available while unlabeled data is abundant. Therefore, it is important to make use of unlabeled data. Co-training is a popular semi-supervised learning technique that uses a small set of labeled data and enough unlabeled data to create more accurate classification models. A key feature for successful co-training is to split the features among more than one view. In this paper we propose new splitting criteria based on the confidence of the views, the diversity of the views, and compare them to random and natural splits. We also examine a previously proposed artificial split that maximizes the independence between the views, and propose a mixed criterion for splitting features based on both the confidence and the independence of the views. Genetic algorithms are used to choose the splits which optimize the independence of the views given the class, the confidence of the views in their predictions, and the diversity of the views. We demonstrate that our proposed splitting criteria improve the performance of co-training. © 2010 Springer-Verlag.
Year:  2010

On the accuracy of commonly used loss models in SCVRs

Authors
Ismail Y.I.

Abstract
[No abstract available]
On the deterministic multicast capacity of bidirectional relay networks

Authors
Mokhtar M., Mohasseb Y., Nafie M., Gamal H.E.

Abstract
In this paper, we completely characterize the deterministic multicast capacity region of the symmetric two-pair bidirectional half duplex relay network with private messages. Towards this end, we first develop a new upper bound on the deterministic capacity region, based on the notion of a one-sided genie. We then proceed to construct novel detour schemes that achieve the upper bound by routing the bits intended for a certain receiver through the network rather than sending it directly. To the best of the authors' knowledge, this scenario corresponds to one of the rare cases where coding, across levels and time, is needed to achieve the deterministic capacity of the network. © 2010 IEEE.
Opportunistic interference alignment for multiuser cognitive radio

Authors
Amir M., El-Keyi A., Nafie M.

Abstract
We present an interference alignment (IA) technique that allows multiple opportunistic transmitters (secondary users) to use the same frequency band of a pre-existing primary link without generating any interference. The primary and secondary transmit-receive pairs are equipped with multiple antennas. We exploit the fact that under power constraints on the primary transmitter, the rate of the primary user is maximized by water-filling on the singular values of its channel matrix leaving some eigen modes unused. The secondary users can align their transmitted signals to produce a number of interference-free dimensions at each secondary receiver without causing any interference to the primary user. We characterize the number of achievable degrees of freedom (DoF) for the secondary users. We also present an iterative algorithm that utilizes channel reciprocity to achieve the proposed cognitive IA scheme. For a cognitive system with 3 secondary users, we derive a closed form solution for the precoding matrices of the secondary users.
Parallel chaining algorithms

Authors
Abouelhoda M., Mohamed H.

Abstract
Given a set of weighted hyper-rectangles in a k-dimensional space, the chaining problem is to identify a set of colinear and non-overlapping hyper-rectangles of total maximal weight. This problem is used in a number of applications in bioinformatics, string processing, and VLSI design. In this paper, we present parallel versions of the chaining algorithm for bioinformatics applications, running on multi-core and computer cluster architectures. Furthermore, we present experimental results of our implementations on both architectures. © 2010 Springer-Verlag.
Year: 2010

Parallel feedback compensation for LDO voltage regulators

Authors
Salem L., Ghoneima M., Ismail Y., Jain R.

Abstract
A novel low dropout (LDO) voltage regulator compensation technique is demonstrated. A parallel feedback path is used to insert a zero at approximately three times the output pole. The parallel feedback consists of passive elements only and occupies small area. The proposed technique completely eliminates the output pole at different load conditions and results in high LDO bandwidth, which achieves fast output tracking of the input reference and fast recovery of sudden load changes. Moreover, the output pole elimination at different load conditions enables the potential scaling of the error amplifier quiescent current with the load without compromising stability. The proposed LDO has been implemented in 65-nm TSMC low-power CMOS process, and achieves 0.24-ns response time at 94% current efficiency. For a 1.2-V input voltage and 1-V output voltage the regulator enables 79mVp-p output droop for a maximum load step. ©2010 IEEE.
Parallel suffix sorting based on bucket pointer refinement

Authors
Mohamed H., Abouelhoda M.

Abstract
Suffix array is one of the most important data structures in bioinformatics. Much effort has been devoted to find efficient sequential algorithms for its construction, but little is done to introduce parallel construction algorithms. The bucket pointer refinement algorithm is one of the efficient suffix sorting algorithms that is tuned for genomic datasets. In this paper, we introduce a parallel version of this algorithm running on (shared memory) multicore computers. We present experimental results comparing our algorithms to other parallel algorithms running on similar architecture. Our program is open source and available at http://www.nubios.nileu.edu.eg/tools/pbpr. © 2010 IEEE.
Year: 2010

Power control for constrained throughput maximization in spectrum shared networks

Authors
Tadrous J., Sultan A., Nafie M., El-Keyi A.

Abstract
We investigate power allocation for users in a shared spectrum network. In such a network, the primary (licensed) users communicate under a minimum guaranteed quality of service (QoS) requirements, whereas the secondary users opportunistically access the primary band. Our objective is to find a power control scheme that determines the transmit power for both primary and secondary users so that the overall network throughput is maximized while maintaining the quality of service of the primary users greater than a specified minimum limit. In the assumed model, no interference cancellation is done at the receivers resulting in a non-convex optimization problem. It has been shown previously that binary power control almost always achieves the global optimum solution when no QoS constraints are imposed. This is not necessarily the case in our scenario, however. We introduce a distributed algorithm for "ternary" power allocation to be used when individual measurements are available at each node. We show via simulations the relative efficiency of the proposed algorithm compared to previously suggested ones. If a central controller exists with available information about the system parameters, we enhance the performance of the proposed algorithm through an iterative geometric programming (GP) algorithm and prove its convergence to a better solution than ternary power allocation. ©2010 IEEE.
Proactive resource allocation: Turning predictable behavior into spectral gain

Authors
El Gamal H., Tadrous J., Eryilmaz A.

Abstract
This paper introduces the novel concept of proactive resource allocation in which the predictability of user behavior is exploited to balance the wireless traffic over time, and hence, significantly reduce the bandwidth required to achieve a given blocking/outage probability. We start with a simple model in which the smart wireless devices are assumed to predict the arrival of new requests and submit them to the network T time slots in advance. Using tools from large deviation theory, we quantify the resulting prediction diversity gain to establish that the decay rate of the outage event probabilities increases linearly with the prediction duration T. This model is then generalized to incorporate the effect of prediction errors and the randomness in the prediction lookahead time T. Remarkably, we also show that, in the cognitive networking scenario, the appropriate use of proactive resource allocation by the primary users results in more spectral opportunities for the secondary users at a marginal, or no, cost in the primary network outage. Finally, we conclude by a discussion of the new research questions posed under the umbrella of the proposed proactive (non-causal) wireless networking framework. ©2010 IEEE.
Propagation modeling for accurate indoor WLAN RSS-based localization

Authors
El-Kafrawy K., Youssef M., El-Keyi A., Naguib A.

Abstract
WLAN RSS-based localization has been a hot research topic for the last years. To obtain high accuracy in the noisy wireless channel, WLAN location determination systems usually use a calibration phase, where a radio map, capturing the signal strength signatures at different locations in the area of interest, is built. The radio map construction process takes a lot of time and effort, reducing the value of WLAN localization systems. In this paper, we propose 3D ray tracing as a way for automatically generating a highly accurate radiomap. We compare this method to previously used propagation modeling-based methods like the Wall Attenuation Factor and 2D ray tracing models. We evaluate the performance of each method and its computational cost in a typical residential environment. We also examine the sensitivity of the localization accuracy to inaccurate material parameters. Our results quantify the accuracy-complexity tradeoff of the different proposed techniques with 3D ray tracing giving the best localization accuracy compared to measurements with acceptable computational requirements on a typical PC. ©2010 IEEE.
Quantitative myocardial blush grade for the detection of cardiac allograft vasculopathy

Authors

Abstract
Background: Cardiac allograft vasculopathy (CAV) progressively compromises microvascular perfusion and function in heart transplantation (HTx)-recipients. The aim of our study was to investigate the ability of quantitative myocardial blush grade (MBG) to detect CAV. Methods: In consecutive HTx-recipients (n = 72) who underwent surveillance cardiac catheterization, MBG was assessed visually and quantitatively, by analyzing the time course of contrast agent intensity rise. Hereby, the parameter Gmax/Tmax was calculated as the plateau of grey-level intensity (Gmax) divided by the time-to-peak intensity (Tmax). HTx-recipients and 18 healthy volunteers underwent cardiac magnetic resonance, to assess diastolic strain rates and myocardial perfusion reserve during pharmacologic hyperemia. Results: Significant correlations were observed between Gmax/Tmax with perfusion reserve and with mean diastolic strain rates (r^2 = 0.68 and r^2 = 0.58, P < .001 for both). Visual and quantitative MBG using a cutoff value of Gmax/Tmax = 2.7/s yielded significantly higher accuracy than stenosis severity on coronary angiograms for the detection of impaired microvascular integrity as a surrogate marker for CAV (AUC = 0.78, SE = 0.06, 95% CI = 0.66-0.87 for lumen narrowing versus AUC = 0.91, SE = 0.03, 95%CI = 0.84-0.97 for Gmax/Tmax; P < .01). Furthermore, quantitative MBG provided more robust prediction of survival (χ^2 = 14.0, P < .001), compared to visually estimated blush (χ^2= 5.4, P = .02) and to coronary lumen narrowing assessment, (χ^2= 4.8, P = .04). Conclusions: Quantification of MBG can be performed on coronary angiograms of HTx-recipients, and may help with the identification of early CAV in patients with impaired perfusion reserve but without angiographically evident atherosclerosis. © 2010 Mosby, Inc. All rights reserved.
RFID-based indoors localization of tag-less objects

Authors
Elsayeh M., Haroon M., Tawfik B., Fahmy A.S.

Abstract
Object localization has become a necessary module in many radiofrequency identification (RFID) systems that require tracking features besides the conventional identification feature. A number of techniques exists in literature that uses the RFID signal information to locate the tagged objects, i.e. objects wearing RFID tags. Nevertheless, in many applications, it is required to track objects that do not carry a tag (whether intentionally or unintentionally). In this work, we propose a technique for tag-less object localization. The technique is based on reconstructing the attenuation map of the environment using back projection of RFID signals emitted from reference tags fixed on the walls of the monitored space. Numerical simulation as well as real-world data show the feasibility of the proposed method. © 2010 IEEE.
Year: 2010

Score-based fusion using quality measures in a semi-supervised identity verification system

Authors
Mamdouh T., El Gayar N., El Azab I.A.

Abstract
The performance of a biometric verification system is affected by how good each user is represented in the user gallery. Due to the infinite number of pose variations, illumination changes and other intra-class variations in the biometric samples, it is impossible to collect all variations in a totally supervised manner. Adaptive biometric systems that use semi-supervised learning techniques are suggested recently in the literature to continuously update user galleries during the system operation. In this work we propose a method for self-training in a bi-modal biometric verification system by making use of the unlabeled data collected during system operation. The novelty of the proposed approach is the use of quality measures to assign weights to individual matchers in a dynamic way and to use the quality information for updating the user gallery. Preliminary results show that using quality measures in the fusion process can increase the accuracy of verification over time, particularly when the percentage of degraded input patterns is substantial.
In this work, we propose an algorithm for segmenting the ascending and descending aorta from magnetic resonance phase contrast images, also referred to as MR flow imaging. The proposed algorithm is based on the active contour model combined with some refinements. In addition, false segmentation results due to severe image artifacts are automatically detected and corrected. The developed algorithm features three practical advantages: (1) fast; (2) requires minimal user interaction; and (3) robust to the changes in the algorithm parameters (e.g. same parameter set is used for all datasets). The algorithm is tested and validated on a number of datasets with different image qualities. The preliminary results show very satisfactory segmentation of the ascending and descending aorta even when the flow images are severely distorted. © 2010 IEEE.
Segmentation of left ventricle in cardiac MRI images using adaptive multi-seeded region growing

Authors
AlAttar M.A., Osman N.F., Fahmy A.S.

Abstract
Multi-slice short-axis acquisitions of the left ventricle are fundamental for estimating the volume and mass of the left ventricle in cardiac MRI scans. Manual segmentation of the myocardium in all time frames per each cross-section is a cumbersome task. Therefore, automatic myocardium segmentation methods are essential for cardiac functional analysis. Region growing has been proposed to segment the myocardium. Although the technique is simple and fast, non uniform intensity and low-contrast interfaces of the myocardium are major challenges of the technique that limit its use in myocardial segmentation. In this work, we propose a modified region growing technique that ensures reliable and fast myocardial segmentation of short-axis images. The proposed technique initializes the region growing process using different seed points chosen automatically according to the information of the mid-contour profile. Then two types of spatial constraints are used to guarantee fast and accurate segmentation. The technique has been tested and validated quantitatively using a large number of images of different qualities. The results confirm the reliability and accuracy of the proposed technique. © 2010 IEEE.
SplitPro: A tool to overcome systemC scheduling inefficiencies

Authors
Guindi R.S., Naguib Y.N.

Abstract
SplitPro is a tool that processes the code of large SystemC modules and splits them into two or more smaller ones without affecting functionality. The purpose of this process splitting is to overcome some inherent inefficiencies of the SystemC 2.1 scheduler, such as unnecessary process wake-up calls, and unnecessary evaluation of portions of code that do not change the output of the system at the end of the simulation clock cycle. These two phenomena negatively affect the simulation speed. SplitPro automatically traces signal dependencies and generates the split processes. The generated code is in standard SystemC notation. In this paper, we present the main idea of SplitPro, and outline its advantages as well as its limitations. We focus on specific experimental results obtained on a number of SystemC processes to illustrate the method, showing up to 92% increase in simulation speed. © 2009 IEEE.
Strain correction in interleaved strain-encoded (SENC) cardiac MR

Authors
Motaal A.G., Osman N.F.

Abstract
The strain encoding (SENC) technique directly encodes regional strain of the heart into the acquired MR images and produces two images with two different tunings so that longitudinal strain, on the short-axis view, or circumferential strain on the long-axis view, are measured. Interleaving acquisition is used to shorten the acquisition time of the two tuned images by 50%, but it suffers from errors in the strain calculations due to inter-tunings motion of the heart. In this work, we propose a method to correct for the inter-tunings motion by estimating the motion-induced shift in the spatial frequency of the encoding pattern, which depends on the strain rate. Numerical data was generated to test the proposed method and real images of human subjects were used for validation. The proposed method corrected the measured strain values so they became nearly identical to the original ones. The results show an improvement in strain calculations so as to relax the imaging constraints on spatial and temporal resolutions and improve image quality. © 2010 Copyright SPIE - The International Society for Optical Engineering.
**Year:** 2010

**Strain-encoded CMR for the detection of inducible ischemia during intermediate stress**

**Authors**

**Abstract**
Objectives: This study sought to evaluate the diagnostic accuracy of strain-encoded cardiac magnetic resonance (SENC) for the detection of inducible ischemia during intermediate stress. Background: High-dose dobutamine stress cardiac magnetic resonance (DS-CMR) is a well-established modality for the noninvasive detection of coronary artery disease (CAD). However, the assessment of cine scans relies on the visual interpretation of wall motion, which is subjective, and modalities that can objectively and quantitatively assess the time course of myocardial strain response during stress are lacking. Methods: Stress-induced ischemia was assessed by wall motion analysis and by SENC in 80 patients with suspected or known CAD and in 18 healthy volunteers who underwent DS-CMR in a clinical 1.5-T scanner. Quantitative coronary angiography was used as the standard reference for the presence of CAD (<50% diameter stenosis). Results: On a patient level, 46 of 80 patients (58%) had CAD, including 20 with single-vessel, 18 with 2-vessel, and 8 with 3-vessel disease. During peak stress, SENC correctly detected ischemia in 45 versus 38 of 46 patients with CAD (7 additional correct findings for SENC), yielding significantly higher sensitivity than cine (98% vs. 83%, p < 0.05). No patients were correctly diagnosed by cine and missed by SENC. During intermediate stress, SENC showed diagnostic value similar to that provided by cine imaging only during peak dobutamine stress (sensitivity of 76% vs. 83%, specificity of 88% vs. 91%, and accuracy of 81% vs. 86%; p = NS for all). Quantification analysis demonstrated that strain rate response is a highly sensitive marker for the detection of inducible ischemia (area under the curve = 0.96; SE = 0.01; 95% confidence interval: 0.93 to 0.99) that precedes the development of inducible wall motion abnormalities and already significantly decreases with moderate 40% to 60% coronary lesions. Conclusions: Using SENC, CAD can be detected during intermediate stress with similar accuracy to that provided by cine only during peak stress. By this approach, patient safety may be improved during diagnostic procedures within lower time spent (Strain-Encoded Cardiac Magnetic Resonance Imaging for Dobutamine Stress Testing. © 2010 American College of Cardiology Foundation.
String mining in bioinformatics

Authors
Abouelhoda M., Ghanem M.

Abstract
Sequence analysis is a major area in bioinformatics encompassing the methods and techniques for studying the biological sequences, DNA, RNA, and proteins, on the linear structure level. The focus of this area is generally on the identification of intra- and inter-molecular similarities. Identifying intra-molecular similarities boils down to detecting repeated segments within a given sequence, while identifying inter-molecular similarities amounts to spotting common segments among two or multiple sequences. From a data mining point of view, sequence analysis is nothing but string-or pattern mining specific to biological strings. For a long time, this point of view, however, has not been explicitly embraced neither in the data mining nor in the sequence analysis text books, which may be attributed to the co-evolution of the two apparently independent fields. In other words, although the word data-mining is almost missing in the sequence analysis literature, its basic concepts have been implicitly applied. Interestingly, recent research in biological sequence analysis introduced efficient solutions to many problems in data mining, such as querying and analyzing time series [49,53], extracting information from web pages [20], fighting spam mails [50], detecting plagiarism [22], and spotting duplications in software systems [14]. © 2010 Springer-Verlag Berlin Heidelberg.
Symbol based log-MAP in concatenated LDPC-convolutional codes

Authors
ElMahgoub K., Nafie M.

Abstract
In this paper we study the use of a high rate Low Density Parity Check (LDPC) codes in concatenated coding structures. Specifically, we use the LDPC code as an outer code, with a convolutional code as an inner code. We decode the convolutional code using a symbol based Log-MAP (Maximum a posteriori probability) decoder, and feed the soft outputs of this decoder into a non-binary Galois Field LDPC decoder. We compare this concatenation scheme using 16 QAM modulation with one using a bit-based Log-MAP decoder over Additive White Gaussian Noise (AWGN) and Stanford University Interim (SUI-3) channel model. The new proposed decoding technique has shown improvements for both channel models. ©2010 IEEE.
Year: 2010

Temperature-aware adaptive task-mapping targeting uniform thermal distribution in MPSoC platforms

Authors
Sarhan H., Eddash O.K., Raymond M., Wassal A., Ismail Y.

Abstract
As on-chip integration increases, the thermal distribution becomes spatially non-uniform and varies based on the power dissipation. In this paper, we introduce a temperature-aware task-mapping algorithm to prevent hotspots and achieve a highly uniform thermal distribution using adaptive multi-threshold values. The algorithm monitors the temperature of the cores, swaps tasks when the temperature of the core is relatively higher than the average temperature of the chip. Cores are switched off if they exceed an absolute maximum temperature. Using this algorithm, reliability is enhanced by achieving a highly uniform thermal distribution and preventing hot cores from exceeding an absolute threshold. ©2010 IEEE.
Throughput maximization over temporally correlated fading channels in cognitive radio networks

Authors
Hamza D., Nafie M.

Abstract
We consider a primary link and a secondary link, each composed of a transmitter and a receiver. The primary channel and the channel between the secondary transmitter and the primary receiver follow a first-order Markov model for channel variation over time. Under this assumption of temporal correlation and via exploiting the channel state information (CSI) feedback, we pose the cognitive power control problem as the maximization of secondary throughput subject to a constraint on the primary outage. To solve this problem, we assume that the primary transmitter sends with a constant-rate and with a constant-power, and we consider two types of feedback: perfect delayed CSI and one-bit automatic repeat request (ARQ) CSI. To reduce the computational complexity in the case of ARQ-CSI, we reformulate the cognitive power control problem as the maximization of the weighted sum of primary and secondary throughput which we solve optimally for delayed-CSI and greedily for ARQ-CSI. We also solve the cognitive power control problem for a constant-power variable-rate primary link where the primary transmitter exploits the channel temporal correlation. In this scheme, we only consider a temporally correlated primary link and perfect delayed CSI. We solve the weighted sum throughput maximization problem under two scenarios. In the first, the primary rate is adapted without considering the secondary link. In the second, the primary rate and secondary power are determined simultaneously assuming a central controller. © 2009 IEEE.
Year: 2010

Time-based demand-constrained cross-layer resource allocation for wireless networks

Authors
Morsy K.E., Nafie M.H., Digham F.F., Elezabi A.Y.

Abstract
Efficient resource allocation is a critical component in multi-user QoS communications and high speed networks. In this paper, we devise a new mathematical model for the resource allocation problem that takes into account the users' demands in a PHY-MAC cross-layer approach. Incorporating the time axis in our model, the target is to maximize the number of bits transmitted in a given frame rather than maximizing the channel capacity or the average throughput. Our design is governed by constraints on users' demands (expressed in bits), energy expenditure, and frame duration. We model the allocation problem as an optimization problem whose solution allocates channels, time span, and power levels to each user. We also derive an upper bound on the performance of any resource allocation algorithm and use this bound to assess the performance of the solution obtained using our proposed model. ©2010 IEEE.
Towards optimum condition assessment policies for water and sewer networks

Authors
Atef A., Osman H., Moselhi O.

Abstract
With ageing water and sewer infrastructure in North America, assessing the condition of these assets has received increased attention in the past few years. Condition assessment is an integral component in any asset management program. Determining the condition of buried infrastructure tends to be more cumbersome, costly and error-prone compared to other surface infrastructure like roads and buildings. For sewers, CCTV is considered the industry standard for condition assessment technologies. For pressurized water pipelines, technologies tend to be more costly and uncertain (e.g. electromagnetic, sonar, acoustic leak detection, infrared etc...). Faced with constrained budgets and the need to obtain reliable condition information to drive their asset management processes, infrastructure owners must balance the value of information obtained through condition assessments with the cost of obtaining this information. This paper presents an analytical framework and decision support system to evaluate the value of information for condition assessments of water and sewer infrastructure. The framework considers: 1) risks associated with operating the asset, 2) potential direct and indirect costs of infrastructure failure, and 3) customer expectations for the system's level of service. The decision support system utilizes Partially Observable Markov Decision Process (POMDP) to compare between the reliability and cost of the condition assessment technology. The system is demonstrated on the water and sewer networks for the City of Hamilton, Canada. Copyright ASCE 2010.
Two-dimensional front-tracking model for film evaporation

Authors
Guignard S., Shawky O.A., Tachon L., Abd-Elsalam K.M., Sabry M.N.

Abstract
To understand the physical process involved in film evaporation, a new numerical model is created using coupled quadratic finite element formulation of the conservation equations. The heat transport equation is solved in the three different phases (solid, liquid and vapor) while the Navier-Stokes equation are solved in the two fluids. The gradient discontinuity at the liquid vapor interface provides local value of the evaporative flux density that is directly linked to the interface velocity jump through mass conservation principle and used as boundary condition for two fluid flow computations. Testing on academic cases and application to axisymmetric film evaporation including comparison with experiments are shown. © 2010 IEEE.
WAMI: A web server for the analysis of minisatellite maps

Authors
Abouelhoda M., El-Kalioby M., Giegerich R.

Abstract
Background. Minisatellites are genomic loci composed of tandem arrays of short repetitive DNA segments. A minisatellite map is a sequence of symbols that represents the tandem repeat array such that the set of symbols is in one-to-one correspondence with the set of distinct repeats. Due to variations in repeat type and organization as well as copy number, the minisatellite maps have been widely used in forensic and population studies. In either domain, researchers need to compare the set of maps to each other, to build phylogenetic trees, to spot structural variations, and to study duplication dynamics. Efficient algorithms for these tasks are required to carry them out reliably and in reasonable time. Results. In this paper we present WAMI, a web-server for the analysis of minisatellite maps. It performs the above mentioned computational tasks using efficient algorithms that take the model of map evolution into account. The WAMI interface is easy to use and the results of each analysis task are visualized. Conclusions. To the best of our knowledge, WAMI is the first server providing all these computational facilities to the minisatellite community. The WAMI web-interface and the source code of the underlying programs are available at http://www.nubios.nileu.edu.eg/tools/wami. © 2010 Abouelhoda et al; licensee BioMed Central Ltd.
Year: 2010

WASP: Wireless autonomous sensor prototype for Visual Sensor Networks

Authors
Orfy A., El-Sayed A., ElHelw M.

Abstract
Visual Sensor Networks (VSNs) enable enhanced three-dimensional sensing of spaces and objects, and facilitate collaborative reasoning to open up a new realm of vision-based distributed smart applications including security/surveillance, healthcare delivery, traffic monitoring, just to name a few. However, such applications require sensor nodes that can efficiently process large volumes of visual information in-situ and exhibit intelligent behavior to support autonomous operation, scalability, and energy efficiency. This paper presents WASP, a vision sensor node prototype with high computational capabilities that satisfy key VSN application requirements. The node integrates hardware components comprising a generic processor, a wireless communication module, and a camera, with a software framework designed to carry out key visual information processing tasks including object detection, segmentation, and morphological operators for image enhancement. In addition, the framework implements classifiers for target recognition and scenario analysis. © 2010 IEEE.
A new adaptive channel estimation for frequency selective time varying fading OFDM channels

Authors
Afifi W.M., Elkamchouchi H.M.

Abstract
In this paper a new algorithm for adaptive dynamic channel estimation for frequency selective time varying fading OFDM channels is proposed. The new algorithm adopts a new strategy that successfully increases OFDM symbol rate. Instead of using a fixed training pilot sequence, the proposed algorithm uses a logic controller to choose among several available training patterns. The controller choice is based on the cross-correlation between pilot symbols over two consecutive time instants (which is considered to be a suitable measure of channel stationarity) as well as the deviation from the desired BER. Simulation results of the system performance confirm the effectiveness of this new channel estimation technique over traditional non-adaptive estimation methods in increasing the data rate of OFDM symbols while maintaining the same probability of error. ©2009 IEEE.
A secure face verification system based on robust hashing and cryptography

Authors
Abdel-Ghaffar E.A., Allam M.E., Mansour H.A.K., Abo-Alsoud M.A.

Abstract
Face verification has been widely studied during the past two decades. One of the challenges is the rising concern about the security and privacy of the template database. In this paper, we propose a secure face verification system which employs a user dependent one way transformation based on a two stage hashing algorithm. We first hash the face image using a two stages robust image hashing technique, then the result hash vector is encrypted using Advanced Encryption Standard (AES). Both the hashing and the encryption/decryption keys are generated from the user claimed ID, using a modified password-based key driven algorithm. The proposed system is tested on the ORL (AT&T) face database. ©2009 IEEE.
A simplification in integral frequency offset estimation based on joint detection algorithm for WiMAX 802.16e

Authors

Abstract
Initial downlink synchronization for orthogonal frequency division multiple access (OFDMA) network access involves timing and frequency synchronization. The frequency offset is produced by oscillator drifts and time-varying Doppler shifts. In mobile WiMAX 802.16e carrier frequency offset (CFO) can be divided into: integral carrier frequency offset (ICFO) and fractional carrier frequency offset (FCFO). There are mainly three methods for CFO estimation: data-aided method, blind and semi-blind. This paper is based on the semi-blind method presented in "Joint detection of integral carrier frequency offset and preamble index in OFDMA WiMAX downlink synchronization", IEEE, 2007, see [2]. We simplify the algorithm presented in that paper by (a) using an adder-subtractor instead of using squares to estimate power and (b) by using a XNOR instead of complex multiplier; thereby reducing hardware gates by a factor of 676. Simulation results show only a slight degradation in performance with a considerable reduction in complexity.
A subspace method for the blind identification of multiple time-varying FIR channels

Authors
Champagne B., El-Keyi A., Tu C.-C.

Abstract
A new method is proposed for the blind subspace-based identification of the coefficients of time-varying (TV) single-input multiple-output (SIMO) FIR channels. The TV channel coefficients are represented via a finite basis expansion model, i.e. linear combination of known basis functions. In contrast to earlier related works, the basis functions need not be limited to complex exponentials, and therefore do not necessitate the a priori estimation of frequency parameters. This considerably simplifies the implementation of the proposed method and provides added flexibility in applications. The merits of the proposed technique, including asymptotic consistency, are demonstrated by numerical simulations.
Year: 2009

Adaptive puncturing and rate selection in single-codeword turbo-coded OFDMA

Authors
Abdelhakim M., Nafie M., Shalash A., Elezabi A.Y.

Abstract
This paper proposes using adaptive puncturing for rate-adaptive OFDMA systems utilizing turbo codes. The scheme is based on adaptively puncturing a Single Code Word (SCW) and hence adaptively changing the rate within the codeword. We compare the SCW against the Multiple Code-Words (MCWs) scheme where different rates are obtained by separate encoding, puncturing, and interleaving on a per-tile basis. Noticeable gains are obtained over the MCW scheme due to the use of larger turbo block sizes and hence larger interleavers. The SCW has around 1dB gain in goodput compared to MCWs, with much improved BER performance. We also propose a novel rate selection scheme for the SCW which we call Recursive Mutual Information Effective SNR mapping (R-MIESM) and compare it against the conventional MIESM scheme. The R-MIESM provides further goodput performance gains for the SCW compared to the MIESM method. © 2009 IEEE.
Adaptive puncturing for coded OFDMA systems

Authors
Abdelhakim M., Nafie M., Shalash A., Elezabi A.Y.

Abstract
A scheme is proposed for adaptively changing the code rate of coded OFDMA systems via changing the puncturing rate within a single codeword (SCW). In the proposed structure, the data is encoded with the lowest available code rate then it is divided among different resource blocks (tiles) where it is punctured adaptively based on some measure of the channel quality for each tile. The proposed scheme is compared against using multiple codewords (MCWs) where the transmitter divides the data over tiles and encodes them separately. We investigate two different adaptive modulation and coding (AMC) selection methods. The first is a recursive scheme that operates directly on the SNR whereas the second operates on the effective SNR value that is obtained using Mutual Information Effective SNR Mapping (MIESM). We then compare our scheme to Per-Frame Adaptation (PFA) where we fix the modulation and coding scheme (MCS) over a given frame. We show via simulations that when using the recursive rate selection method the SCW scheme significantly outperforms the MCWs and the PFA. It is also shown that applying the MIESM rate selection method, the PFA improves significantly, yet the SCW scheme is the best performer. We also introduce a novel interleaving method prior to puncturing that improves the performance for certain restricted adaptation mechanisms. ©2009 IEEE.
Abstract
In this paper, we consider a cooperative relaying scenario with multiple sources transmitting to one or more destination nodes through several relay terminals. Each relay is equipped with multiple receive and transmit antennas. We assume that the relays can estimate their uplink (relay-destination) channels with enough accuracy and that they have access to the training sequences transmitted by the sources. We present two adaptive training-based algorithms for multiuser relay beamforming. Both algorithms use Kalman filtering to estimate the beamforming matrices iteratively. The first algorithm is centralized where the relay terminals forward their received data to a processing center that computes the beamforming coefficients and feeds them back to the relays. In the second algorithm, each relay terminal can estimate its beamforming matrix locally using its received data and some common information that is broadcasted by the other relays. We present numerical simulations that validate the good performance of the proposed beamforming algorithms in stationary and nonstationary signal environments. © 2009 IEEE.
Alignment of minisatellite maps based on run-length encoding scheme

Authors
Abouelhoda M.I., Giegerich R., Behzadi B., Steyaert J.-M.

Abstract
Subsequent duplication events are responsible for the evolution of the minisatellite maps. Alignment of two minisatellite maps should therefore take these duplication events into account, in addition to the well-known edit operations. All algorithms for computing an optimal alignment of two maps, including the one presented here, first deduce the costs of optimal duplication scenarios for all substrings of the given maps. Then, they incorporate the pre-computed costs in the alignment recurrence. However, all previous algorithms addressing this problem are dependent on the number of distinct map units (map alphabet) and do not fully make use of the repetitiveness of the map units. In this paper, we present an algorithm that remedies these shortcomings: our algorithm is alphabet-independent and is based on the run-length encoding scheme. It is the fastest in theory, and in practice as well, as shown by experimental results. Furthermore, our alignment model is more general than that of the previous algorithms, and captures better the duplication mechanism. Using our algorithm, we derive a quantitative evidence that there is a directional bias in the growth of minisatellites of the MSY1 dataset. © 2009 Imperial College Press.
An automatic gene ontology software tool for bicluster and cluster comparisons

Authors
Al-Akwa F.M., Kadah Y.M.

Abstract
We propose an Automatic Gene Ontology (AGO) software as a flexible, open-source Matlab software tool that allows the user to easily compare the results of the bicluster and cluster methods. This software provides several methods to differentiate and compare the results of candidate algorithms. The results reveal that bicluster/cluster algorithms could be considered as integrated modules to recover the interesting patterns in the microarray datasets. The further application of AGO could to solve the dimensionality reduction of the gene regulatory networks. Availability: AGO and help file is available at http://home.k-space.org/FADL/Downloads/AGO-prgram.zip. © 2009 IEEE.
An integrated multi-sensing framework for pervasive healthcare monitoring

Authors

Abstract
Pervasive healthcare provides an effective solution for monitoring the wellbeing of elderly, quantifying post-operative patient recovery and monitoring the progression of neurodegenerative diseases such as Parkinson's. However, developing functional pervasive systems is a complex task that entails the creation of appropriate sensing platforms, integration of versatile technologies for data stream management and development of elaborate data analysis techniques. This paper describes a complete and an integrated multi-sensing framework, with which the sensing platforms, data fusion and analysis algorithms, and software architecture suitable for pervasive healthcare applications are presented. The potential value of the proposed framework for pervasive patient monitoring is demonstrated and initial results obtained from our current research experiences are described.
Analysis of a device-free passive tracking system in typical wireless environments

Authors
Kosba A.E., Abdelkader A., Youssef M.

Abstract
Device-free Passive (DfP) localization is a new concept in location determination where the tracked entity does not carry any device nor participate actively in the localization process. A DfP system operates by processing the received physical signal of a wireless transmitter at one or more monitoring points. The previously introduced DfP system was shown to enable the tracking of a single intruder with high accuracy in a highly controlled WLAN environment. In this paper, we propose and analyze different algorithms for DfP tracking in a typical indoor WLAN environment, rich in multipath. We also study the effect of the temporal and spatial changes in the environment on the accuracy of the system. In addition, we evaluate the effect of the different configurations of the wireless equipment placement on the DfP localization accuracy. Our results show that our proposed techniques can accurately track the user in typical environments, thus enabling a large number of DfP applications. ©2009 IEEE.
ARQ secrecy: From theory to practice

Authors
Omar Y., Youssef M., El Gamal H.

Abstract
Inspired by our earlier work on Automatic Repeat reQuest (ARQ) secrecy, we propose a simple, yet efficient, security overlay protocol to existing 802.11 networks. Our work targets networks secured by the Wired Equivalent Privacy (WEP) protocol because of its widespread use and vulnerability to a multitude of security threats. By exploiting the existing ARQ protocol in the 802.11 standard, our proposed opportunistic secrecy scheme is shown to defend against all known passive WEP attacks. Moreover, our implementation on the madwifi-ng driver is used to establish the achievability of a vanishing secrecy outage probability in several realistic scenarios. © 2009 IEEE.
ARQ-based secret key sharing

Authors
Latif M.A., Sultan A., El Gamal H.

Abstract
This paper develops a novel framework for sharing secret keys using existing Automatic Repeat reQuest (ARQ) protocols. Our approach exploits the multi-path nature of the wireless environment to hide the key from passive eavesdroppers. The proposed framework does not assume the availability of any prior channel state information (CSI) and exploits only the one bit ACK/NACK feedback from the legitimate receiver. Compared with earlier approaches, the main innovation lies in the distribution of key bits among multiple ARQ frames. Interestingly, this idea allows for achieving a positive secrecy rate even when the eavesdropper experiences more favorable channel conditions, on average, than the legitimate receiver. In the sequel, we characterize the information theoretic limits of the proposed schemes, develop low complexity explicit implementations, and conclude with numerical results that validate our theoretical claims. ©2009 IEEE.
Authentication over noisy channels

Authors
Lai L., El Gamal H., Poor H.V.

Abstract
An authentication counterpart of Wyner's study of the wiretap channel is developed in this work. More specifically, message authentication over noisy channels is studied while impersonation and substitution attacks are investigated for both single- and multiple-message scenarios. For each scenario, information-theoretic lower and upper bounds on the opponent's success, or cheating, probability are derived. Remarkably, in both scenarios, the lower and upper bounds are shown to match, and hence, the fundamental limits on message authentication over noisy channels are fully characterized. The opponent's success probability is further shown to be smaller than that derived in the classical noiseless channel model. These results rely on a novel authentication scheme in which shared key information is used to provide simultaneous protection against both types of attacks. Finally, message authentication for the case in which the source and receiver possess only correlated sequences is studied. © 2009 IEEE.
BicATPlus: An automatic comparative tool for Bi/Clustering of gene expression data obtained using microarrays

Authors
Al-Akwa F.M., Ali M.H., Kadah Y.M.

Abstract
In the last few years the gene expression microarray technology has become a central tool in the field of functional genomics in which the expression levels of thousands of genes in a biological sample are determined in a single experiment. Several clustering and biclustering methods have been introduced to analyze the gene expression data by identifying the similar patterns and grouping genes into subsets that share biological significance. However, it is not clear how the different methods compare with each other with respect to the biological relevance of the biclusters and clusters as well as with other characteristics such as robustness and predictability. This research describes the development of an automatic comparative tool called BicATplus that was designed to help researchers in evaluating the results of different bi/clustering methods, compare the results against each others and allow viewing the comparison results via convenient graphical displays. BicAT plus incorporates a reasonable biological comparative methodology based on the enrichment of the output bi/clusters with gene ontology functional categories. No exact algorithm can be considered the optimum one. Instead, bi/clustering algorithms can be used as integrated techniques to highlight the most enriched biclusters that help biologists to draw biological prediction about the unknown genes.
Blind cognitive MAC protocols

Authors
Mehanna O., Sultan A., El Gamal H.

Abstract
We consider the design of cognitive Medium Access Control (MAC) protocols enabling an unlicensed (secondary) transmitter-receiver pair to communicate over the idle periods of a set of licensed channels, i.e., the primary network. The objective is to maximize data throughput while maintaining the synchronization between secondary users and avoiding interference with licensed (primary) users. No statistical information about the primary traffic is assumed to be available a-priori to the secondary user. We investigate two distinct sensing scenarios. In the first, the secondary transmitter is capable of sensing all the primary channels, whereas it senses one channel only in the second scenario. In both cases, we propose MAC protocols that efficiently learn the statistics of the primary traffic online. Our simulation results demonstrate that the proposed blind protocols asymptotically achieve the throughput obtained when prior knowledge of primary traffic statistics is available. ©2009 IEEE.
CellNet: A bottom-up approach to network design

Authors
Hassan H., Eltoweissy M., Youssef M.

Abstract
The ever-increasing dependence on the Internet is challenged by several factors impeding the smooth transition to the nomadic and ubiquitous future communications. These hindering factors are primarily attributed to the top-down approach in designing computer networks that resulted in adopting a layered architecture for abstracting network functionalities as well as for engineering protocols; a methodology that proved to be neither adaptable nor evolvable in response to changes in network operational requirements and technological advancements. This paper presents a bottom-up strategy for designing computer networks through i) the formalization of network design core principles, ii) the derivation of a conceptual framework for network concerns and a structural model for network building elements inspired by natural complex systems, thus introducing the Network Cell which is the network elementary building block intrinsically capable of specialization, adaptation and evolution, and iii) finally, a Cell-based network realization. Cell-based network adaptation capabilities are evaluated through simulations. Results show the awareness of UDP and TCP to path delays and the possibility of tweaking their operation accordingly. ©2009 IEEE.
Comparison and analysis of water main performance models

Authors
Osman H.

Abstract
Evaluating the condition state of infrastructure assets is one of the most integral pieces of information to the asset manager. Water infrastructure poses specific challenges compared to sewer infrastructure where techniques like CCTV are now being consistently used to assess condition. The number of water main breaks is commonly used as a proxy for water main condition. Statistical water main performance models rely on using past breakage patterns and rates to predict future performance of the water main network. Performance models can be broadly classified into two groups. Rate-of-failure models attempt to extrapolate the breakage rate for a particular cohort of pipes and do not differentiate between the times between successive failures. Examples of statistical modeling approaches for these models include the Non-Homogeneous Poisson Process and the Multi-Variant Exponential (MVE) model. On the other hand, Transition-State (TS) models attempt to model the time between successive failures for pipes. Examples of these models include the Proportional Hazards Model and the Transition State - Life Regression Model. This paper presents a comparison and analysis of rate-of-failure models and transition-state models using a single data set for cast and ductile iron pipes in the City of Hamilton, Canada. The paper makes comparisons between the models' ability to support breakage forecasting, long-term strategic planning and short-term tactical planning. The paper also analyzes the data needs of each model and the impact of data inaccuracies (that are common in water main databases) on the predictive accuracy of each model. © 2009 ASCE.
Year: 2009

Computer aided diagnosis system for classification of microcalcifications in digital mammograms

Authors
Osman M.E., Wahed M.A., Mohamed A.S., Kadah Y.M.

Abstract
Breast cancer is the main cause of death for women between the ages of 35 to 55. Mammogram breast X-ray is considered the most reliable method in early detection of breast cancer. Microcalcifications are among the earliest signs of a breast carcinoma. Actually, as radiologists point out, microcalcifications can be the only mammographic sign of non-palpable breast disease which are often overseen in the mammogram. In this paper a method is proposed to develop a Computer-Aided Diagnostic system for classification of microcalcifications in digital mammograms, it splits into three-step process. The first step is Region of Interest extraction of 32 x 32 pixels size. The second step is the features extraction, where we used a set of 234 features from Region of Interest by employing wavelet decomposition, 1st order statistics from wavelet coefficients algorithms; also, we extracted 1st order statistics, median contrast and local binary partition features. The third step is the classification process where differentiation between normal and abnormal is performed using a Minimum Distance Classifier and K-Nearest Neighbor Classifiers employing the leave-one-out training-testing methodology. The results show acceptable sensitivity and specificity for the proposed system.
Distributed admission and power control for cognitive radios in spectrum underlay networks

Authors
George J., Sultan A., Nafie M.

Abstract
In this paper we investigate admission control and power allocation for cognitive radios in an underlay network. We consider the problem of maximizing the number of supported secondary links under their minimum QoS requirements without violating the maximum tolerable interference on primary receivers in a cellular network. An optimal solution to our problem is shown in previous works to be NP-hard. We propose an efficient distributed algorithm with reasonable complexity that provides results close to the optimum solution without requiring neither a large amount of signaling nor a wide range of information about the system parameters. Our algorithm is compared with previously proposed algorithms to demonstrate its relative efficiency.
In this paper we propose distributed storage algorithms for large-scale wireless sensor networks. Assume a wireless sensor network with n nodes that have limited power, memory, and bandwidth. Each node is capable of both sensing and storing data. Such sensor nodes might disappear from the network due to failures or battery depletion. Hence it is desired to design efficient schemes to collect data from these n nodes. We propose two distributed storage algorithms (DSA’s) that utilize network flooding to solve this problem. In the first algorithm, DSA-I, we assume that the total number of sensors is known to each sensor in the network. We show that this algorithm is efficient in terms of the encoding and decoding operations. Furthermore, every node utilizes network flooding to disseminate its data throughout the network using a mixing time of approximately O(n). In the second algorithm, DSA-II, we assume that the total number of nodes is not known to every sensor; hence dissemination of the data does not depend on n. The encoding operations in this case take O(Cμ2), where μ is the mean degree of the network graph and C is a system parameter. We evaluate the performance of the proposed algorithms through analysis and simulation. We show that the performance of the proposed algorithms matches the derived theoretical results.

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Fast fractal modeling of mammograms for microcalcifications detection

Authors
Mohamed W.A., Alolfe M.A., Kadah Y.M.

Abstract
Clusters of microcalcifications in mammograms are an important early sign of breast cancer in women. Comparing with microcalcifications, the breast background tissues have high local self-similarity, which is the basic property of fractal objects. A fast fractal modeling method of mammograms for detecting the presence of microcalcifications is proposed in this paper. The conventional fractal modeling method consumes too much computation time. In the proposed method, the image is divided into shade (homogeneous) and non-shade blocks based on the dynamic range and only the non-shade blocks are modeled. Reducing the number of the processed blocks reduces the encoding time to 6.372% compared to the conventional modeling method. The modeled mammograms were investigated for microcalcifications detection and the results show that the sensitivity is 92% for 25 abnormal mammograms were obtained.
Feature selection in computer aided diagnostic system for microcalcification detection in digital mammograms

Authors
Alolfe M.A., Mohamed W.A., Youssef A.-B.M., Kadah Y.M., Mohamed A.S.

Abstract
In this paper an approach is proposed to develop a computer-aided diagnosis (CAD) system that can be very helpful for radiologist in diagnosing microcalcifications' patterns in digitized mammograms earlier and faster than typical screening programs and showed the efficiency of feature selection on the CAD system. The proposed method has been implemented in four stages: (a) the region of interest (ROI) selection of 32x32 pixels size which identifies clusters of microcalcifications, (b) the feature extraction stage is based on the wavelet decomposition of locally processed image (region of interest) to compute the important features of each cluster, (c) the feature selection stage, which select the most significant features to be used in next stage, and (d) the classification stage, which classify between normal and microcalcifications' patterns and then classify between benign and malignant microcalcifications. In classification stage, two methods were used, the voting K-Nearest Neighbor classifier, and support vector machine classifier. The proposed method was evaluated using the Mammographic Image Analysis Society (MIAS) mammographic databases. The proposed system was shown to have the large potential for microcalcifications detection in digital mammograms.
Fingerprinting with minimum distance decoding

Authors
Lin S.-C., Shahmohammadi M., El Gamal H.

Abstract
This paper adopts an information-theoretic framework for the design of collusion-resistant coding/decoding schemes for digital fingerprinting. More specifically, the minimum distance decision rule is used to identify 1 out of $t$ pirates. Achievable rates, under this detection rule, are characterized in two scenarios. First, we consider the averaging attack where a random coding argument is used to show that the rate $1/2$ is achievable with $t=2$ pirates. Our study is then extended to the general case of arbitrary $t$ highlighting the underlying complexity-performance tradeoff. Overall, these results establish the significant performance gains offered by minimum distance decoding compared to other approaches based on orthogonal codes and correlation detectors which can support only a subexponential number of users (i.e., a zero rate). In the second scenario, we characterize the achievable rates, with minimum distance decoding, under any collusion attack that satisfies the marking assumption. For $t=2$ pirates, we show that the rate $1-H(0.25)\approx 0.188$ is achievable using an ensemble of random linear codes. For $t\geq 3$, the existence of a nonresolvable collusion attack, with minimum distance decoding, for any nonzero rate is established. Inspired by our theoretical analysis, we then construct coding/decoding schemes for fingerprinting based on the celebrated belief-propagation framework. Using an explicit repeat-accumulate code, we obtain a vanishingly small probability of misidentification at rate $1/3$ under averaging attack with $t=2$. For collusion attacks, which satisfy the marking assumption, we use a more sophisticated accumulate repeat accumulate code to obtain a vanishingly small misidentification probability at rate $1/9$ with $t=2$. These results represent a marked improvement over the best available designs in the literature. © 2009 IEEE.
FPGA implementation of a configurable viterbi decoder for software radio receiver

Authors
Shaker S.W., Elramly S.H., Shehata K.A.

Abstract
Convolutional codes are one of the Forward Error Correction (FEC) codes that are used in every robust digital communication system. Viterbi algorithm is employed in wireless communications to decode the convolutional codes. Such decoders are complex and dissipate large amount of power. Software Defined Radio (SDR) is realized using highly configurable hardware platforms. Field Programmable Gate Array technology (FPGA) is a highly configurable option for implementing many sophisticated signal processing tasks in SDR. In this paper, a generic, configurable and low power Viterbi decoder for software defined radio is described using a VHDL code for FPGA implementation. The proposed design of the Viterbi decoder is considered to be generic so that it facilitates the prototyping of the decoder with different specifications. The proposed design is implemented on Xilinx Virtex-II Pro, XC2vp30 FPGA using the FPGA Advantage Pro package provided by Mentor Graphics and ISE 10.1 by Xilinx. ©2009 IEEE.
FPGA implementation of a reconfigurable Viterbi decoder for WiMAX receiver

Authors
Shaker S.W., Elramly S.H., Shehata K.A.

Abstract
Field Programmable Gate Array technology (FPGA) is a highly configurable option for implementing many sophisticated signal processing tasks in Software Defined Radios (SDRs). Those types of radios are realized using highly configurable hardware platforms. Convolutional codes are used in every robust digital communication system and Viterbi algorithm is employed in wireless communications to decode the convolutional codes. Such decoders are complex and dissipate large amount of power. In this paper, a low power-reconfigurable Viterbi decoder for WiMAX receiver is described using a VHDL code for FPGA implementation. The proposed design is implemented on Xilinx Virtex-II Pro, XC2vpx30 FPGA using the FPGA Advantage Pro package provided by Mentor Graphics and ISE 10.1 by Xilinx. ©2009 IEEE.
Year: 2009

**Fuzzy gaussian process classification model**

**Authors**
Ahmed E., El Gayar N., Atiya A.F., El Azab I.A.

**Abstract**
Soft labels allow a pattern to belong to multiple classes with different degrees. In many real world applications the association of a pattern to multiple classes is more realistic; to describe overlap and uncertainties in class belongingness. The objective of this work is to develop a fuzzy Gaussian process model for classification of soft labeled data. Gaussian process models have gained popularity in the recent years in classification and regression problems and are example of a flexible, probabilistic, non-parametric model with uncertainty predictions. Here we derive a fuzzy Gaussian model for a two class problem and then explain how this can be extended to multiple classes. The derived model is tested on different fuzzified datasets to show that it can adopt to various classification problems. Results reveal that our model outperforms the fuzzy K-Nearest Neighbor (FKNN), applied on the fuzzified dataset, as well as the Gaussian process and the K-Nearest Neighbor models used with crisp labels. © 2009 Springer Berlin Heidelberg.
Hidden anchor: Providing physical layer location privacy in hybrid wireless sensor networks

Authors
El-Badry R., Youssef M., Eltoweissy M.

Abstract
In many hybrid wireless sensor networks (HWSNs) applications, sensor nodes are deployed in hostile environments where trusted and untrusted nodes co-exist. In such hybrid networks, it becomes important to allow trusted nodes to share information, especially, location information and, at the same time, prevent untrusted nodes from gaining access to this information. We focus on anchor-based localization algorithms in HWSNs, where a small set of specialized nodes, i.e. anchor nodes, broadcast their location to the network and other nodes can use the broadcast information to estimate their own location. The main challenge is that both trusted and untrusted nodes can measure the physical signal transmitted from anchor nodes. Thus, untrusted nodes can use the physical signal transmitted from an anchor node to estimate its location. In this paper, we propose Hidden Anchor, an algorithm that provides anchor physical layer location privacy. The Hidden Anchor algorithm exploits the inherently noisy wireless channel and uses identity cloning of neighboring trusted nodes to make anchors unobservable to untrusted nodes while providing complete information to trusted nodes. Evaluation of the Hidden Anchor algorithm through analysis and simulation shows that it can hide the location and identity of anchor nodes with very low overhead. ©2009 IEEE.
Year: 2009

Inherent fat cancellation in complementary spatial modulation of magnetization

Authors
Fahmy A.S., Basha T.A., Osman N.F.

Abstract
An efficient fat suppression method is presented for MR tagging with complementary spatial modulation of magnetization (CSPAMM). In this method, the complementary modulation is applied to the water content of the tissues, while in-phase modulation is applied to the fat content. Therefore, during image reconstruction, the subtraction of the acquired images increases the tagging contrast of the water while cancels the tagging lines of the fat. Compared with the existing fat suppression techniques, the proposed method allows imaging with higher temporal resolution and shorter echo-time without increasing the scan time. The feasibility of applying the method on 1.5 Tesla (T) and 3.0T scanners has been tested using MR phantom and human volunteers. © 2008 Wiley-Liss, Inc.
Abstract
Brain-Computer Interfaces (BCI) is a one kind of communication system that enables control of devices or communication with others only through brain signal activities without using motor activities. P300 Speller is a BCI paradigm that helps disabled subjects to spell words by means of their brain signal activities. This paper tries to demonstrate the performance of different machine learning algorithms based on classification accuracy. Performance has been evaluated on the data sets acquired using BC12000’s P300 Speller Paradigm provided by BCI competitions II (2003) & III (2004) organizers for three subjects. As a primary stage, a preprocessing was applied on the samples in order to extract the most significant features before introducing them to machine learning algorithms. The algorithms applied are Bayesian Linear Discriminant Analysis (BLDA), linear Support Vector Machine (SVM), Fisher Linear Discriminant Analysis (FLDA), Generalized Anderson's Task linear classifier (GAT), Linear Discriminant Analysis (LDA). BLDA and SVM yielded the highest accuracy for all 3 subjects. Principal Component Analysis (PCA) was applied on the data presented to the BLDA classifier for dimensionality reduction. The results obtained after this stage were slightly lower than those without reduction but they are still acceptable. This advantage could help in using P300 Speller BCI system beyond mere proof-of-concept systems and allow their widespread application out of laboratories.
Abstract
Time series forecasting is a challenging problem, that has a wide variety of application domains such as in engineering, environment, finance and others. When confronted with a time series forecasting application, typically a number of different forecasting models are tested and the best one is considered. Alternatively, instead of choosing the single best method, a wiser action could be to choose a group of the best models and then to combine their forecasts. In this study we propose a combined model consisting of Multi-layer perceptron (MLP), Gaussian Processes Regression (GPR) and a Negative Correlation Learning (NCL) model. The MLP and the GPR were the top performers in a previous large scale comparative study. On the other hand, NCL suggests an alternative way for building accurate and diverse ensembles. No studies have reported on the performance of the NCL in time series prediction. In this work we test the efficiency of NCL in predicting time series data. Results on two real data sets show that the NCL is a good candidate model for forecasting time series. In addition, the study also shows that the combined MLP/GPR/NCL model outperforms all models under consideration. © 2009 Springer Berlin Heidelberg.
Modeling of ultrasound hyperthermia treatment of breast tumors

Authors
Hassan O.M., Hassan N.S.D., Kadah Y.M.

Abstract
Ultrasound hyperthermia has become one of the new therapeutic modalities for breast cancer treatment, since ultrasound appears to selectively affect malignant cells without causing any deleterious effects to the surrounding normal tissues. The main objective of this study is to numerically simulate the interaction of therapeutic ultrasound with a multi-tissue type system, and to develop an analytical model for calculating the temperature rise in these tissues due to ultrasound. First, the Finite-Element Method has been used to compute the radiated power density produced by a circular ultrasonic transducer disk, the heat deposition in each of the biological tissues and the 2-D temperature distribution during ultrasound hyperthermia. Second, an analytical model was developed in which a modified heat transfer equation was used to compute temperature profiles in different tissues. The therapeutic transducer was employed at three different frequencies of 0.75, 1.5 and 2.75 MHz and simulations were allowed to run from 180 to 300 seconds, for a focal depth 10 cm below the surface of the breast tissue. Numerical results of the temperature distribution in different tissues were compared with analytical calculations. The results show that employing a transducer at a frequency of 1.5 MHz is the most suitable for a successful ultrasound therapy in this application.
We propose a model that describes the interaction of several Brain Regions based on Functional Magnetic Resonance Imaging (FMRI) time series to make inferences about functional integration and segregation within the human brain. The method is demonstrated using dynamic causal modeling (OeM) using real data to show how such models are able to characterize interregional dependence. We extend estimating and reviewing designed model to characterize the interactions between regions. A further benefit is to estimate the effective connectivity between these regions. All designs, estimates, reviews are implemented using Statistical Parametric Mapping (SPM), one of the free best software packages used for design models and analysis for inferring about FMRI functional magnetic resonance imaging time series.
Natcracker: Nat combinations matter

Authors
Roverso R., El-Ansary S., Haridi S.

Abstract
In this paper, we report our experience in working with Network Address Translators (NATs). Traditionally, there were only 4 types of NATs. For each type, the (im)possibility of traversal is well-known. Recently, the NAT community has provided a deeper dissection of NAT behaviors resulting into at least 27 types and documented the (im)possibility of traversal for some types. There are, however, two fundamental issues that were not previously tackled by the community. First, given the more elaborate set of behaviors, it is incorrect to reason about traversing a single NAT, instead combinations must be considered and we have not found any study that comprehensively states, for every possible combination, whether direct connectivity with no relay is feasible. Such a statement is the first outcome of the paper. Second, there is a serious need for some kind of formalism to reason about NATs which is a second outcome of this paper. The results were obtained using our own scheme which is an augmentation of currently-known traversal methods. The scheme is validated by reasoning using our formalism, simulation and implementation in a real P2P network. ©2009 IEEE.
New approach for data acquisition and image reconstruction in parallel magnetic resonance imaging

Authors
Mohamed H., Gabr R.E., Youssef A.-B.M., Kadah Y.M.

Abstract
In this study, we propose a novel data acquisition and image reconstruction method for parallel magnetic resonance imaging (MRI). The proposed method improves the GRAPPA algorithm by simultaneously collecting data using the body coil in addition to localized surface coils. The body coil data is included in the GRAPPA reconstruction as an additional coil. The reconstructed body coil image shows greater uniformity over the field of view than the conventional sum-of-squares (SoS) reconstruction that is conventionally used with GRAPPA. The body coil image can also be used to correct for spatial inhomogeneity in the SoS image. The algorithm has been tested using numerical and real MRI phantom data.
Year: 2009

Novel reliability-based hybrid ARQ technique

Authors
Gomaa A., Nafie M., Abdallah M.

Abstract
In this paper we propose a novel technique for hybrid automatic repeat request (HARQ) systems where turbo codes are used as the forward error correction (FEC) techniques. This technique uses the histogram of the soft values generated by the turbo decoder to control the size and the contents of the retransmissions needed when the packet can not be decoded correctly. These soft values represent the reliabilities of the information bits; hence the proposed technique is a reliability-based (RB) HARQ technique. The proposed technique is compared to the conventional RB-HARQ and the conventional rate compatible punctured turbo (RCPT) codes, and is shown to achieve higher throughput and/or less number of transmissions.
On power control and frequency reuse in the two user cognitive channel

Authors
Koyluoglu O.O., El Gamal H.

Abstract
This paper considers the generalized cognitive radio channel where the secondary user is allowed to reuse the frequency during both the idle and active periods of the primary user, as long as the primary rate remains the same. In this setting, the optimal power allocation policy with single-input single-output (SISO) primary and secondary channels is explored. Interestingly, the offered gain resulting from the frequency reuse during the active periods of the spectrum is shown to disappear in both the low and high signal-to-noise ratio (SNR) regimes. We then argue that this drawback in the high SNR region can be avoided by equipping both the primary and secondary transmitters with multiple antennas. Finally, the scenario consisting of SISO primary and multi-input multi-output (MIMO) secondary channels is investigated. Here, a simple Zero-Forcing approach is shown to significantly outperform the celebrated DecodingForwarding-Dirty Paper Coding strategy (especially in the high SNR regime). © 2009 IEEE.
On the delay limited secrecy capacity of fading channels

Authors
Khalil K., Youssef M., Koyluoglu O.O., El Gamal H.

Abstract
In this paper, the delay limited secrecy capacity of the flat fading channel is investigated under two different assumptions on the available transmitter channel state information (CSI). The first scenario assumes perfect prior knowledge of both the main and eavesdropper channel gains. Here, upper and lower bounds on the secure delay limited capacity are derived and shown to be tight in the high signal-to-noise ratio (SNR) regime (for a wide class of channel distributions). In the second scenario, only the main channel CSI is assumed to be available at the transmitter. Remarkably, under this assumption, we establish the achievability of non-zero secure rate (for a wide class of channel distributions) under a strict delay constraint. In the two cases, our achievability arguments are based on a novel twostage approach that overcomes the secrecy outage phenomenon observed in earlier works. © 2009 IEEE.
Overlapping multihop clustering for wireless sensor networks

Authors
Youssef M., Youssef A., Younis M.

Abstract
Clustering is a standard approach for achieving efficient and scalable performance in wireless sensor networks. Traditionally, clustering algorithms aim at generating a number of disjoint clusters that satisfy some criteria. In this paper, we formulate a novel clustering problem that aims at generating overlapping multihop clusters. Overlapping clusters are useful in many sensor network applications, including intercluster routing, node localization, and time synchronization protocols. We also propose a randomized, distributed multihop clustering algorithm (KOCA) for solving the overlapping clustering problem. KOCA aims at generating connected overlapping clusters that cover the entire sensor network with a specific average overlapping degree. Through analysis and simulation experiments, we show how to select the different values of the parameters to achieve the clustering process objectives. Moreover, the results show that KOCA produces approximately equal-sized clusters, which allow distributing the load evenly over different clusters. In addition, KOCA is scalable; the clustering formation terminates in a constant time regardless of the network size. © 2009 IEEE.
Preventing wormhole attack in wireless ad hoc networks using cost-based schemes

Authors
Azer M.A., El-Kassas S.M., El-Soudani M.S.

Abstract
Ad hoc networks can be rapidly deployed and reconfigured. Hence, they are very appealing as they can be tailored to lots of applications. Due to their features, they are vulnerable to many attacks. A particularly severe security attack, called the wormhole attack, has been introduced in the context of ad-hoc networks. During the attack a malicious node captures packets from one location in the network, and tunnels them to another malicious node at a distant point, which replays them locally. In this paper we explain the wormhole attack modes and propose two schemes for the wormhole attack prevention in ad hoc networks. The schemes rely on the idea that usually the wormhole nodes participate in the routing in a repeated way as they attract most of the traffic. Therefore, each node will be assigned a cost depending in its participation in routing. The cost function is chosen to be exponential in powers of two such that to rapidly increase the cost of already used nodes. Besides preventing the wormhole attack, these schemes provide a load balance among nodes to avoid exhausting a node that is always cooperative in routing.
Year: 2009

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Randomization for security in half-duplex two-way Gaussian channels

Authors
El Gamal A., Youssef M., El Gamal H.

Abstract
This paper develops a new physical layer framework for secure two-way wireless communication in the presence of a passive eavesdropper, i.e., Eve. Our approach achieves perfect information theoretic secrecy via a novel randomized scheduling and power allocation scheme. The key idea is to allow Alice and Bob to send symbols at random time instants. While Alice will be able to determine the symbols transmitted by Bob, Eve will suffer from ambiguity regarding the source of any particular symbol. This desirable ambiguity is enhanced, in our approach, by randomizing the transmit power level. Our theoretical analysis, in a 2-D geometry, reveals the ability of the proposed approach to achieve relatively high secure data rates under mild conditions on the spatial location of Eve. These theoretical claims are then validated by experimental results using IEEE 802.15.4-enabled sensor boards in different configurations, motivated by the spatial characteristics of Wireless Body Area Networks (WBAN).
Year: 2009

Security in Ad hoc networks: From vulnerability to risk management

Authors
Azer M.A., El-Kassas S.M., El-Soudani M.S.

Abstract
Mobile Ad hoc Networks (MANETs) have lots of applications. Due to the features of open medium, absence of infrastructure, dynamic changing network topology, cooperative algorithms, lack of centralized monitoring and management point, resource constraints and lack of a clear line of defense, these networks are vulnerable to attacks. A vital problem that must be solved in order to realize these applications is that concerning the security aspects of such networks. Solving these problems combined with the widespread availability of devices such as PDAs, laptops, small fixtures on buildings and cellular phones will ensure that ad hoc networks will become an indispensable part of our life. In this paper, we discuss the reasons of vulnerability as well as active and passive attacks on such networks. We present the security measures used to secure ad hoc networks such as authentication, threshold cryptography, trust and reputation, and present a risk management scheme. Concluding remarks are presented at the end of this paper, while mentioning the different open research areas and challenges in the discussed security measures. © 2009 IEEE.
Smart devices for smart environments: Device-free passive detection in real environments

Authors
Moussa M., Youssef M.

Abstract
Device-free Passive (DfP) localization is a system envisioned to detect, track, and identify entities that do not carry any device, nor participate actively in the localization process. A DfP system allows using nominal WiFi equipment for intrusion detection, without using any extra hardware, adding smartness to any WiFi-enabled device. In this paper, we focus on the detection function of the DfP system in a real environment. We show that the performance of our previously developed algorithms for detection in a controlled environments, which achieved 100% recall and precision, degrades significantly when tested in a real environment. We present an alternative algorithm, based on the maximum likelihood estimator (MLE), that has a significant performance increase in a real environment. Our results show that the recall of the system increases by more than 10% when using the proposed MLE without affecting the system's precision. © 2009 IEEE.
Strain-encoded cardiac magnetic resonance for the evaluation of chronic allograft vasculopathy in transplant recipients

Authors
Korosoglou G., Osman N.F., Dengler T.J., Riedle N., Steen H., Lehrke S., Giannitsis E., Katus H.A.

Abstract
The aim of our study was to investigate the ability of Strain-Encoded magnetic resonance imaging (MRI) to detect cardiac allograft vasculopathy (CAV) in heart transplantation (HTx)-recipients. In consecutive subjects (n = 69), who underwent cardiac catheterization, MRI was performed for quantification of myocardial strain and perfusion reserve. Based on angiographic findings subjects were classified: group A including patients with normal vessels; group B, patients with stenosis <50%; and group C, patients with severe CAV (stenosis ≥ 50%). Significant correlations were observed between myocardial perfusion reserve with peak systolic strain (r = -0.53, p < 0.001) and with mean diastolic strain rate (r = 0.82, p < 0.001). Peak systolic strain and strain rate were significantly reduced only in group C, while mean diastolic strain rate and myocardial perfusion reserve were already reduced in group B and A. Myocardial perfusion reserve and mean diastolic strain rate had higher accuracy for the detection of CAV (AUC = 0.95, 95% CI = 0.87-0.99 and AUC = 0.93, 95% CI = 0.84-0.98, respectively) and followed peak systolic strain and strain rate (AUC = 0.80, 95% CI = 0.69-0.89 and AUC = 0.78, 95% CI = 0.67-0.87, respectively). Besides the quantification of myocardial perfusion, the estimation of the diastolic strain rate is a useful parameter for CAV assessment. In combination with the clinical evaluation, these parameters may be effective tools for the routine surveillance of HTx-recipients. © 2009 The American Society of Transplantation and the American Society of Transplant Surgeons.
Year: 2009

The MIMO wireless switch: Relaying can increase the multiplexing gain

Authors
Ghozlan H., Mohasseb Y., Gamal H.E., Kramer G.

Abstract
This paper considers an interference network composed of K half-duplex single-antenna pairs of users who wish to establish bi-directional communication with the aid of a multi-input-multi-output (MIMO) half-duplex relay node. This channel is referred to as the "MIMO Wireless Switch" since, for the sake of simplicity, our model assumes no direct link between the two end nodes of each pair implying that all communication must go through the relay node (i.e., the MIMO switch). Assuming a delay-limited scenario, the fundamental limits in the high signal-to-noise ratio (SNR) regime is analyzed using the diversity-multiplexing tradeoff (DMT) framework. Our results sheds light on the structure of optimal transmission schemes and the gain offered by the relay node in two distinct cases, namely reciprocal and non-reciprocal channels (between the relay and end-users). In particular, the existence of a relay node, equipped with a sufficient number of antennas, is shown to increase the multiplexing gain; as compared with the traditional fully connected K-pair interference channel. To the best of our knowledge, this is the first known example where adding a relay node results in enlarging the pre-log factor of the sum rate. Moreover, for the case of reciprocal channels, it is shown that, when the relay has a number of antennas at least equal to the sum of antennas of all the users, static time allocation of decode and forward (DF) type schemes is optimal. On the other hand, in the non-reciprocal scenario, we establish the optimality of dynamic decode and forward in certain relevant scenarios. © 2009 IEEE.
Ultrafast localization of the optic disc using dimensionality reduction of the search space

Authors
Mahfouz A.E., Fahmy A.S.

Abstract
Optic Disc (OD) localization is an important pre-processing step that significantly simplifies subsequent segmentation of the OD and other retinal structures. Current OD localization techniques suffer from impractically-high computation times (few minutes/image). In this work, we present an ultrafast technique that requires less than a second to localize the OD. The technique is based on reducing the dimensionality of the search space by projecting the 2D image feature space onto two orthogonal (x- and y-) axes. This results in two 1D signals that can be used to determine the x- and y-coordinates of the OD. Image features such as retinal vessels orientation and the OD brightness and shape are used in the current method. Four publicly-available databases, including STARE and DRIVE, were used to evaluate the proposed technique. The OD was successfully located in 330 images out of 340 images (97%) with an average computation time of 0.65 seconds. © 2009 Springer-Verlag.
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Ultrafast optic disc localization using projection of image features

Authors
Mahfouz A.E., Fahmy A.S.

Abstract
Optic Disc (OD) localization is a fundamental step in developing computer-assisted diagnostics. In this work, an ultrafast method to locate the OD in retinal fundus images is presented. The proposed method is based on transforming the localization problem into two 1D problems by projecting the image features onto two perpendicular directions. Image features such as the directionality of the retinal vessels, the brightness and the size of the OD have been used in the current method. Two publicly available databases were used to evaluate the accuracy and the computation time of the proposed technique. The OD was correctly located in 71 out of 81 of the STARE images (87.6%) with computation time of 0.8 seconds per image. The OD was also successfully located in all the 40 images (100%) using the DRIVE database. ©2009 IEEE.
**WinBioinfTools: Bioinformatics tools for windows cluster**

**Authors**
Mohamed H., Abouelhoda M.

**Abstract**
Open source bioinformatics tools running under MS Windows are rare to find, and those running under Windows HPC cluster are almost nonexisting, in spite of the fact that Windows is the most popular operating system. Therefore, we introduce WinBioinfTools, an open source toolkit containing a number of bioinformatics tools running under Windows High Performance Computing Server 2008. The current version contains three programs for biological sequence analysis: 1) CoCoNUT for pairwise genome comparison, 2) WinBLAST for biological database search, and 3) WinPSA for global pairwise sequence alignment. We show how the Linux/Unix components of these programs were ported to run under Windows. We also demonstrate by experiments the advantage of using a computer cluster compared to a single machine, highlighting the benefits of using the Windows HPC Cluster 2008. Furthermore, we compare the performance of WinBioinfTools on the Windows- and Linux Cluster. © 2009 IEEE.
A fast algorithm for the multiple genome rearrangement problem with weighted reversals and transpositions

Authors
Bader M., Abouelhoda M.I., Ohlebusch E.

Abstract
Background: Due to recent progress in genome sequencing, more and more data for phylogenetic reconstruction based on rearrangement distances between genomes become available. However, this phylogenetic reconstruction is a very challenging task. For the most simple distance measures (the breakpoint distance and the reversal distance), the problem is NP-hard even if one considers only three genomes. Results: In this paper, we present a new heuristic algorithm that directly constructs a phylogenetic tree w.r.t. the weighted reversal and transposition distance. Experimental results on previously published datasets show that constructing phylogenetic trees in this way results in better trees than constructing the trees w.r.t. the reversal distance, and recalculating the weight of the trees with the weighted reversal and transposition distance. An implementation of the algorithm can be obtained from the authors.

Conclusion: The possibility of creating phylogenetic trees directly w.r.t. the weighted reversal and transposition distance results in biologically more realistic scenarios. Our algorithm can solve today's most challenging biological datasets in a reasonable amount of time. © 2008 Bader et al; licensee BioMed Central Ltd.
Cardiac MRI steam images denoising using bayes classifier

Authors
Motaal A.G., Al-Attar M.A., Osman N.F., Fahmy A.S.

Abstract
Imaging of the heart anatomy and function using magnetic resonance imaging (MRI) is an important diagnosis tool for heart diseases. Several techniques have been developed to increase the contrast-to-noise ratio (CNR) between myocardium and background. Recently, a technique that acquires cine cardiac images with black-blood contrast has been proposed. Although the technique produces cine sequence of high contrast, it suffers from elevated noise which limits the CNR. In this paper, we study the performance and efficiency of applying a Bayes classifier to remove background noise. Real MRI data is used to test and validate the proposed method; In addition, a quantitative comparison is done between the proposed method and other thresholding-based classifications techniques. © 2008 IEEE.
CoCoNUT: An efficient system for the comparison and analysis of genomes

Authors
Abouelhoda M.I., Kurtz S., Ohlebusch E.

Abstract
Background: Comparative genomics is the analysis and comparison of genomes from different species. This area of research is driven by the large number of sequenced genomes and heavily relies on efficient algorithms and software to perform pairwise and multiple genome comparisons. Results: Most of the software tools available are tailored for one specific task. In contrast, we have developed a novel system CoCoNUT (Computational Comparative genomics Utility Toolkit) that allows solving several different tasks in a unified framework: (1) finding regions of high similarity among multiple genomic sequences and aligning them, (2) comparing two draft or multi-chromosomal genomes, (3) locating large segmental duplications in large genomic sequences, and (4) mapping cDNA/EST to genomic sequences. Conclusion: CoCoNUT is competitive with other software tools w.r.t. the quality of the results. The use of state of the art algorithms and data structures allows CoCoNUT to solve comparative genomics tasks more efficiently than previous tools. With the improved user interface (including an interactive visualization component), CoCoNUT provides a unified, versatile, and easy-to-use software tool for large scale studies in comparative genomics. © 2008 Abouelhoda et al; licensee BioMed Central Ltd.
Comparing maintenance strategies for overlays

Authors
Krishnamurthy S., El-Ansary S., Aurell E., Haridi S.

Abstract
In this paper, we present an analytical tool for understanding the performance of structured overlay networks under churn based on the master-equation approach of physics. We motivate and derive an equation for the average number of hops taken by lookups during churn, for the Chord network. We analyse this equation in detail to understand the behaviour with and without churn. We then use this understanding to predict how lookups will scale for varying peer population as well as varying the sizes of the routing tables. We also consider a change in the maintenance algorithm of the overlay, from periodic stabilisation to a reactive one which corrects fingers only when a change is detected. We generalise our earlier analysis to understand how the reactive strategy compares with the periodic one. © 2008 IEEE.
Constructing suffix array during decompression

Authors
Mahmoud M., Abouelhoda M.I., Kandil A., Elbialy A.

Abstract
The suffix array is an indexing data structure used in a wide range of applications in Bioinformatics. Biological DNA sequences are available to download from public servers in the form of compressed files, where the popular lossless compression program gzip [1] is employed. The straightforward method to construct the suffix array for this data involves decompressing the sequence file, storing it on disk, and then calling a suffix array construction program to build the suffix array. This scenario, albeit feasible, requires disk access and throws away valuable information in the compressed file. In this paper, we present an algorithm that constructs the suffix array during the decompression requiring no disk access and making use of the decompression information to construct the suffix array. © 2008 IEEE.
Fine tuning the enhanced suffix array

Authors
Abouelhoda M.I., Dawood A.

Abstract
The enhanced suffix array is an indexing data structure used for a wide range of applications in Bioinformatics. It is basically the suffix array but enhanced with extra tables that provide extra information to improve the performance in theory and in practice. In this paper, we present a number of improvements to the enhanced suffix array: 1) We show how to find a pattern of length $m$ in $O(m)$ time, i.e., independent of the alphabet size. 2) We present an improved representation of the bucket table. 3) We improve the access time of addressing the LCP (longest common prefix) table when one byte per entry is used in representing it. The basic idea behind these improvements is the extensive use of the minimal perfect hashing technique, by which $n$ static items can be stored in linear space while retaining $O(1)$ access time. © 2008 IEEE.
Formal specification and analysis of the PCF protocol in the 802.11 standard using systems of communicating machines

Authors
Youssef M., Miller R.E.

Abstract
With the widespread usage of the 802.11 protocol, it becomes important to study the protocol operation. In this paper we propose a formal model for the point coordination function (PCF) of the 802.11 MAC layer using systems of communicating machines. Our goal is to analyse the protocol for safety and liveness properties. These properties cannot be verified directly from the protocol description. Analysis shows that the PCF protocol is free from deadlocks and non-executable transitions. We also show that liveness is guaranteed in the PCF protocol.
Machine learning methodologies in Brain-Computer Interface systems

Authors
Selim A.E., Wahed M.A., Kadah Y.M.

Abstract
Brain-Computer Interfaces (BCI) is a one kind of communication system that enables control of devices or communication with others only through brain signal activities without using motor activities. The main application for BCI is to provide an alternative channel for helping disabled persons, hereafter mentioned as subjects, to communicate with the external world. This paper tries to demonstrate the performance of different machine learning algorithms based on classification accuracy. Performance has been evaluated on dataset II from BCI Competition III for the year 2004 for two subjects 'A' & 'B' and dataset IIb from BCI Competition II for the year 2003 for one subject 'C'. As a primary stage, a preprocessing was applied on the samples in order to extract the most significant features before introducing them to machine learning algorithms. The algorithms applied are Bayesian Linear Discriminant Analysis (BLDA), linear Support Vector Machine (SVM), Fisher Linear Discriminant Analysis (FLDA), Generalized Anderson's Task linear classifier (GAT), Linear Discriminant Analysis (LDA). BLDA and SVM yielded the highest accuracy for all 3 subjects. BLDA algorithm achieved classification accuracy 98%, 98% and 100%; SVM algorithm achieved 98%, 96% and 100% for subjects 'A', 'B' and 'C' respectively. © 2008 IEEE.
Year: 2008

Modeling intrastromal photorefractive keratectomy procedures

Authors
Hameed A.M.A., Solouma N.A., Kadah Y.M.

Abstract
The main idea to correct sight disorders using lasers is to modify corneal curvature by applying laser to specific layers of the cornea. Intrastromal Photorefractive keratectomy is a laser technique used to correct sight disorders by evaporating corneal tissue, which results in small cavities that may coincide to form a larger cavity that will collapse to deform the curvature of the cornea. In this work, a 3D finite element model of the cornea was designed with typical parameters to simulate the procedure. The model outcome was compared with an earlier 2D model used for the same purpose, so as to determine its accuracy. Finally, a 3D finite element simulation of the procedure was made for a virtual astigmatic case, so as to visualize the corneal curvature change. The results of this work show that this finite element model is relatively accurate for modeling the corneal deformation after performing the procedure. © 2008 IEEE.
MyP2PWorld: Highly reproducible application-level emulation of P2P systems

Authors
Roverso R., Al-Aggan M., Naiem A., Dahlstrom A., El-Ansary S., El-Beltagy M., Haridi S.

Abstract
In this paper, we describe an application-level emulator for P2P systems with a special focus on high reproducibility. We achieve reproducibility by taking control over the scheduling of concurrent events from the operating system. We accomplish that for inter- and intra-peer concurrency. The development of the system was driven by the need to enhance the testing process of an already-developed industrial product. Therefore, we were constrained by the architecture of the overlying application. However, we managed to provide highly transparent emulation by wrapping standard/widely-used networking and concurrency APIs. The resulting environment has proven to be useful in a production environment. At this stage, it started to be general enough to be used in the testing process of applications other than the one it was created to test. © 2008 IEEE.
Year: 2008

**Novel computational apoptosis-neurogenesis model for multi-abstraction level perception**

**Authors**
Zaher A.M., Aboul-Makarem F., Kadah Y.M.

**Abstract**
Artificial neural network provides a cybernetic model that is similar to human intelligence in terms of parallel processing, generalization and memory stacking on the same neural network. From the era of neurogenesis, research models expect the rules that govern new neurons to depend on old mature circuitry. Other research models show the existence of catastrophic interference associated with new neurons if species is exposed to variable information content environment. In this work, the model developed provides a theoretical framework for a novel attention sensitive neural network as well as an experimental framework revealing the addition of new neuron can be prevented from catastrophic interference phenomena if it undergoes certain structural processes in human brain. © 2008 IEEE.
On the secrecy capacity of fading channels

Authors
Gopala P.K., Lai L., El Gamal H.

Abstract
We consider the secure transmission of information over an ergodic fading channel in the presence of an eavesdropper. Our eavesdropper can be viewed as the wireless counterpart of Wyner's wiretapper. The secrecy capacity of such a system is characterized under the assumption of asymptotically long coherence intervals. We first consider the full channel state information (CSI) case, where the transmitter has access to the channel gains of the legitimate receiver and the eavesdropper. The secrecy capacity under this full CSI assumption serves as an upper bound for the secrecy capacity when only the CSI of the legitimate receiver is known at the transmitter, which is characterized next. In each scenario, the perfect secrecy capacity is obtained along with the optimal power and rate allocation strategies. We then propose a low-complexity on/off power allocation strategy that achieves near-optimal performance with only the main channel CSI. More specifically, this scheme is shown to be asymptotically optimal as the average signal-to-noise ratio (SNR) goes to infinity, and interestingly, is shown to attain the secrecy capacity under the full CSI assumption. Overall, channel fading has a positive impact on the secrecy capacity and rate adaptation, based on the main channel CSI, is critical in facilitating secure communications over slow fading channels. © 2008 IEEE.
On the secrecy rate region for the interference channel

Authors
Koyluoglu O.O., Gamal H.E.

Abstract
This paper studies interference channels with security constraints. The existence of an external eavesdropper in a two-user interference channel is assumed, where the network users would like to secure their messages from the external eavesdropper. The cooperative binning and channel prefixing scheme is proposed for this system model which allows users to cooperatively add randomness to the channel in order to degrade the observations of the external eavesdropper. This scheme allows users to add randomness to the channel in two ways: 1) Users cooperate in their design of the binning codebooks, and 2) Users cooperatively exploit the channel prefixing technique. As an example, the channel prefixing technique is exploited in the Gaussian case to transmit a superposition signal consisting of binning codewords and independently generated noise samples. Gains obtained from the cooperative binning and channel prefixing scheme compared to the single user scenario reveals the positive effect of interference in increasing the network security. Remarkably, interference can be exploited to cooperatively add randomness into the network in order to enhance the security. © 2008 IEEE.
Optimal medium access protocols for cognitive radio networks

Authors
Lai L., El Gamal H., Jiang H., Vincent Poor H.

Abstract
This paper focuses on the design of medium access control protocols for cognitive radio networks. The scenario in which a single cognitive user wishes to opportunistically exploit the availability of empty frequency bands within parts of the radio spectrum having multiple bands is first considered. In this scenario, the availability probability of each channel is unknown a priori to the cognitive user. Hence efficient medium access strategies must strike a balance between exploring (learning) the availability probability of the channels and exploiting the knowledge of the availability probability identified thus far. For this scenario, an optimal medium access strategy is derived and its underlying recursive structure is illustrated via examples. To avoid the prohibitive computational complexity of this optimal strategy, a low complexity asymptotically optimal strategy is developed. Next, the multi-cognitive user scenario is considered and low complexity medium access protocols, which strike an optimal balance between exploration and exploitation in such competitive environments, are developed.
Performance evaluation of cardiac MRI image denoising techniques

Authors
AlAttar M.A., Motaal A.G., Osman N.F., Fahmy A.S.

Abstract
Black-blood cardiac Magnetic Resonance Imaging (MRI) plays an important role in diagnosing a number of heart diseases. The technique suffers inherently from low contrast-to-noise ratio between the myocardium and the blood. In this work, we examined the performance of different classification techniques that can be used. The three techniques successfully removed the noise with different performance. Numerical simulation has been done to quantitatively evaluate the performance of each technique. © 2008 IEEE.
Robust blind image-adaptive watermarking

Authors
Elrefaey L.A., Allam M.E., Kader H.A., Selim M.

Abstract
This paper proposes a new blind, robust image watermarking for copyright protection and ownership verification in the DCT domain. The owner information is in the form of a logo image. Two different watermarking systems are considered. The first one is based on the principle of spread spectrum communication, in which we propose an adaptive direct sequence spread spectrum DSSS embedding, and a correlation based decoding. The second one is based on Spread Transform (ST) which is a hybrid combination between spread spectrum and a quantization watermarking scheme called Scalar Costa Scheme (SCS). We describe how to incorporate a perceptual model, based on Watson's perceptual model, into the frameworks. The proposed systems are tested using different standard test images and the performance is evaluated under JPEG compression and compared to each other and to other watermarking schemes. Experimental Results show that the proposed systems have good imperceptibility and higher robustness to JPEG image compression.
The relay-eavesdropper channel: Cooperation for secrecy

Authors
Lai L., El Gamal H.

Abstract
This paper establishes the utility of user cooperation in facilitating secure wireless communications. In particular, the four-terminal relay-eavesdropper channel is introduced and an outer-bound on the optimal rate-equivocation region is derived. Several cooperation strategies are then devised and the corresponding achievable rate-equivocation region are characterized. Of particular interest is the novel noise-forwarding (NF) strategy, where the relay node sends codewords independent of the source message to confuse the eavesdropper. This strategy is used to illustrate the deaf helper phenomenon, where the relay is able to facilitate secure communications while being totally ignorant of the transmitted messages. Furthermore, NF is shown to increase the secrecy capacity in the reversely degraded scenario, where the relay node fails to offer performance gains in the classical setting. The gain offered by the proposed cooperation strategies is then proved theoretically and validated numerically in the additive white Gaussian noise (AWGN) channel. © 2008 IEEE.
The water-filling game in fading multiple-access channels

Authors
Lai L., El Gamal H.

Abstract
A game-theoretic framework is developed to design and analyze the resource allocation algorithms in fading multiple-access channels (MACs), where the users are assumed to be selfish, rational, and limited by average power constraints. The maximum sum-rate point on the boundary of the MAC capacity region is shown to be the unique Nash equilibrium of the corresponding water-filling game. This result sheds a new light on the opportunistic communication principle. The base station is then introduced as a player interested in maximizing a weighted sum of the individual rates. A Stackelberg formulation is proposed in which the base station is the designated game leader. In this setup, the base station announces first its strategy defined as the decoding order of the different users, in the successive cancellation receiver, as a function of the channel state. In the second stage, the users compete conditioned on this particular decoding strategy. This formulation is shown to be able to achieve all the corner points of the capacity region, in addition to the maximum sum-rate point. On the negative side, it is shown that there does not exist a base station strategy in this formulation that achieves the rest of the boundary points. To overcome this limitation, a repeated game approach, which achieves the capacity region of the fading MAC, is presented. Finally, the study is extended to vector channels highlighting interesting differences between this scenario and the scalar channel case. © 2008 IEEE.
Abstract
In this work, the critical role of noisy feedback in enhancing the secrecy capacity of the wiretap channel is established. Unlike previous works, where a noiseless public discussion channel is used for feedback, the feed-forward and feedback signals share the same noisy channel in the present model. Quite interestingly, this noisy feedback model is shown to be more advantageous in the current setting. More specifically, the discrete memoryless modulo-additive channel with a full-duplex destination node is considered first, and it is shown that the judicious use of feedback increases the secrecy capacity to the capacity of the source-destination channel in the absence of the wiretapper. In the achievability scheme, the feedback signal corresponds to a private key, known only to the destination. In the half-duplex scheme, a novel feedback technique that always achieves a positive perfect secrecy rate (even when the source-wiretapper channel is less noisy than the source-destination channel) is proposed. These results hinge on the modulo-additive property of the channel, which is exploited by the destination to perform encryption over the channel without revealing its key to the source. Finally, this scheme is extended to the continuous real valued modulo-Λ channel where it is shown that the secrecy capacity with feedback is also equal to the capacity in the absence of the wiretapper. © 2008 IEEE.
Towards a federated network architecture

Authors
Hassan H.M., Eltoweissy M., Youssef M.

Abstract
The layered architecture that guided the design of the Internet is deemed inadequate as a reference model for engineering protocols for NGN. Layered protocol suites impose a strict sequential order on protocol execution conflicting with the efficient engineering of end systems, as well as failing to express vertical functional integration, the separation of control and data planes, and the distributed nature of network functions. Furthermore, protocols developed according to the layered architecture are implemented as monolithic blocks with undefined or implicit dependencies lacking flexibility to adapt to changing application requirements. We claim that NGN architecture design should be dual faceted along a vertical and a horizontal dimension. The vertical dimension addresses complexity at a network node by abstracting the communication functionality into several components and defining component interactions, while the horizontal dimension addresses the distributed nature of the network, abstracting network links into communication paths, and defining procedures for creating, maintaining, as well as exchanging data between different network components along these paths. We propose a preliminary network architecture based on component federation. We focus on the vertical decomposition of the communication functions and their interactions considering the distributed consequences of these interactions along the horizontal dimension of the network.

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Towards evolving sensor actor networks

Authors
Eltarras R., Eltoweissy M., Youssef M.

Abstract
Sensor Actor NETworks (SANET) represent a major component of ubiquitous service environments promising interesting solutions to a wide range of problems. Despite the obvious increase in the research activities proposing architectures and protocols for SANETs, we are still no where near the production of industrial-grade SANET software that can be relied upon for mission critical applications. The cost of programming, deploying and maintaining SANET environments is still highly prohibitive due to the lack of industrial tools capable of realizing adaptive SANET software in a cost effective way. We envision next generation SANET environments as large-scale autonomous systems 1) deployed by multiple infrastructure providers, 2) running multiple applications and 3) providing ubiquitous services collaboratively to both stationary and mobile users. Software adaptability is essential due to both the fragile topology and the change of the SANET goal or mission in response to diverse events. The system should be able to change its structure and behavior at run-time while maintaining its integrity. We introduce Elastic SANET (ESANET) as an attempt to realize a scalable, flexible, cost-effective and dynamic computing infrastructure capable of efficiently running multiple applications on top of SANET hardware resources. ESANET software systems are likely to evolve over time. Deployment of software in ESANET is a progressive first class runtime operation. We propose a role-oriented software architecture that abstracts ESANET environments as fields of collaboration between specialized nodes, clusters, and overlays. We expect such architecture to achieve massive scalability and resilience to topology and context changes. Our proposed architecture could increase the network lifetime, not only by promoting efficient operation, but also by defining a mechanism to allow the network to recover from the death of individual nodes by preserving stocks of unspecialized standby stem nodes in a minimal power mode. Finally, we present a nano-middleware architecture and show how an evolution capable ESANET can be bootstrapped. ©2008 IEEE.
VisCHAINER: Visualizing genome comparison

Authors
Othman A., Martin A., Butterstein D., Abouelhoda M.I.

Abstract
Visualization of genome comparison data is valuable for identifying genomic structural variations and determining evolutionary events. Although there are many software tools with varying degrees of sophistication for displaying such comparisons, there is no tool for displaying dot plots of multiple genome comparisons. The dot plot mode of visualization is more appropriate and convenient than the traditional linear mode, particularly for detecting large scale genome deletions, duplications, and rearrangements. In this paper, we present VisCHAINER, which addresses this limitation, and displays dot plots of multiple genome comparisons in addition to the traditional linear mode. VisCHAINER is a stand-alone interactive visualization that effectively handles large amounts of genome comparison data. © 2008 IEEE.