The Second International Conference on Electrical Engineering and Control Applications

ICEECA'2014

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The Second International Conference on Electrical Engineering and Control Applications (ICEECA'14) provides a forum for specialists and practitioners to present and discuss their research results in the several areas of the conference, and also state of the art findings in using the applied electrical engineering and automatic control to solve national problems that face developing countries. The conference ICEECA'14 publishes papers on theoretical analysis, experimental studies and applications in the domain of automatic control and computer engineering. The objective of the conference is not only the exchange of knowledge and experience, since the conference is an open door to students, but also provides opportunities for researchers to target future collaboration on current issues.

The topics included:

Control and systems engineering

Biomedical control systems, Fuzzy systems, Robust control, Predictive and adaptive control, Non linear control, Optimal and stochastic control, Real-time control, Mechatronics & Robotics, Hybrid systems, Intelligent control systems, Control and Embedded systems.

Renewable energy

Bioenergy and sustainability, Wind energy, Solar energy, Thermal energy, Hybrid renewable energy, Fuel cell, Energy storage and management, Energy transfer, Photovoltaic energy, Biomass, Geothermal, Nuclear energy, Algorithms, Complexity and stability.

Faults Diagnosis-Faults Tolerant Control

Fault accommodation, Fault detection and identification, Fault diagnosis, Fault estimation, Fault tolerant systems, System reconfiguration.

Large Scale Systems

Discuss new developments useful in handling complexity in modeling, control and optimization of large scale complex systems such as urban traffic systems, power, Environmental systems.

Fractional order systems

Fractional controller, Fractional differential equation, Fractional filter, Fractional systems approximation.

Unconventional algorithms in control engineering

Nature-inspired algorithms in synthesis, Control and identification of nonlinear and complex systems, Deterministic chaos control, Complex networks control, Big Data in control engineering.

Signal and Communications

Signal processing, Cryptography, Biometry and medical imaging, Image segmentation and scene analysis, Data fusion and pattern recognition, Communication systems, Wireless technologies, Antennas and propagation, Modulation and signal design, Satellite communications.

Preface

This proceeding is a part of the Second international Conference on Electrical Engineering and control Applications which was held at Constantine, Algeria from 18-Nov-2014 to 20-Nov-2014. This conference was organized by Department of electronics, Faculty of sciences and Technology University Constantine 1 and technically sponsored by Springer, CSC Chapter IEEE France Section, CSC Chapter IEEE Norway Section, IEEE Computational Intelligence Society Czech & Slovak Chapter, MIR Labs, IT4Innovations Centrum excellence and MIS Laboratory University of Picardie Jules Verne.

The papers cover a wide range of topics, problems and challenges faced by academics involved in engineering and control Applications. It is pleasing to note that several papers address multidisciplinary matters to promote development and co-operation, and to pursue innovation and best practice in these field of academic.

There were 3 plenary lectures and 102 accepted contributions organized on 10 oral sessions covering the different areas of the conference: Control system, fault tolerant control, biotechnical, bioenergy, communication, signal processing, optimization,... With these articles and participants, were held many fruitful discussions, exchanges and collaborations that contributed to success of the conference. Best papers will be selected for possible publication in the Journal of Automation & Systems Engineering.

Given the rapidity with which science is advancing in all of the areas covered by ICEECA, we expect that future ICEECA conferences will be as stimulating as this second meeting, as indicated by the contributions presented in this proceedings volume.

We would like to express our sincere gratitude to the invited speakers and all contributors. Thanks are also due to the members of the National Organizing Committee for their assistance and valuable support. The assistance of the International Program Committee is gratefully acknowledged.

This event is mainly financed by the Faculty of sciences and Technology, University Constantine 1 and sponsored by DGRSDT (La Direction Générale de la Recherche Scientifique et du Développement Technologique), Laboratory of LARC (Laboratoire d'automatique et de robotique Constantine), Laboratory of SYSCOM (Signaux et systems de communication), envilab (Environmental Technology & Laboratory Equipment) and SonalGaz society.

Plenaries

Plenary 1

Evolutionary Algorithms and Deterministic Chaos: Perspectives in Control and Synthesis

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Abstract: Proposed keynote is focused on mutual intersection of two interesting fields of research i.e. evolutionary algorithms and deterministic chaos. It consists of two parts. The first one will discuss the phenomenon of the so-called deterministic chaos. Based on the characterization of deterministic chaos, universal features of that kind of behavior are explained. It is shown that despite the deterministic nature of chaos, long-term behavior is unpredictable. This is called sensitivity to initial conditions. We further give a concept of quantifying chaotic dynamics: the Lyapunov exponent. Moreover, we explain how chaos can originate from order by period doubling, intermittence, chaotic transients and crises. Further are discussed different examples of systems showing chaos, for instance mechanical, electronic, biological, meteorological, algorithmic and astronomical systems. Examples provided for this part of tutorial will be done in the Mathematica software In the second part evolutionary algorithms and its fruitful intersection with deterministic chaos are discussed from three points of views. The first one introduce with use of evolutionary algorithms on chaotic system control and its stabilization as well as of synthesis of artificial chaotic systems. Here classical as well as spatiotemporal deterministic chaos will be discussed and demonstrated by examples in Mathematica software. The second one will discuss use of deterministic chaos instead of pseudo-random number generators inside evolutionary algorithms with application on well known evolutionary algorithms (differential evolution, PSO, SOMA, genetic algorithms,..) and test functions. Mutual comparison will be presented, based on our research. The third point of view will discuss presence of chaotic behavior inside evolutionary algorithm dynamics and show novel method (already published by Springer) that allow visualize and analyze presence of chaos in discussed algorithm. At the end will be discussed its impact on evolutionary algorithm performance.

Plenary 2

From Fourier Analysis to Multi-resolution Analysis : Applications in Medical Imaging

by Abdeldjalil Ouahabi
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Abstract: Most real world applications can be reduced to the problem of signal representation and reconstruction. These two problems are closely related to synthesis and analysis of signals. The Fourier transform is the classical tool used to solve them. More recently, wavelets have entered the arena providing more robust and flexible solutions to discretize and reconstruct signals. Starting from Fourier analysis, the talk guides the audience to acquire an understanding of the basic ideas and techniques behind the wavelets. We introduce the Fourier and Window Fourier Transform, the classical tools for signal analysis in the frequency domain, and we use them as a guide to arrive at the Wavelet transform. The fundamental aspects multiresolution representation and its importance to signal discretization and to the construction of wavelets is also discussed. Multiresolution analysis using the wavelet transform has received considerable attention in recent years by industrial engineers, medical researchers, university lab attendants, lecturer-researchers and researchersin various fields, particularly in medical imaging, intelligent instrumentation, telecommunications, smart grid systems, fault tolerance control, artificial intelligence, control systems, robotics and vision, etc. It is a powerful tool for efficiently representing signals and images at multiple levels of detail with many inherent advantages, including compression, level-of-detail display, progressive transmission, level-of-detail editing, filtering, modeling…

This presentation aims to provide a simple formalization and new clarity on multiresolution analysis, rendering accessible obscure techniques, and merging, unifying or completing the technique with encoding, feature extraction, denoising, compressive sensing, multifractal analysis and texture analysis.

My talk will focus on medical imaging because imaging promises to accelerate disease diagnosis at pre-symptomatic levels; enhance understanding of the pathways of drug action and effectiveness; improve the use of physical, chemical, genetic, and biological methods to arrest the ravages of human disease and disability; and assist in evaluating the effectiveness of therapeutic measures of all types. Finally, biomedical imaging has the potential to help contain the exploding costs of health care through early identification and intervention in disease and through the development of improved therapeutic measures.

Recently, many advances in biomedical image processing, and multiresolution analysis has shown a great potential for enhancing and interpreting useful diagnostic information from these images more accurately. This plenarytalk covers the most commonly used algorithms in medical imaging (image registration, image segmentation and image denoising) including computerized

tomography, magnetic resonance imaging, ultrasound imaging, nuclear medicine imaging, computerized hematological cell analysis, etc. The review ends by highlighting some future possibilities and challenges.

Plenary 3

Network control from L1 perspective:Taking in to account delays and constraints

by Jean Jacques Loiseau
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Abstract:The economical system can be seen as an interconnexion of entities that exchange goods and money in a dynamic way. Using this point of view, a behavioral model is obtained writing down the nodes equations of the network that are derived from mass and flow conservation laws. These equations are basically linear, so that they are simple to use to estimate the future values of the variables, or to design the management strategies that permit the economical system to follow the global demand and stabilize the behaviour.

There are two phenomena that complexity the model, and that must be taken in to account, with a good precision, to obtain good results, that are *pure delays* and *constraints*. Pure delays in economical systems come for instance from the production processing, the transportation, the supply of raw material and distribution of finished goods. Taking decisions may al so add a delay in the loop. Hard constraints come from the capacity of the different resources that are used, especially the maximal production rate that depends on the size of the production tool, the stock and the supply capacities.

Another constraint comes from the nature of the variables. Since they are flows between nodes, or stock levels at the nodes, they only take positive values. We propose a method that permits to take in to account delays and constraints. It rests upon two basic ideas.

The first one is that prediction is necessary to compensate delays. The second one is that linear constraints can be expressed in terms of L1 bounds. Thanks to these basic tools, were formulat and solve the problem of stock and supply management in economical systems, in terms of polytopic invariance problem. We further analyze the robustness of the obtained management strategy, and calculate bounds for the level of oscillations in a supply chain – the so-called bullwhip effect. We point out that this solution actually applies to the control of a large class of distributed and constrained systems.

Topic N°1

Control and systems engineering

Induction Motor Control with Stator Resistance and Rotor Speed Estimation Based on Parallel Fuzzy-MRAS Observer

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Abstract: The present paper aims to give a contributes toimprove of the dynamic performances of an MRAS estimator with rotor field oriented that ensures a simultaneous estimation of the speed and the stator resistance of an induction motor in sensorless field oriented control using available information signals such as voltages and stator currents. The conventional adaptation mechanism of stator resistance MRAS estimator was designed by the use proportional integral (PI) scheme at first, we propose a changed structure resulting on a nonlinear variable gain proportional integral controller (VGPI) in the second scheme, then by an intelligent controller (fuzzy-PI) in thirdscheme. The estimated value of the stator resistance is updated online into the speed estimator with the Pl adaptation mechanism and finally substituted in the fuzzy-PI controller scheme. Tests are performed and validated by numerical simulation by MATLAB SIMULINK, environment, acquired results illustrate the contribution of every controller in terms of the quality of estimation and robustness versus disturbances, as well as in relation to the variations of the stator resistance of the induction motor.

Keywords : MRAS; Stator Resistance; PI Controller; VGPI; Fuzzy -PI ; Adaptation Mechanism

Power Quality Improvement based on Five-level NPC Series APF using Fuzzy Control Scheme

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Abstract. This paper presents novel five-level NPC (Neutral Point Clamped) series APF (Active Power Filter) based on instantaneous reactive power control strategies for harmonic voltage compensation. The standard configuration based on voltage source inverter (VSI) with hysteresis controller presents several drawbacks such us uneven switching frequency and limited to lower power applications. Multilevel inverters are currently being investigated and used in various industrial applications. Five-level inverter is one of the most converters employed, their advantages include the capability to reduce the harmonic content and decrease the voltage or current ratings of the semiconductors. Fuzzy controllers are successfully employed in various industrial applications; they represent a good alternative to classic control systems. To benefit of all these advantages a novel control scheme for five-level series APF based on fuzzy techniques is proposed in this work. The proposed fuzzy voltage controller is designed to improve compensation capability of series active power filter by adjusting the voltage error using a fuzzy rule. The simulation is performed using MATLABSimulink and SimPowerSystem Toolbox. The obtained results demonstrate the effectiveness of the proposed Series APF control system.

Keywords: Fuzzy logic voltage controller; Series active power filter; Five-level (NPC) compensation; Instantaneous reactive power theory; inverter; Harmonics voltage disturbances

A State Feedback based Unified Power Flow Controller for Power Flow Control

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Abstract: This article presents a state feedback based controller design methodology for a unified power flow controller to achieve rapid reference signal tracking in the internal control level. State feedback is a linear control technique based on the pole placement theory and overcomes the drawback of traditional linear proportional-integral control, which is typically tuned for one specific operating condition. In this article, we first establish a state spacedynamic model of UPFC based on Kirchhoff's equations and (d-q) transformation, then state feedback control is developedfor the unified power flow controller dynamic model via an

appropriate coordinate transformation, and resulted linear controller is then applied on the transformed linear system. The proposed control is validated via a detailed simulation on a two bus system. Simulation results show power, effectiveness and accuracy of the proposed controller.

Adaptive Backstepping Control Using Combined Direct and Indirect Modification Adaptation

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Abstract: In this paper, by using the dynamic surface control technique, an adaptive backstepping controller using combined direct and indirect σ-modification adaptation is proposed for a class of parametric strict-feedback systems. In this approach, a σ-modification parameter adaptation law that combines direct and indirect update laws is proposed. At first, the x-swapping identifier with a gradient-type update law is presented for a class of parametric strict-feedback nonlinear systems. Next, the main steps of the controller design for a class of nonlinear systems in parametric strict-feedback form are described. The closed-loop error dynamics is shown to be globally stable by using the Lyapunov stability approach. Finally, simulation results for a single-link flexible-joint robot manipulator are given to illustrate the tracking performance of the proposed adaptive control scheme.

Keywords: -Backstepping control, direct and indirect adaptive control, adaptive dynamic surface control, Lyapunov stability, flexible joint manipulators.

Linear Stochastic Model Validation for Civil Engineering Structures under Earthquakes

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Abstract: The autoregressive moving average exogenous(ARMAX) model validation of civil engineering structure under earthquake is developed in this paper. The Kanai-Tajimi and Clough-Penzien seismic models are developed. An identification process is used to estimate the polynomial parameters for unknown simulated seismic signal in order to take into account the soil-structure interaction (SSI) within the structural model. The results show that the ARMAX model presents an interesting representation for the linear stochastic systems in control point of view. Simulation tests using a single-degree-of-freedom structure are performed to show the efficiency of introducing the SSI, by identification, in the response of the structure under the seismic ground motion.

Keywords: Dynamics of structures; ARMAX model; seismic ground motion; Soil structure interaction, Identification

Command of homemade dip coater used for elaborating thin films

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Abstract: In this work a homemade dip coater was carried out and calibrated in the laboratory in order to realize thin films using solgel process. This system allows a translation motion downwardly and upward at a controlled speed. The extreme positions (lowest and highest) are fixed using two proximity sensors. A sample holder is immersed in a solution for a predetermined time and then the sample is removed. The dipping speed, withdrawing speed and immersion time are controlled easily by the user in a wide range of choices. This dip coater works in automatic mode and it can be used manually. The dipping and withdrawing speeds were identified to frequencies of the converter. Structural, optical and electrical characterization of zinc oxide thin films elaborated by using this dip coater shows good quality of crystallization, morphology and interesting sensitivity to be used as sensors. This low cost system has proved its robustness and reliability.

Keywords: Automatic; Frequency converter; Motion control; Dip coater; ZnO thin films

Optimal command for the control of the air navigation of an aircraft

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Abstract: Our aim is to solve a problem of optimal control with free final time using the Pontryagin's maximum principle. As an illustration, we consider a navigation problem which is solved analytically and numerically by the shooting method in the case without constraint. The two approaches are compared. Besides, we consider a second case, where we solve numerically the same problem with a constraint on the state.

Keywords: Optimal control, shooting method, Pontryaguin principles.

Implementation of a SLAM Algorithm Based on Segments Lines

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Abstract: This paper addresses the simultaneous localization and mapping of a robot in an unknown environment (SLAM). Several approaches and techniques were proposed in literature to solve this problem. These techniques employ different estimation methods and different representations of the environment either points or segments represented generally by lines with their information on the geometric position of their extremities. The objective of this paper is to propose solutions for the single robot EKF-SLAM. The algorithms developed in this paper were implemented and validated experimentally using a Pioneer 3-AT mobile robot Pioneer 3-AT equipped with 2D laser telemeter; good results have been obtained.

Keywords:component; Mobile robot; Kalman filter; localization; cartography

Model Predictive Control for Hybrid System Using MLD formalismApplication to the Three-Tank Benchmark Problem

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Abstract: This paper present modeling and controlling of linear hybrid systems using Mixed Logical Dynamical (MLD) system framework described by interdependent physical laws, logic rules, and operating constraints. These are described by linear dynamic equations subject to linear inequalities involving real and integer variables. The changes which may appear over such dynamics are modeled by using the auxiliary variables take into account the interconnections. The MLD model is used for synthesis of a model predictive control (MPC) law. The discretetime equivalent of the model predicts the hybrid system behavior over a prediction horizon. The controller requires solution of on line mixed integer quadratic or linear program to solve an optimization problem. Simulation was performed using Hysdel compiler to illustrate performances and efficiently of this formalism using a three-tank system.

Keywords: Hybrid system, Mixed logical and dynamical, model predictive control, Mixed integer quadratic/linear programming.

Adaptive Fuzzy Control-Based Projective Synchronization Scheme of Uncertain Chaotic Systems with Input Nonlinearities

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Abstract: In this paper, a projective synchronization scheme for a class of master–slave disturbances and input nonlinearities (dead-zone and sector chaotic systems subject to dynamic nonlinearities) is investigated. To practically achievethis synchronization, an adaptive fuzzy variable-structure control system is designed. The fuzzy systems are used to appropriately approximate the uncertain nonlinear functions. A Lyapunov approach is employed to prove the boundedness of all signals of the closed-loop control system as well as the exponential convergence of the synchronization errors to an adjustable region. simulations results are presented to illustrate the effectiveness of the proposed projective synchronization scheme.

Keywords:projective synchronization; adaptive control; fuzzy control; dead-zones; uncertain chaotic system.

Gas Conditioning Tower Model Based Neural Network Identification

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Abstract: This work focuses on the identification of Gas Conditioning Tower (GCT) operating in a cement plant. Gas conditioning tower is an important element in the cement production chain. Mathematical modeling of such a process proves very complex. This is due to the phenomena that occur during the operation of the system. An artificial neural network model is constructed in the aim to study the system as well as used for control process. Resulted model is tested and validated using data extracted on a gas conditioning tower operating at Chlef cement plant in Algeria.

Keywords:gas conditioning tower; artificial neural network; model identification; electrostatic precipitator; dust collector.

Neural Network Augmented Adaptive Control for a Class of Nonlinear Uncertain Systems

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Abstract: An adaptive output feedback control design procedure is developed for highly uncertain nonlinear systems. The approach is also applicable to systems of unknown, but bounded dimension. This includes systems with both parametric uncertainties and unmodelled dynamics. This result is achieved by extending the universal function approximation property of linearly parameterized neural networks to model unknown system dynamics from input/output data. The network weight adaptation rule is derived from Lyapunov stability analysis that guarantees boundedness of the NN weights and the system tracking errors. The effectiveness of the proposed control algorithm has been proved and successfully verified through computer simulation for a nonlinear second-order system.

Keywords:output feedback; uncertain systems; robustifying term; error observer; single-hidden-layer neural networks (SHLNN).

A novel state representation of Electric Powered Wheelchair

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Abstract: This paper describes a kinematic and dynamic modeling of an electric powered wheelchair (EPW) which is already quoted in full screen with a new state representation. In order to simplify the control design of the EPW, decoupling problem dynamics is considered. Afterwards a PI controller is implemented to achieve our purpose.

Keywords: component, electric powered wheelchair; Modeling; Decoupling; Proportional Integral controller.

Solving Min-Max Problem of Linear Dynamic System with Discontinued Trajectory

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Abstract: Optimal control problems with non-differentiable objective function are known to be hard in the mathematical theory of optimal process [7]. In this paper, trajectories representing the state of the system are discontinued by some perturbations leading to the well-known min max problem with mixed variables. This problem has been solved using adaptive method, also called support method, originally proposed by R.Gabasov and F.M. Kirillova [9]. We defined the support control and the objective function growth allowing us to formalize both optimality and sub optimality criteria. Using an hamiltonian function, these criterias are formally defined in the form of Pontryaguine maximum principle.

Keywords-Optimal control, Maximum principles, control support.

Optimization of cereal output in presence of locusts

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Abstract: In this paper, we study a modelization of the evolution of cereal output production, controlled by adding fertilizers and in presence of locusts, then by adding insecticides. The aim is to maximize the cereal output and meanwhile minimize pollutioncaused by adding fertilizers and insecticides.The optimal control problem obtained is solvedtheoretically by using the Pontryagin MaximumPrinciple, and then numerically with shootingmethod.

Keywords: optimal control, optimization, Pontryagin maximum principal.

Backstepping Control, Based on Sliding Mode Observer Applied For Quadrotor Helicopter Flight Dynamics

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Abstract: This article is dedicated to the synthesis of anobserver for a flying robot type quadrotor. In particular, itconfirms the importance of sliding mode observer (SMO) toestimate in finite time the variables of a process. The performanceand characteristics of a sliding mode observer combined withcontroller based on receding horizon point to point steering (based on the triangular form) and applied to a Quadrotor.The observer used to defeat to sensor availability is shownto be reliable when dealing with bounded of disturbances.Matlab/Simulink used to simulation the work in order to providethe output trajectories and are analyzed.

Keywords: Backstepping, Control, Dynamic Modeling, Sliding Mode Observer.

Decoupling design for multivariable Generalised Predicitve Control

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Abstract: A new optimal control algorithm for decoupling multivariable systems based on generalised predictive control is proposed. The control strategy uses a modified cost function by incorporating an additional error signal. The proposed methodology is then applied to the non-linear distillation column; obtained simulation results show its efficiency.

Keywords:MIMO generalised predictive control; decoupling design; feed-forward; distillation column.

Chaos Recognition Methods: A Survey

Introducing the Scilab© library "IsItChaos"

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Abstract: Non-linear systems (NLS) with complex dynamics have lately been the subject of intense research and exploration, mainly the "chaos theory". Once taken by this phenomenon, we started a quest for the roots of such intriguing subject, asking the fundamental question of how to recognize Chaos. This procedure has been used directly and indirectly for decades now, yet without being established as standalone discipline. In this work, we try to examine the origins, the evolution and the real- life aspects of this precious tool. We give application examples generated using our Scilab© library "IsItChaos".

Keywords: Chaos; Chaos Recognition; System Identification.

Nine-level USAMI Control Using Particle Swarm Optimization

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Abstract: Harmonic Elimination Strategy (HES) has been a widely researched alternative to traditional PWM techniques. This paper presents the harmonic elimination strategy of a Uniform Step Asymmetrical Multilevel Inverter (USAMI) using Particle Swarm Optimization (PSO) which eliminates specified higher order harmonics while maintaining the required fundamental voltage. This method can be applied to USAMI with any number of levels. As an example, in this paper a 9-level USAMI is considered and the optimum switching angles are calculated to eliminate the 5th, 7th and 11th harmonics. TheHES-PSO approach is compared to the well-known Sinusoidal Pulse-Width Modulation (SPWM) strategy. Simulation results demonstrate the better performances and technical advantages of the HES-PSO controller in feeding an asynchronous machine.Indeed, the harmonic distortions are efficiently cancelled providing thus an optimized control signal for the asynchronous machine. Moreover, the technique presented here substantially reduces the torque undulations

Keywords: Uniform step asymmetrical multilevel inverter (USAMI); Harmonic Elimination Strategy (HES); Particle Swarm Optimization (PSO); Sinusoidal Pulse-Width Modulation (SPWM)

Single and multi-objective predictive control of mobile robots

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Abstract: In this work, we present a comparison between the use of a simple and multi objective MBPC in robots control for tracking trajectories and obstacle avoidance. Two cases were considered, in the first each robot has its own MPC controller where in the second a single two- objectives MPC controller is used for both robots. For the second case two approaches were proposed to solve the multi objective optimization problem arising in the MOMPC: the multi objective Particle Swarm Optimization (MOPSO) and weighted sum method. The simulation results show that the robots movement is more stable by the MOPSO-NMPC than the PSO-NMPC. Computation times as expected are shorter PSO-NMPC, however MOPSO-NMPC although more time consuming is still feasible.

Keywords: Model predictive control; metaheuristics; multiobjective optimization

Control of a Shunt Active Power Filter connected to the Low-Voltage Network with a Balanced and Unbalanced Nonlinear Load using the PQ Method

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Abstract: This paper presents a P-Q controlled Shunt Active Power Filter (SAPF) used to compensate for harmonicdistortion in three-phase three-wire systems. The SAPF employs a simple method for the calculation of the reference compensation current based of Fast Fourier Transform. This presented filter is able to operate in both balanced and unbalanced load conditions. A P-Q method based current controller strategy is used toregulate the filter current and hence ensure harmonic free supply current. The validity of the presented approach in harmonic mitigation is verified via simulation results of the proposed test system under different loading conditions.

Keywords- Balanced and Unbalanced Load; Shunt Active Power Filter (SAPF) ; P-Q method; Total Harmonic Distortion (THD).

Modeling and Control of Induction Motor Using Causal Informational Graph

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Abstract: In this paper, we'd like to present a tool for modeling and representing systems that allows a subsequent structuring of their control o. This tool, which is the causal informational graph (CIG), allows to highlight the different relationships between energy variables in a system; supplemented by another tool that is the macroscopic energy representation (MER), which insists on the principle of action and reaction between the different elements of the system. These tools enable a dual interest, first developing the model for the system structure and its control . In this article we consider the application as electromechanical conversion chain with actuator as an induction machine.

Keywords: Causal Informational Graph(CIG),Inverse model of control , Induction machine, Field oriented control

Comparison between Predictive Sliding Mode control and Sliding Mode control with Predictive Sliding Function

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Abstract: This paper shows comparison between the Predictive Sliding Mode Controller (PSMC) and the Sliding Mode Controller with Predictive Sliding Function (SMC-PSF). The proposed controllers combine the design of Sliding Mode Control (SMC) with Model Predictive Control (MPC). This combination improves the performance of these two control laws. In fact, using a non-minimum phase system, the performances of the (PSMC) and the (SMC-PSF), in terms of strong robustness to external disturbance, parameters variation, chattering elimination and fast convergence were judged better, in comparison with SMC and MPC. Comparing the two controllers PSMC and SMC-PSF , the simulation results show that the SMC-PSF is more able to eliminate oscillations at the phase of convergence and at the presence of hard parameters variation.

Keywords: Sliding Mode Control; Model predictive Control; Predictive Sliding Mode Control; Predictive Sliding Function; Non minimum phase systems.

Discrete Variable Structure Model Reference Adaptive Control using only I/O measurements for Non Strictly Positive Real System

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Abstract: Solving the problem of unpredictable transient responses and tracking reference trajectories has recently becomes one of the challenging aspects of Model Reference Adaptive Control (MRAC). In this paper, a Discrete Variable Structure Model Reference Adaptive Control using only input-output measurements (D-VS-MRAC-IO) for linear non strictly positive real systems with relative degree two and relatively important parameter variations was proposed. The D-VSMRAC-IO was designed in order to improve the performances of the MRAC control. Simulation results show a good reference trajectory tracking in spite of the presence of parameter uncertainties.

Keywords: Model Reference Adaptive Control, Variable Structure Control, Relay, Discrete Non-Strictly Positive Real Systems, Relative Degree Two, Parameter Uncertainties.

Practical Observer -Based Control for Piecewise Affine (PWA) Systems

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Abstract: the aim of this paper is to propose a systematic switching practical stabilizing method for general PWA systems around an average equilibrium without states Since, the subsystems in PWA models are not required to share measurement. Any equilibrium or may not have any one. For this reason, a practical stabilization technique i s adopted which calculates the exact coordinates of the convergence point and its distance from the average equilibrium reference such that the induced stabilizationerror will be known with precision. A BMI (Bilinear Matrix Inequality) formulation for the design control and the associated multi-observer one are proposed, both systems are separately treated as switched systems with a synchronization process. The proposed approach is based on Lyapunov theory and continuous state space partition. Promising simulation results are obtained for all treated examples.

Keywords:BMI, Hybrid Observer, Multilevel DC/DC Converters, PWA Systems, Practical Switching Stabilization.

Stable Adaptive Fuzzy Sliding-Mode Controller for a Class of Underactuated Dynamic Systems

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Abstract: In this paper, a novel stable adaptive fuzzy sliding– mode controller (AFSMC) is investigated for a classof uncertain underactuated nonlinear dynamic systems. The underactuated system is decoupled into two subsystems. In the controller design, a sliding surface for each subsystem is defined and a suitable adaptive fuzzy system is used to reasonably approximate the uncertain functions. The stability of the closed-loop system is proven by Lyapunov approach. The effectiveness of the proposed AFSMC is illustrated throughout simulation results.

Keywords:Adaptive control; sliding-mode control; fuzzy control; underactuated system.

Abnormalities detection for radiotherapy Services

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Abstract: In this study, we present Radiotherapy (or radiation oncology) is used to treat the cancer. a computers network used for abnormality detection in radiotherapy services. The Cancer treatment field concerns also chemotherapy, surgery and other medical means but these are not the object of this survey. The last step to treat cancer is the radiotherapy. The system used for this work in a radiotherapy service consists of a set of 5 personal computers (PC's), one PC server, 3 linear accelerators (VARIAN model) and 2 scanner simulators(VARIAN and General Electric) located in four cure rooms. Currently, the problem of the quality of services and the accidents in radiotherapy services in the world is not solved. This system is used in order to improve the quality services and to increase the medical care. Its mainpurpose is to avoid mistakes in treatment which could kill patients. Accidents occur till now even in developed countries (USA, France, England, etc.). This project is in its first version. Some results are obtained and described in this study. The PC's are put in a computers network and three of them are used to control the check-list of the apparatus (linear accelerators). One special PC (the server) is used as a data server in order to store all data of the system like the check-list of the devices, the temperature and the moisture data and the physicians and patients' management.

Keywords: Abnormalities detection, Cancer Medical procedures, Radiotherapy Treatment, client/server architecture, MySQL database, PHP language, Information systems.

Circulating Fluidized Bed Boiler Control: Design of a PID Based on H_∞ Theory and PFC Controllers

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Abstract: The process of solid waste incineration in a circulation fluidized bed boiler must occur at a well-defined temperature to output the less possible pollutants. This paper proposes two techniques for temperature control to an uncertainty model with simple implementation. So, a predictive functional control and a PID controller based on H_∞ theory will be proposed and compared with other controls methods.

Development of a sliding mode control on a complex system (Application on a boiler system)

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Abstract: This paper describe a multivariable control of a boiler by sliding mode control. The manipulated variables are the input feed water, the fuel and the steam flow while the controlled variables are the water level, the pressure inside the drum and the output power. The results of simulation show that the controller gives good performance.

Keywords: Sliding mode control, Sliding surface, Multivariable control, Boiler, Robustness.

Fuzzy State Feedback Controller for Networked Systems with Time Delays

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Abstract: This paper focus on the problem of the systems controlled via network, we develop a guaranteed cost control (GCC) method for Takagi–Sugeno (T–S) fuzzy systems with state and input delays. The state feedback controller approaches is considered. The stability of time-delay T-S fuzzy system using GCC is also established by delay-dependent Lyapunov-Krasovskii functional approach. The result is presented in terms of linear matrix inequalities (LMIs). An example is included to illustrate the effectiveness of the approaches proposed in this paper.

Keywords: Networked control system (NCS); Takagi–Sugeno (T–S) fuzzy system; delay-dependent; guaranteed cost control Lyapunov-Krasovskii; linear matrix inequality (LMI).

Using PDC controller Design for Fuzzy Predictive Control Models

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Abstract: In this paper, we are considering a model based T-S fuzzy predictive control using LMI optimization. The aim of T-S fuzzy predictive controller is to drive the state of the system to the original state where a stabilizing controller is ensured. The stability of the controlled systems is studied using non quadratic case of the Lyapunov function and adopting of PDC controller. The stability is guaranteed on based the conditions of terms of set LMIs. Where, the optimal solution has obtained at each sampling time. The results are shows the effectiveness of this strategy.

Keywords: Model predictive control (MPC), Takagi-Sugeno (T-S) fuzzy systems, Linear matrix inequality (LMI), Parallel distributed compensation PDC.

Indirect Robust Adaptive Fuzzy Control of Uncertain Two Link Robot Manipulator

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Abstract: This paper presents an adaptive fuzzy logic modeling and control of two link robot manipulator with uncertainties. To estimate the uncertain parts of the process, fuzzy logic systems are used. The uncertain nonlinearities of the system are captured by fuzzy systems that have been proven to be universal approximators. The proposed control scheme completely overcomes the singularity problem that occurs in the indirect adaptive feedback linearizing control. Projection in the estimate parameters is not required and the stability analysis of the closed-loop system is performed using Lyapunov approach. Simulation results are provided to verify the effectiveness of the proposed design.

Keywords: Adaptive fuzzy control, Feedback Linearization, nonlinear systems, Lyapunov stability.

Topic N°2

Renewable energy

SIMULATION AND OPTIMIZATION OF PHOTOVOLTAIC ENERGY SYSTEM IN TIARET-ALGERIA USING SAM SOFTWARE

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Abstract: The present work will be an optimal study of the Photovoltaic system to feed customers by electric energy. Using SAM software, a comparison study between PV system with single inverter and micro-inverter is determined, finished by an economic evaluation of the best system. The simulation results showed that for a PV system with micro-inverter consists of 242 kWdcphotovoltaic modules with 255kW dc inverter, produced electricity for TIARET site. The cost of energy from the PV system with micro-inverter is 4.43 Cent$/kWh, whereas the total direct cost, and total installed cost are1,148,308.70 and 1,179,972.18 $, respectively, with72% of this cost represent cost of module.

Keywords:PVsystem, optimization, SAM software, Inverter.

Robust MPPT and Nonlinear Control of Wind Power Generation Systems Based on the PMSG

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Abstract: this paper proposes a variable speed control scheme for grid-connected wind energy conversion system WECS using permanent magnet synchronous generator PMSG. The control algorithm tracks the maximum power for wind speeds below rated speed of wind turbines and ensures the power will not go over the rated power for wind speeds over the rated value. The control algorithm employs sliding mod controller SMC to effectively do this target. The block diagram of the WECS with PMSG and a back-to-back PWM-VSC converter structure is established with the d,q frame of axes. Both converters used the sliding mode control scheme considering the variation of wind speed. The control system has two controllers for generator side and grid side converters. The main function of the generator side controller is to track the maximum power through controlling the rotational speed of the wind turbine using SMC. In the grid side converter, active and reactive power control has been achieved by controlling q axis and d axis current components, respectively. The q-axis current is set at zero for unity power factor and the d-axis current is controlled to deliver the power flowing from the dc-link to the electric utility grid. The system is built using Matlab/ Simulink environment. Simulation results show the effectiveness of the proposed control scheme.

Keywords: PMSG; WECS; SMC;back-to-back PWM-VSC converter.

Control of grid-connected photovoltaic system with batteries storage

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Abstract: this paper presents a control of grid-connected photovoltaic system with electrochemical batteries storage; the objective of this system is to supply prescribed active photovoltaic power to the grid in different atmospheric conditions (Temperature, illumination); this presented work focuses on decupled active and reactive power strategy, which makes it possible to control the level of the active and reactive power injected (or recovered) with the electrical supply network. Simulation results illustrate the performances obtained.

Keywords: Photovoltaic panels, PV, MPPT, battery, active and reactive power control, and grid-connected.

Shaded modules arrangement depending on shadow types and their impact on series-parallel array Of PV systems

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Abstract: The photovoltaic array still have major weakness to partial shading conditions which can cause multi power peak (MPP) with reducing dramatically output array energy, The main objective of this paper is to establish a clear relationship between shaded modules location in PV array in order to increase output of PV array with different shading type.

Keywords: Photovoltaic modeling, Matlab/Simulink, Interface user graphic GUI, Shading effect, Shadow type.

Variation and the influence of the pitch angle of the rotational speed of the wind turbine

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Abstract: The considerable growth of power energy consumption in all its forms with polluting effects associated caused by the combustion of fossil fuels, are the heart ofdiscussions about the future of the planet. The renewable energy,as wind power, has an increasing growth but its mechanical power depends strongly on the wind regime as well theperformance characteristics of the wind turbine. The variation of wind speed has a significantly influences on the wind flow whichacts on the blades. Then blades have cyclic variations of pitch angle β. Simulation results were analyzed, showing the influence of the pitch angle variation and mechanical power generated.

Keywords: Wind turbine, Wind speed, Pitch angle, Modeling, DFIG, and MPPT.

Robust Nonlinear Combined Backstepping Sliding Mode Control of DFIG Under Wind Speed Variation

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Abstract: This paper discusses the control of wind energy conversion system WECS, equipped by a doubly fed induction generator DFIG topology the stator is connected direct to the grid while the rotor is connected to grid through a back-to-back AC-DC-AC PWM converter. The control strategy is applied to the Rotor Side Converter RSC with nonlinear backstepping combined to sliding mode controllers. Elsewhere, the Grid Side Converter GSC is controlled in order to guarantee a smooth DC voltage and ensure sinusoidal currents in the grid side with a unity power factor at the grid side. Simulation results are evaluated in terms of power followed tracking and sensitivity to disturbance caused by sudden changes in wind speed allowing the passing of hypo synchronous mode to the hyper synchronous mode.

Keywords: doubly fed induction generator; wind turbine; power control; backstepping; sliding mode; Lyapunov function.

Cost evaluation of producing electricity from wind

Case study: Two highland sites Algerians

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Abstract: In this article, we present results of a cost estimating study of electricity generated by different types of wind turbines installed in the areas of Setif and Tiaret, two sites located in the highlands of northern Algeria.This study is based on wind data from the National Meteorological Office (ONM), measured at the stations of Setif and Tiaret. The data considered includes 10 years of measurements. The statistical treatment of the data was performed using WAsP software. It is clear that the annual average wind speed is 3.46m/s in Setif and 5.07 m/s in Tiaret at 10 m above ground level. We then determined the statistical Weibull parameters (shape factor k, and scale factor c) at 10 meters and at different heights (30, 50 and 70 m). These parameters were extrapolated using a power law based on the Weibull parameters. Afterward, three models of commercially available wind turbines were selected, namelyBonus 300 KW/33, Bonus 1.0 MW/54 and Vestas 2.0 MWV80, their performance were evaluated thanks to WAsP software, the calculation was achieved by calculating the capacity factor and annual energy produced by each type of wind turbine forthe two regions. An economic calculation was then performed using the PVC (Present Value of Cost) method. It follows that the lower cost of wind generation is obtained with the model Vestas 2 MW / V80 with a cost per kilowatt-hour (kWh) of around $ 0.0644/kWh in Setif and $ 0.0342/kWh in Tiaret.

Keywords: wind energy; WAsP; Weibull distribution; wind turbine; PVC.

Influence of Operational Parameters on the Production of a Plane Solar Distiller Coupled to a Hybrid Photovoltaic Thermal Sensor

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Abstract- It is universally recognized that the lack of water on the one hand, and the depletion of fossil fuels on the other hand are one of the major challenges of our century, the face of these critical issues, desalination of salt water and / or brackish water appears as one of the possible solutions to the survival of humanity. Among the techniques used in this field, and needs relatively low drinking water, solar distillation can be a very good solution especially for arid and desert zones. In order to improve the production of solar stills, our work focuses on the coupling of a flat plate solar distiller with a flat plate collector to ensure preheating distilled water. We prepared heat balances at the distiller and describe their sensor transient thermal behaviour. Next, we used the RK4 method to solve systems of equations obtained. The numerical results clearly show the influence of various parameters on the daily production of this system.

Keywords: flat plate distiller, collector, preheating, production, sensor, preheating, production.

Backstepping Sliding Mode Control of a PMSG based Wind Energy Conversion system

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Abstract: In this paper, a robust controller based on backstepping sliding mode control is proposed and applied to a permanent magnet synchronous generator (PMSG) based wind energy conversion system (WECS). The control objective is to ensure maximum power capture in the presence of adverse stochastic wind variations, this is possible by controlling the rotational speed of the WECS, to this end, the backstepping technique is used to synthesize the control law and a sliding term is appended to ensure system robustness. Stability and tracking properties of the closed loop system are proved using Lyapunov stability theory, numerical simulation is carried out on a typical 3kW PMSG based wind turbine; the results are analyzed to assess the effectiveness of the proposed control scheme.

Keywords:Wind energy; backstepping; sliding mode; maximum power caputre; Lyapunov theory.

Influence of band gap profiling on the performance of CIGS based solar cells

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Abstract:A'grading' of band gap through the thickness of CIGS absorber by varying the fluxes of different elements during the deposition process can be used to improve cell performance. The difficulty of controling perfectly the ratio of the Ga to In rate in CIGS absorber solar cells to produce a linear band gap grading result on the depth profiles which often exhibit a certain poor linearity. Two profiles were proposed to study this effect on the performance of CIGS solar cells: profile close to the linear and Fermi profile. The case considered was normal grading. The influence of both profiles was proved. For band gap deviations affected performance is obtained when the band gap has a Fermi profile. It was found that increasing Form profile β the difference of efficiency reaches +0.8% and varying inflection point X_0 leads to a difference between +1% and -0.9% comparing to the base case, a linear band gap. The influence of a band gap profile close to the linear is also significant where we found a difference between +0.5% and -0.2% but Fermi profile is more decisive.

Keywords:Cu(In,Ga)Se; Solar cell; graded band-gap; Fermi profile; AMPS-1D

The development of empirical photovoltaic/Thermal Collector

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Abstract: In the PV system, the electrical efficiency decreases rapidly as the PV module temperature increases. Therefore, in order to achieve higher electrical efficiency, the PV module should be cooled by removing the heat in some way. In order to eliminate an external electrical source and to cool the PV module, the PV module should be combined with the solar air/water heater collector. This type of system is called solar photovoltaic thermal (PV/T) collector. The PV/T collector produces thermal and electrical energy simultaneously. In this study, an attempt has been made to develop the hybrid PVT collector based on a new integrated absorber configuration that is formed by two types of absorber, the first is parallel vertical tubes and the second is an enclosure.

Keywords:solar energy; hybrid collector; PV module photovoltaic; Photovoltaic-thermal (PV/T)

A Mathematical Model to Determine the Shading Effects in the I-V Caracteristic of a Photovoltaic Module

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Abstract: The performance of a photovoltaic (PV) array is affected by temperature, solar insolation, shading. Often, the PV arrays get shadowed, completely or partially, by the passingclouds neighboring buildings, towers or by trees, etc. The situation is of a particular interest in a case of the large PV powerplants. In the case of the shading the characteristics of the PV module are more complex with the several peak values. Under such conditions, it is very difficult to determine the maximum power point (MPP).This paper presents a MATLAB-based modeling and simulation scheme suitable for studying the I–V and P–V characteristics of a PV under a non-uniform insolation due to partial shading. The Photovoltaic model has beendeveloped and used as Simulink subsystems. The proposed modelfacilitates simulating the dynamic performances of PV-based power systems and also has been validated by means ofsimulation study.

Keywords:MATLAB; photovoltaic cells; partial shading reverse characteristics;

Hybrid Simulation of Maximum Power Point Tracking Methods (Incremental of the Conductance (Inc-Cond), Counter Reaction of Voltage Method using Pilot Cell) for a Stand Alone Photovoltaic System

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Abstract: The power generated by solar photovoltaic (PV) module depends on surrounding irradiance and temperature. This paper presents a hybrid simulation model of PV module and system using Matlab®/Simulink® and Pspice®, combined together using Cadance® software SLPS®. The hybrid simulation model includes the solar PV panel and the boost converter with MPPT controller. The target of this work is to find the possibilities of Pmax control using the maximum power point methods (MPPT). Many algorithms for searching MPP are proposed. In this study, the methods simulated are Incremental of conductance (Inc-Cond) and voltage feedback using pilot cell. The simulation is done under different atmospheric conditions. This last permit to study behaviour of photovoltaic chain components.

Keywords:MPPT, Boost, pilot- cell, Inc-Cond, Hybrid, SLPS.

MPP Investigation under different shading types and PV shaded module arrangements for SP and TCT configurations

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Abstract: The photovoltaic array still have major weakness to partial shading conditions which can cause multi power peak (MPP) with reducing dramatically output array energy, The proposed model is used to investigate MPP of the SP and TCT configuration for different PV shaded module location. To get a compressive comparison between this two types of configuration, this paper is to establish a clear relationship between shaded modules location in SP and TCT PV array in order to increase power output of PV array with different shading type.

Keywords: Photovoltaic modeling, Matlab/Simulink, GUI, TCT, Shading effect, Shadow type, MPP.

The progress of biofuel towards achieving a sustainable world

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Abstract: Diesel and petrol, this two fossil fuels are mostly used sectors that are the major components for globalization and economic development of a country such as in industrial, commercial, agricultural and transportation sectors etc. Transportation sector heavily depends upon this fossil fuels. Depletion of fossil fuel, increase in price of fuel, global warming effects, harmful emissions from fossil fuel operated engines have generated interest in developing clean alternative fuels which are locally available, environmentally acceptable and technically feasible have become an important topic on the global agenda in many countries including Malaysia. Amongst many options, biofuel is considered as most appropriate alternative of fossil fuel as it is environment friendly, non-toxic, renewable, emits less emissions etc. Biofuel has similar working properties compared to petroleum fuel, even there is no need to modify the engine to operate it with biofuel. On the other hand, it should be noted that using biofuel as an engine operating fuel has some disadvantages such as- coking of injectors and carbon deposits on piston as well as head of engine, excessive engine wear and higher NO_x emissions from biodiesel fuel combustion. All problems need to solve for its widespread applicability in all sectors.

Keywords: Biofuel; transport; renewable energy; automobile engineering.

Hybrid Systems Using Thermal/Biomass Sources

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Abstract: the hybrid systems of renewable energy can contribute in a significant way to the durable development in several isolated areas. This paper discusses an optimization solution of an hybrid system of renewable energy. We consider the example of the combination of two common renewable energy resources namely thermal and biomass. We present the estimation of the energetic potential for each considered renewable energy resource that can be extracted from a given site; and then we propose their repartition in order to optimize the exploitation of these available resources while meeting the global specific energy demand. The general problem can be formulated as a problem of optimal allocation of limited resources constrained to meet specific demands. We consider two types of situations. The first type considers situations where the installed energetic capacity of each resource is continuous. The second type considers situations where the installed energetic capacity is only available as specific discontinuous units. The approach adopted to solve the first type uses the simplex linear programming method while for the second type; we use the integer linear programming method. We also present some examples to illustrate the proposed technique.

Keywords :optimal energy distribution, Renewable energy, integration of renewable energy, thermal, biodigester, linear programming.

A Neural and Fuzzy Logic Based Control Scheme for a Shunt Active Power Filter

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Abstract: In this paper, a three-phase shunt active filter is used to compensate for current harmonics and reactive power in three-phase distribution network system. In order to improve its performances, artificial neural networks and fuzzy logic approaches are used to control this device. The first controller, based on ADALINE networks, is used with the direct method in order to identify precisely the necessary currents to reduce the harmonics and to compensate reactive power. The neural network inputs are based on a decomposition of the measured currents. This decomposition is also based on the Fourier series analysis of the current signals and Least Mean Square (LMS) training algorithm to carry out the weights. In this case, three ADALINE are used to extract the fundamental component of the distorted line current directly from the three phase space. The second controller is the fuzzy logic controller, used to regulate the DC link capacitor voltage. This approach has the advantage to eliminate the PLL and Concordia, Park or Clark transformations method. Speed and accuracy of this approach results in improving the performance of the APF.

Keywords: Adaline, Fuzzy Logic Control, Active Power Filter, Power Quality.

Analysis of Power Loss in Photovoltaic Modules

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Abstract: connecting photovoltaic cells to form an array can cause problems when the Characteristics of the cells are not matched. This problem, known as mismatch, can reduce the power output of the array and lead to cell degradation through localized heating of individual cells. Such problems can arise simply through the shading of a single cell.
In this paper, the circuit design strategy known asparallel series is described and analyzed and its effect on minimizing mismatch power loss is evaluated. Also the technique of reducing cell shunt resistance to minimize mismatch effects is assessed.

Keywords: solar cells shunt resistance, power losses, shading effect.

A modified STF based control algorithm to control an active power filter with reactive compensation and active power injection

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Abstract : The conventional grid connected photovoltaic inverter is controlled by a dual loop control strategy in a synchronous reference frame, this control methodology require the use of a PLL circuit in order to keep the track of the voltage waveform and remain synchronous with the grid voltage, the deterioration of the voltage waveform may lead to a decrease of the inverter performance or even instability.

In this paper we propose the use of simplified control strategy based on an instantaneous phase angle detection algorithm to extract the fundamental of the load current, this allows us to calculate the harmonic current in a stationary frame, and thus no PLL is needed. To extract the maximum power from the photovoltaic panel an MPPT algorithm based on perturb and observe method is used, this technique is known for its simplicity and robustness, the reactive power is injected as well. The use of the photovoltaic inverter to inject harmonics and reactive power allows us to get the full benefice of the inverter, especially at night and inconvenient weather condition. The detailed algorithm is presented; the performance of the method under severe main voltage conditions have been investigated by simulation.

Keyword: Renewable energy, harmonic, power quality, PLL, unbalance voltage, PAF, reactive power, PV panel

Topic N°3

Fault Tolerant Control

An Improved Method for Gear Fault diagnosis

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Abstract: Envelope analysis is especially suitable for fault diagnosis inducing periodic shocks or amplitude modulations such as gears and bearings and has been applied widely for mechanical fault detections over the last few decades. However, a critical limitation of this technique is that it requires a prior knowledge on filtering band. Due to this drawback, detecting machine defects at the incipient stage when defect-characteristic components are weak in amplitude and without a distinctive spectral pattern poses a challenge to the conventional enveloping spectral analysis technique .In order to overcome this limitation, this work gives a new signal processing approach for gear faults diagnosis based on Hilbert Transform (HT) and Fast Fourier Transform (FFT). It is applied on real measurement signals collected from an experimental vibration system. The monitoring results indicate that the proposed method improves the gear faults diagnosis relatively to other common techniques.

Keywords : Vibration signal Analysis; gear Fault diagnosis; Hilbert Transform (HT); Envelope Analysis (EA); Fast Fourier Transform (FFT).

Inter-turn Stator and Rotor Fault in Doubly-Fed Induction Generator Based Wind Power System

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Abstract: The aim of this paper is to develop a doubly-fed induction generator (DFIG) wind turbine model suitable for the simulation of this generator in the healthy mode and faulty mode. The DFIG is directly connected to the grid whereas the rotor winding is fed by back-to-back PWM converters. the Control schemes for reactive power and speed regulation are designed firstly. Under different wind speed, maximum power point tracing (MPPT) control is implemented to ensure the optimum active power output. The numerical simulation developed in Matlab/Simulink studies the effects of stator and rotor inter-turn short-circuit in the DFIG. Afterward, the application of current signatures analysis and Park's vector Approach techniques are used to detect this type of fault. Simulation results for stator and rotor fault are shown and interpreted.

Keywords :wind Energy ; dfig ; inter-turn ; short-circuit ;mppt.

Dynamic process monitoring based on neuronal principal component analysis

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Abstract: In this paper a new adaptive principal componentanalysis (APCA) algorithm is introduced for dynamic processmonitoring. Its basic idea is to use a neuronal principal component analysis based on the generalized Hebbian algorithm.The provided interest of the proposed APCA algorithm isthe new form to be followed to update the PCA model. Ateach time instant, a new observation is available, the PCAmodel is updated according to it without having to re-exploreall previously available data. To identify faults in a dynamicprocess, the reconstruction based contribution approach isused and adapted in real times. The results for applying thisalgorithm on the the Tennessee Eastman process shows itsfeasibility and advantageous performances.

Robust fault detection filter design for discrete-time fuzzy models

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Abstract: This New fault detection observer design conditions for discrete-time fuzzy systems with unmeasurable premisevariables are proposed. In this study, the considered Takagi-Sugeno (T-S) fuzzy system is subject to sensor faults and unknown bounded disturbances. The T-S observer is used to estimate jointly states and faults by means of a mixed performance index. Using the technique of descriptor system representation new conditions are proposed in terms of aLinear Matrix Inequality (LMI) by considering the sensor faultas an auxiliary state variable. Simulation results are presentedto demonstrate the effectiveness of the approach.

Fault Tolerant Control for Nonlinear Systems Described by Fuzzy Bilinear Models

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Abstract: In this paper, Fault Tolerant Control (FTC) isdeveloped for nonlinear systems by combining output feedbackcontrol and Fuzzy Bilinear Observers (FBO) for improvingstability under faults. The nonlinear system is modeled as a FuzzyBilinear Model (FBM). The design of such a control law requiresthe knowledge of the states. Then, a fuzzy bilinear observer ispresented to achieve this task. Using Lyapunov theory, sufficientdesign conditions of the FTC are obtained in terms of LinearMatrix Inequalities (LMIs). An isothermal Continuous StirredTank Reactor (CSTR) is used to illustrate the efficiency of thestudied approach.

Faults Estimation for T-S Fuzzy Models subject to Unmeasurable Premise Variables and Sensor Faults

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Abstract: This paper deals with the sensor faults estimation problem based on a Proportional Integral (PI) observer for Takagi-Sugeno (TS) fuzzy models with unmeasurable premisevariables. The sensor faults are assumed as time-varying signals whose *k*th time derivatives are bounded. Based on Lyapunov stability theory and L_2performance, the convergence conditions of the PI observer as well as the simultaneous estimation of states and time-varying sensor faults are established under Linear Matrix Inequalities (LMI) constraints. Finally, a numericalexample is considered to illustrate the proposed approach.

Keywords : Unmeasurable premise variable; Faults estimation;Time-varying sensor faults; PI observer; L_2 performance; TS fuzzy models; LMI.

Towards High Reliability of a Multi-Agent System Designed for Intrusion Detection in MANET

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Abstract: Replication is widely used to enhance both reliability and performance in distributed systems. In this paper, we present a replication framework for replicating MASID (Multi-Agent System for Intrusion Detection) agents, in which two varieties of agent replication are combined, namely replication at system initialization and replication on demand. The key differencebetween standard replication approaches and our approach is that the former depends on the notion of replicate groups, whereas MASID-R allows more flexibility through the introduction of a new type of agents called: generator of replicas.The main goal of our work is, then, to develop a new system for intrusion detection (IDS) highly available, reliable and at thesame time lightweight. Simulations using NS-2 have beenperformed to study the feasibility and prove the optimality of the proposed approach.

Keywords :fault tolerance; reliability; availability; agent replication; intrusion detection; network security.

Feature Selection For enhancement Of Bearing Fault Detection and Diagnosis Based on Self-Organising Map

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Abstract: Mechanical faults account for a large majority of the faults in the electrical rotating machinery, it can result in partial or total breakdown of a motor. Therefore, their diagnosis is an intensively investigated field of research. This paper investigates the application of the Self-Organizing Maps (SOM) for the detection of rolling element bearing damages in three-phase induction motor. It discusses the integration of features selection methods in the fault classification system based on SOM. The bearings vibration signal is obtained from experiment in different conditions: normal bearing, bearing with inner race fault,bearing with outer race fault and bearings with balls fault. Then then multiple features extraction techniques from time, frequency and time-frequency domain are used. ReliefF and min redundancy max Relevance (mRMR) techniques are used to select the optimal features and reduce the dimension of calculated features. Finally, the SOM is used for classification of the different conditions. The obtained results show that the association of feature selection techniques to SOM classifier can improve the classification performances the fault detection process.

Keywords : Fault Detection and Diagnosis, Bearing Faults, Feature Selection, Self-Organizing Map,.

Observer based Fault Tolerant Control for T-S Systems with Multiple Delays

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Abstract:this paper is concerned with the problem of fault estimation and fault tolerant control (FTC) for a class of networked control systems (NCSs) with multiple state-delays via the Takagi– Sugeno (T–S) fuzzy model. A full order fuzzy-augmented fault estimation observer (AFEO) design is proposed to achieve fault estimation of T–S models with actuator faults. Based on the information of online fault estimation, a state feedback–fault tolerant controller (SFFTC) is designed to compensate for the effect of faults by stabilizing the closed-loop system. The disturbance rejection attenuation is constrained to a given level by means of the H_∞-performance index. Sufficient conditions are established for the existence of the desired (AFEO) and (OSFTC) in terms of linear-matrix inequalities (LMIs). An example is given to illustrate the effectiveness and applicability of the proposed design method.

Keywords: Observer-based, fault tolerant control (FTC), T-S fuzzy systems, networked control systems (NCSs).

Topic N°4

Large Scale Systems

Impact Studies of the Current Harmonics on the Setting and Coordination of Directional Overcurrent Relays

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Abstract : In the modern power systems, the nonlinear loadsare intensively used to fulfill various tasks, namely: power conversion, control and monitoring. Unfortunately, these nonlinear loads are harmonics generators and thereforehave a great negative impact on power quality and also on power system protection performance especially on the operation of Directional OverCurrent Relays (DOCR). This last is designed to operate efficiently at the fundamental frequency. The distorted waveform will affect the operation of the DOCR and causes an untimely relay tripping under normal operating conditions. This paper details the impact of Total Harmonic Distortion Current (THDI) levels on DOCR. Our study is focused on fault current (IF), operating times of primary and backup relays, and their Coordination Time Interval (CTI). The prefault voltage values in the presence of harmonics are computed using harmonics power flow program and used to calculate the three phase short circuit. The WSCC 9-bus power transmission test system is used to highlight the impact of harmonics on overcurrent relays, and the obtained results show that the harmonics have a great impact on the relays and may cause a miss of coordination between the primary and the backup relays.

Keywords- power system, protective relay, total harmonic distortion; directional overcurrent protection; Short circuit analysis; harmonics power flow;, coordination time interval.

Modelling of MOSFET transistor by MLP neural Networks

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Abstract: In this paper we use neural networks to model a MOSFET transistor, the structure of the neural model and its training is effected the genetic algorithm which evolves tominimize the difference between the desired values resultingfrom the practical measurement and the neural model values. The neuronal model consists of three layers, an input layer with two neurons, one for the drain voltage and the other to the error that we want to minimize; an output layer for the drain current of the neural model and a hidden layer with varying number of neurons. After applying this approach we found several models that offer a very low error modeling, and the obtained results arevery satisfactory.

Keywords- component; MOSFET; Neural network; Genetics algorithm; modeling.

Invited session:
Fractional order systems and Controls

Session organizer:

Dr. Samir Ladaci

Design of a fractional order fuzzy PID controller for a piezoelectric actuator using ACO algorithm

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Abstract: In this paper, a kind of fractional order fuzzy PID controller is proposed and it is applied to a piezoelectric actuator. An efficient way to tune fractional order fuzzy PID controller parameters is proposed using an ant colony optimization (ACO) algorithm, which treats the controller parameters tuning as an optimization problem with a proper fitness function. The obtained simulation results show the effective performance of the proposed method

Keywords- Piezoelectric actuator control, Ant colony optimization, Fractional order fuzzy PID controller, fuzzy PID controller.

Optimal Tuning of Decentralized Fractional Order $PI^{\lambda}D^{\mu}$Controller

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Abstract: Decentralized fractional order $PI^{\lambda}D^{\mu}$controllers have been designed in this paper for simultaneous tracking ofindividual process variables in multivariable systems under step reference input. The proposed decentralized fractional order$PI^{\lambda}D^{\mu}$ controller is a generalization of the conventionaldecentralized PID controller. The controller design framework takes into account the minimization of a weighted sum of Integral of Time multiplied Squared Error (ITSE) so as to balance the overall tracking errors for the process variables. Decentralized fractional order $PI^{\lambda}D^{\mu}$ controller gains are tuned using Partical Swarm Optimization algorithm (PSO). Recently, introduced PSO Algorithm has proven its excellent capabilities, such as faster convergence and better global minimum achievement. Credible simulation comparisons have been reported for one benchmark 2×2 multivariable process. The simulation results verify the superiority of the proposed decentralized fractional order $PI^{\lambda}D^{\mu}$controller to the conventional decentralized PID controller designed also with PSO algorithm.

Keywords- Decentralized control, Fractional order $PI^{\lambda}D^{\mu}$ controller, Partical Swarm Optimization algorithm.

Parameters and Order Identification of the Fundamental Linear Fractional Systems of Commensurate Order

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Abstract: The identification of fractional order systems is a moredifficult problem than the integer one because it requires not only the estimation of the model coefficients but also the determination of the fractional orders with the tedious numerical calculation of the fractional order derivatives. This paperaddresses the time domain identification of the dynamical fundamental linear fractional system of commensurate order described by linear fractional order differential equation. The proposed identification technique is based on the recursive least squares algorithm applied to a linear regression equation using adjustable fractional order differentiator to estimate the model's parameters and the commensurate order at the same time. Illustrative examples are also presented to validate the usefulness of the proposed identification approach.

Keywords-Adjustable fractional order differentiator; Least squares method; Linear fractional differential equation; Recursive identification

Small Signal Fractional Order Modeling of PN Junction Diode

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Abstract: This paper deals with the dynamical fractional order model of PN junction diode based small signal equivalent circuits. With the advent of fractional calculus, it is seen that these concepts would have several advantages and applications in such fields. We present various small signal PN junction equivalent circuit models including their frequency responses. The equivalent models presented utilize the concepts of fractional calculus. Experimental data are used to validate the proposed approach.

Keywords- fractional order models, PN junction, diffusive systems, small signal equivalent circuit models.

ABS Control Via Fractional Order Extremum Seeking Method with Enhanced Response

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Abstract : This paper focuses on the development of a robust Fractional Order Extremum-Seeking (FOES) scheme for controlling the ABS of vehicle motion system by continuously adjusting the brake torque. Extremum Seeking (ES) known for its properties to seek the maximum of unknown function and Fractional Order (FO) control for its robustness in the presence of parameter variations and the disturbances are employed to control the wheel slip rate in emergency braking maneuver. The aim of an ABS is to minimize brake distance while steer ability is retained even under hard braking, to understand the fundamental physical effect, which leads to wheel blocking during braking. Simulations under various road conditions are performed to demonstrate the effectiveness of the proposed control.

Keywords; Extremum Seeking, Fractional Order Control, Fractional Calculus, ABS, friction force coefficient (FFC),

Rational Function Approximation of a Fundamental Fractional Order Transfer Function

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Abstract: This paper introduces a rational function approximation of the fractional order transfer function$H(s) = \frac{(\tau_0 s)^a}{[1+(\tau_0 s)^{2a}]}$, $for\ 0 < a \leq 0.5$. This fractional order transfer function is one of the fundamental functions of the linear fractional system of commensurate order corresponding to pure complex conjugate poles or eigenvalues, in s^a. Hence, the proposed approximation will be used in the solution of the linear fractional systems of commensurate order. Illustrative examples are given to show the exactitude and the efficiency of the approximation method.

Keywords- Fractional power zero, linear fractional system, irrational transfer function, rational transfer function.

Robust Adaptive Fuzzy control for a Class of Uncertain nonlinear Fractional Systems

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Abstract : This paper presents a novel adaptive fuzzy logic controller (FLC) equipped with an adaptive algorithm to achieve synchronization performance for fractional chaotic systems.By introducing the fuzzy control design and robustness tracking approach, a desired synchronization error can be attenuated to a prescribed level, even in the presence of the high level of uncertainties and noisy training data.

Based in the work of [4,1], the novel fill in this work is the use the numerical approximation method of Grunwald–Letnikov. The simulation example are given for fractional chaotic systems to illustrate results signify the effectiveness of the proposed control scheme.

Topic N°5

Unconventional algorithms in control engineering

Contribution the Predictive Control on the Minimization of the chattering the Torque and the Stator Flux of the Induction Machine

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Abstract: The predictive control is born of a real need in the industry. A need for systems capable of regulating higher performance than conventional controllers (PID), while respecting the constraints of operation and producing even higher. Predictive control is an advanced automatic control technique. It aims at controling complex industrial systems. The principle of this technique is to use a dynamic model of the process inside the controller in real time to anticipate the future behavior of the process. Many predictive control algorithms have been developed and their differences are based on the types of prediction model used to represent the process, the noise and the performance function to be minimized.

This article presents the principle and interest of this command. With the aim of minimizing the torque pulsations and stator flux of the induction machine, we present the predictive control based on the linearization input-output of the machine. The technique of the linearization is used to give a linearized and uncoupled model from the machine for the anticipation of future behavior of the output; for that, we chose as output the module of the stator flux and electromagnetic torque. The simulation results obtained show high dynamic performance in torque and stator flux module.

Keywords- Induction Motor, Predictive control, Input-output linearization, Space vector modulation (SVM).

A New Metaheuristic For Solving Economic Dispatch Problem

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Abstract : The goal of the economic load dispatch is to determine the optimal power outputs of on-line generating units in order to meet the load demand subject to satisfying various operational constraints over finite dispatch periods, finding optimal solutions to these problems requires efficient optimization algorithms.Firefly algorithm and bat algorithm are the most recent methods and they already proved there efficient but their aspect random present a disadvantage which is the instability of the results, indeed they depend on the random initial values generated by the program. To solve this problem, we tried to hybrid firefly algorithm and bat algorithm, and to test our new algorithm we applied it to a standard electric network of 14 buses with two buses generator (two dimensions problem) and we compared the result obtained with those obtained by other methods.

Keywords; Economic Load Dispatch; metaheuristic algorithm; Firefly Algorithm;Bat Algorithm; Hybrid Algorithm

Topic N°6

Signal and Communications

Communication and Control of Signal Processing from Metering System

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Abstract: This paper introduces the control in process industries, explains why control is important, and identifies different ways in which precise control is ensured. We present calibration of sensory instruments installed and experimental results from a skid of metering on oil industry. It combines the notion of calibration function and a controller procedure recursively. First, the control is utilized to obtain the error of instruments. The simulation results clearly show that the errors respect of the tolerance defined by the international standards and recommendations. Secondly, some experimental results are demonstrated to validate the proposed method of controllers. The experimental results carried from norms and standard references are given to illustrate the efficiency and the benefits of the proposed calibration and the various stages of implementation of this method.

Keywords- control; metering; sensor; measurement; error.

A Leaky Wave Antenna Based on SIW Technology for ka Band Applications

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Abstract: The design of an antenna based on Substrate Integrated Waveguide (SIW) has been realized in this paper , The structure consists of an array of slot antenna designed to operate in Ka 17,3 à 21.2 GHz band applications, The structure of SIW is composed of two rows of cylinders between metal plates; it can be easily produced by the standard method PCB "circuit" or LTCC method, The direction of the main lobe of the antenna radiation pattern can be steered by changing the frequency in the band from backward direction to forward direction.

Keywords: Leaky wave antenna, substrate integrated waveguide, ka-band, CST, moment's method.

Selective Filters Design based Two-Dimensional Photonic Crystals. Modeling Using the 2D-FDTD Method

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Abstract: The photonic crystals are structures whose dielectric index varies in one or more spatial directions. In these latter appear energy band gap for the electromagnetic field, prohibiting propagation of light in certain directions and to certain energies. These characteristics give the photonic crystals having attractive properties for many applications in integrated optic. Precisely, this work is a contribution to the two-dimensional planar photonic crystals in the field of integrated optics. In this paper we propose a novel selective filters topologies by the use of cascaded wave guides. The performance of such structures in terms of transmission and reflection will be performed and analyzed using 2D-FDTD method.

Keywords: dimensional photonic crystals, filters selective wavelength, FDFD - 2D, photonic band BIP.

Design of Antipodal Linearly Tapered Slot Antennas (ALTSA) Arrays in SIW Technology for UWB Imaging

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Abstract: The aim of this paper, a new configuration of antipodal linear tapered slot antenna (ALTSA) using micro strip to Substrate Integrated Waveguide (SIW) transition with ultra wideband UWB imaging system performance is proposed and demonstrated. The antenna consists of a SIW and a linear tapered slot structure which is connected to the substrate integrated waveguide. It is designed in the form of a substrate integrated waveguide (SIW) array with respect to side lobe level constraints. The proposed antenna features a small size, low - profile and low cost, and can achieve a 10 - dB return loss from frequency range [55-70] GHz, stable radiation patterns and linear phase response, thus capable for applications in UWB radar imaging systems. For side lobe reduction, a simple quasi triangular distribution is proposed and is accomplished uniquely by means o f 3 dB power dividers. A 2- way series feed network with T- junction is designed and demonstrate.

Keywords- Antipodal Linear Tapered Slot Antenna (ALTSA), Substrate Integrated Waveguide (SIW), T-junction power divider, UWB imaging.

Writer's Gender Classification Using HOG and LBP Features

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Abstract: The gender identification in handwritten documentsbecomes to be important for various writer-authentication purposes. It provides information about anonymous documents forwhich, we need to know if they were written by a Man ora Woman. In this work, we propose a system for writer'sgender classification that is based on local textural and gradient features. Specifically, our proposed features are the Histogramof Oriented Gradients (HOG) and Local Binary Patterns (LBP),which are successful in various pattern recognition applications.The classification step is achieved by SVM classifier. The resultsobtained on samples extracted from IAM dataset show that theproposed features provide quite promising results.

Keywords: Gender classification; HOG; LBP; SVM.

A Multimodal Image Reconstruction Method Using Ultrasonic Waves and Electrical Impedance Tomography

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Abstract: In this paper, a new method that improves the image obtained by an array of ultrasonic sensors using electrical impedance tomography (EIT) is presented. One of its target applications can be in automatic exploration of soft tissues, where different organs and eventual anomalies exhibit simultaneously different electrical conductivities and different acoustic impedances. The proposed method shows that by properly combining EIT with an ultrasonic-based method, the accuracy of the shape of the internal inclusions can be improved. The obtained results clearly show the outperformance of this method over single modalities techniques that use either ultrasound or EIT imaging.

Keywords: Electrical impedance tomography (EIT); inverse problems; medical imaging; ultrasound reflection data.

Comparative study between Wavelet-based features and MFCCs as front-ends of Speech recognition system using OLLO Corpus

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Abstract: The aim of this study is to suggest a more compact wavelet-based acoustic analysis for speech recognition task. Our work consists in finding the better choice of the wavelet for this task. To evaluate this analysis, we built an ASR reference system based on the modeling of phonemes by the HMM (Hidden Markov Models) associated with the GMM models (Gaussian Mixture Model) using the HTK tool. This analysis is validated on the OLLO database used in speech recognition. A recognition accuracy of 87.55% was obtained using the proposed feature extraction method compared to 92.5% using the MFCCs.

Keywords- ASR, Wavelet, HMM, MFCC, GMM, OLLO...

Wavelets Based Image De-Noising: Application to EFTEM Imaging

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Abstract- Image de-noising is a very important step in Electron Microscopy (EM) image processing, before the three-dimensional reconstruction (tomography reconstruction) of the EM images. They normally have a problem of high noise level, which causes a loss in the contained information. This paper brings out the efficiency of the wavelet transform in the aim of improving thequality of real datasets. These real datasets are an EM images took at different time exposure, meaning reducing the noise level, where it seems better to answer the tradeoff between the use of Low electron doses to reduce the radiation damage, and feasibility to improve SNR after acquisition. In this matter, we have considered both hard and soft thresholding. To assess our results, we have chosen the signal-to-noise-ratio SNR criterion beside the visual quality of the obtained images. As expected, the wavelet was the right choice to perform well in Electron Microscopy and to be efficient in terms of SNR improvement.

Keywords: Electron Microscopy, Wavelet, Tomography reconstruction.

Effect of the Natural Noises and Sound Attenuation on MFCC used in Birdsong Recognition

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Abstract: in this paper, a study of the impact of natural noisesand signal attenuation on characterization methods (MFCC, PLP, LPC, and LPCC) used in the bird sound's recognition, is proposed. The ultimate goal is to monitor and recognize Migratory Birds in Tonga Lake through a wireless sensors network called WSN. This study will allow us to choose the correct method of characterizing, implementable on WSN, and adopted to a hostile and noisy environment. The parameterization of the acoustic signals, especially speech signals, using the MFCC coefficients often leads to better results in terms of recognition than the other methods. Depending on the application, numerous variations and improvements of the original idea of MFCC were suggested. In this work, different implementations of MFCC's computations were compared according to several criteria: recognition rate, speed of execution, computational complexity and robustness to noise and sound attenuation in air.

Keywords- birdsong recongnition; MFCC; PLP; LPC; LPCC;DTW;noisy environments; signal attenuation..

Denoising Medical Ultrasound Images and Error Estimate by Cellular Neural Networks and Translation Invariant Wavelets

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Abstract: Speckle Noise is a natural characteristic of medical ultrasound images. It is a term used for the granular form that appears in B-Scan and can be considered as a kind of multiplicative noise. Speckle Noise reduces the ability of an observer to distinguish fine details in diagnostic testing. It also limits the effective implementation of image processing such as edge detection, segmentation and volume rendering in 3 D. Therefore; treatment methods of speckle noise were sought to improve the image quality and to increase the capacity of diagnostic medical ultrasound images. Such as median filters, Wiener and linear filters (Persona & Mali, SRAD ...).The first method used in this work is newly invented by Chua & Yang called Cellular Neural Networks (CNN), the second method is 2-D translation invariant forward wavelet transform, both are used in image processing, including noise reduction applications in medical imaging.

Keywords- wavelets transform, image processing, ultrasound image, cellular neural network, filtering.

On A novel Voice Activity Detection Technique

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Abstract: In this paper we present a new technique for voiceactivity detection (VAD). The proposed technique is based onhomogeneity test of two autoregressive (AR) processes, each ofwhich models a speech window and involves the measure ofa defined distance. The homogeneity test is formulated as ahypothesis test with a threshold derived analytically accordingto a user-defined false-alarm probability. Results using Auroradatabase shows the effectiveness of the proposed techniquecompared to other methods and standards.

Keywords- Homogeneity test; voice activity detection; autoregressive process; hypothesis test;

Performance Evaluation of Segmentation Algorithms Based on Level Set Method: Application to Medical Images

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Abstract: Currently, the phase of segmentation is an importantstep in the treatment and the interpretation of the medicalimages; it represents one of the most difficult step for theextraction of the relevant parameters of the image and fact partof a very active field and rich of research. In this paper, wepresent an overview about segmentation methods based on level

set technique, namely Caselle method, Chan Vese method,Chumming Li method, Lankton method, Bernard method and Limethod. The performance of each method can be evaluated eithervisually, or from similarity measurements between a referenceand the results of the segmentation. We have applied eachmethod for different medical images. We present a comparativeevaluation of the considered segmentation methods, with respectto four criteria, given specific medical datasets. Throughsimulated results, we have demonstrated that the best results areachieved by Shi method and Chan & Vese method.

Keywords- Image Segmentation; Level Set; Active Contours;Medical Images.

New Front End Based on Multitaper and Gammatone Filters for Robust Speaker Verification

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Abstract: Motivated by the need of speaker verification systems with high robustness in mismatched noisy conditionsencountered in forensic area, we propose in this paper the Multitaper method for Gammatone Cepstral Coefficients (MGCC) feature extraction. The idea is to couple the advantage of the low-variance multitaper short term spectral estimators with the acoustic robustness of the auditory Gammatone filterbanks. Experimental results on the TIMIT corpus, with mismatched environment and low environmental signal to noise ratios (SNR) levels, show that the proposed MGCC features outperform largely the conventional Mel Frequency Cepstral Coefficients (MFCC) features. Furthermore, and interestingly the proposed features outperforms at almost all the operating signal to noise ratios the recently proposed auditory hearing inspired Gammatone Frequency Cepstral Coefficient (GFCC) feature for white, bubble and factory noises using both the GMM-UBM de facto standard and the state-of -the art I-vector speaker verification systems.

Keyword- component; MFCC; Multitapers; Gammatone filter; Speaker Verification; Noisex.

Quantitative analysis of real-time image mosaicing Algorithms

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Abstract: Image registration and photo-mosaicing of related imagery from unmanned aerial vehicles (UAVs) is an active research topic. Aerial photography and mosaicing became crucial for surveillance and reconnaissance. It consists in aligning multiple images to construct a single large image of a 3D scene allowing the operator to view images that offers a wider field of view than standard images. Offline registration andmosaicing of collected images from UAVs has proven to give greatresults but is numerically intensive and somewhat slow. In thispaper, a new approach for real time mosaicing is proposed based on new registration approach which reduces accumulated error and

distortion of the current image. A quantitative analysis of the new approach is performed. This analysis allows thecomparison of two images mosaic using some parameters to evaluate the quality, the Distortion rate and the speed of mosaicing.

Keywords- Homography; Image mosaicing; KLT; SURF.

Modified Grain-128 For Image Encryption and Decryption

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Abstract: the purpose of this contribution is to propose a newstream cipher based on filter generator inspired from Grain-128with several improvements. The system based on three mainelements LFSR(Linear Feedback Shift Register), NLFSR(NonLinear Feedback Shift Register) and non linear filtering function.Several tests are done for proving the system performanceincluding visual tests, statistical tests, and security analysis

Keywords- stream cipher; Nonlinear filter generator; LFSR;NLFSR.

On using a novel random interleaver in OFDM-IDMA system

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Abstract: In system combining orthogonal the frequency divi-sion multiplexing (OFDM) and the interleaving division multipleaccess (IDMA), known as OFDM-IDMA, all users can transmittheir information at the same time and in the same frequencyband. To support multi-user context, the interleaver is thekey block to ensure orthogonality between different users. Inthis paper, a new random interleaver is proposed to mitigatemulti-user access interference (MAI) in OFDM-IDMA systemresolving operating in multi-path SISO channel. The architectureexploits the capabilities of OFDM in increasing the robustnessagainst inter-symbol interference, of IDMA protecting againstthe MAI, and of the interleaver in immunizing against channelerrors. The simulation results show that the resulting architecture incorporating the proposed interleaver yields a gain in terms ofbit error rate (BER) performance particularly when the SNR,the processing gain and the number of paths increase.

Keywords - OFDM-IDMA; Random Interleaver; FiestelStructure; GRP permutation.

Stochastic Simulation Tool for Aerospace Mission Analysis

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Abstract: During flight mission, the high-intensity level acoustic load generated by large launch vehicle lift-off propulsion is of major concern for the integrity of the launch complex and the vehicle payloads. Acoustic loads are principal source of structural vibration and internal noise during launch. The prediction of the acoustic loading at the surface of rocket fairings is challenging because of the complexity of the fairing geometry.

The proposed approach is to minimize the weight and the surface of the Small launch vehicle faring (SLVF) towards minimizing the effect of the interferences for height frequency of the external acoustic waves using a genetic algorithm.

Keywords - Small Launch vehicle Fairing, Sound Pressure, Genetic algorithm, satellite.

Nano-coaxial waveguide grating as anisotropic Plates

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Abstract: we present anisotropic metamaterial plates with enhanced transmission through perfectly conductor metallic screens perforated by sub wavelength Annular Aperture Arrays with elliptical core. The geometrical artificial anisotropy obtained can be controlled through polarization and propagation properties of guided modes inside the cavities. We can adjust easily the metal thickness to get the desired value of the phase difference between the two transversal electromagnetic field components. The control of this birefringence is presented here through an example of a half-wave plate exhibiting a transmission of about 53% in the visible range.

Keywords - metamaterial ; birefringence ; anisotropy ;FDTD.

Optimized Antennas Design For Electromagnetic Energy Harvesting

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Abstract: Energy harvesting is the process by whichenergy from different sources of radiation in the environment is captured and stored. It can provide an alternative energy capable of replacing, totally or partially, the batteries of certain micro systems that have low energy requirements. This paper focuses on the design and optimization of antennas in order to work in the [0.9 GHz-3GHz] band. This frequency band covers the common communication standards (GSM900 & 1800, UMTS, DETC and Wi-Fi) since its quantity ofelectromagnetic energy is high. We present simulation results under HFSS software to analyze the performance of the designed antennas to be used as the first elements for constituting the rectennas.

Keywords - harvesting, rectenna, printed antennas, broadband antenna, rectifier, optimization.

EMD-Based Signal Denosing Using Soft Thresholding on Selected Intrinsic Mode Functions

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Abstract: In this paper, a new method of signals denoising was proposed. It is based on the Empirical Mode Decomposition (EMD) and a soft thresholding approach. The noisy signal was first decomposed by EMD method into intrinsic oscillatory components called Intrinsic Mode Functions (IMFs) and a residue. Then, the noisy low-order IMFs that contain a large portion of noise are removed. The selected IMFs, which contain a small portion of noise, are optionally filtered using the soft-thresholding method. Finally, the thresholded IMFs are added to the remaining IMFs with the residue to reconstruct the denoised signal. The simulated results which are presented and analyzed, showing that the proposed technique has an excellent performance even when the signal-to-noise ratio (SNR) is low (–5 dB). The proposed method has the best performance compared to the other EMD-based methods.

Keywords - Empirical Mode Decomposiotion; Soft Thresholding; Signal Denoising; Selection Criterion.

Multispectral Image Denoising Based on Neighboring Thresholding and Phase Smoothing in Quaternionic Domain

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Abstract: The objective of this paper is to study the potential of the quaternionic wavelet transform for the processing of multispectral images with strong geometric information. Denoising approach is based on the phase regularization and the spatial-spectral mutual neighborhoodwhere quaternionic magnitude coefficients are thresholded in local window. The quaternionic wavelet transform gives a verygood separation of the coefficients in terms of magnitude and 3-angles phase and generalize better the concept of analytic signal to the image. This representation retains property of the shift invariant and it allows the introduction of a true 2D analysis. Our method is applied to satellite images representing regions of Algeria. Results indicate that the performances have increased in noise suppression and edge preservation compared with the wavelet methods that do not use the phase or multiband information.

Keywords - Small multispectral; satellite; wavelet; quaternionic;neighborhood; thresholding; phase.

Comparative Study of Time Frequency Analysis Application on Abnormal EEG signals

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Abstract: This paper presents a time-frequency analysis for somepathological Electroencephalogram (EEG) signal. The proposed method is to characterize some pathological EEG signals using some time frequency distribution. TFD are useful tools for analyzing the non-stationary signals such as EEG signals. We have used the spectrogram, Choi-Williams distribution and the Smoothed pseudo Wigner Ville distribution in conjunction with the Rényi entropy. The study is conducted on some case of epileptic seizure of EEG signals collected on a known database.

The best values of the analysis parameters are extracted by the evaluation of the minimization of the Rényi entropy values. The results have permit to visualize in time domain some pathological EEG signals. Also, the Rényi marginal have been used in order to identify the peak seizure. The characterization is achieved by evaluating the frequency bands using the frequency marginal.

Keywords - component; EEG; time frequency analysis; Rényi entropy.

Particle Swarm for Antennas Optimization: Modeling using the Moments Method

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Abstract: This paper introduces a novel technique for efficiently combining Particle Swarm Optimization (PSO) with method of moments (MOM) for computing the resonant frequency and bandwidth of rectangular microstrip antenna. In this technique, the problem is formulated in terms of an integral equation which is the kernel of a dyadic Green's function. After this PSO which will be introduce to determinate antenna parameters by optimizing the impedance matrix |Z|. The resonant frequency results obtained by using (PSO/MOM) algorithm are in very good agreement with the experimental results available in the literature. The computation time is greatly reducedas compared to the classical MOM.

Keywords - component; Particle Swarm Optimization (PSO); Method of Moments (MOM); Microstrip Antenna; Impedance matrix |Z|; resonant frequency and Bandwidth.

Bandwidth Optimization of Circularly Polarized Microstrip Hexagonal Slot Antenna

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Abstract: In this paper, we present the optimized simulation results of a two broadband microstrip slot antennas fed by a tapered microstrip line. The antenna is composed of a hexagonalslot, tapered microstrip feeding line to enhance the impedance bandwidth and reflector conductor to enhance the gain.Following a rigorous optimization procedure in Ansys HFSS Optimetrics, it is shown that the 10-dB reflection coefficient and 3-dB axial-ratio (AR) bandwidths were 69.62% and 21.63%,respectively, for the antenna on the Taconic RF35 substrate. For the antenna on Rogers Ultralam2000 substrate, the 10-dB reflection coefficient and 3-dB axial ratio bandwidths reach 74.17% and 16.12%, respectively, whereas the values were 48.9% and 17% respectively in the design given in the literature. The total size of the optimized antenna is 60x55x16.1 mm^3.

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Keywords - Hexagonal Slot, Microstrip Antenna, Broadband Antenna, Slot Antenna, Circular Polarization, Optimization.

Design and Performance Analysis of MDHP Code for Spectral-Amplitude Coding Optical Code Division Multiple Access (OCDMA)

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Abstract: Many codes have been proposed for spectral coding (SAC) systems for Code Division Multiple Access Optical (OCDMA), with variable weight greater than one. In this paper we propose a new code for SAC-OCDMA system. The new code is called multi-diagonal high-power code (MDHP). This code with its architecture and ease of construction provides good performance in terms of bit error rate (BER). MDHP codes can be adapted to any number of users and weight without any constraint and a high weight and a shorter length compared to other codes. The MDPH codes with distances varying between 20 km and 80 km are shown BER > than 10^{-9} which making them suitable for transmission OCDMA. We simulate the performance of the proposed system with taking into account the entire concrete impacts in the system, such that non-linear effects, the dispersion and attenuation in the fiber codes.

Keywords - multi-diagonal codes with higher power;optical code-division multiple-access; multiple-access interference; spectral-amplitude coding; phase-induced intensity noise.

Erbium Doped Fiber Amplifiers in booster position for Access Networks

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Abstract: This paper reports on Erbium Optical Amplifiers (EDFAs) and their use in optical communication systems in particular improving the reach of Passive Optical Networks (PON). The aim of this later is to analyze the performance of Erbium Doped Fiber Amplifier (EDFA) system by comparing the gains and noise figures of different parameters such length amplifier (L_{edfa}) and concentration of erbium ions (C) to optimize the gain of EDFA amplifier in booster position .

Keywords -component; Optical amplifierc; Access network;Erbium doped fiber amplifier; Passive Optical Networks.

Invited session:

New trends in modelling and control of power converters

Study and Simulation of a DC–DC Zeta Converter for Photovoltaic Application

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Abstract : This paper presents a synchronous Zeta converter for photovoltaic application, the control system of the converter is based on pulse width modulation (PWM) technique. In the proposed DC-DC converter, the diode is replaced by a MOSFET to reduce the conduction losses in the circuit.

This converter is designed and simulated in MATLAB Simulink; it has high efficiency compared to conventional converters, so the conversion of the photovoltaic system is improved. This converter works in both buck and boosts functions and provides very good results. The choice of its components depends on the parameters of the generator and the load.

Keywords: Zeta converter; photovoltaic; PWM; control system; efficiency.

Optimized Sliding Mode Control of DC-DC Boost Converter for Photovoltaic System

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Abstract: DC–DC converters are an important element in photovoltaic systems to attain desired level of energy and to shape it according to the demand. This paper proposes new optimized sliding mode controller (SMC) with fixed switching frequency for a boost converter to step up a fluctuating solar panel voltage to a higher constant DC voltage. Based on the converter functioning principle, a sliding mode controller (SMC) is proposed. Then, a method for SMC parameters selection using simplex and PSO techniques is given. The simplex method allows obtaining the admissible ranges for SMC parameters while taking into account practical considerations about the converter. Then, theses ranges will be used by the particle swarm optimization technique (PSO) to find optimal values for controller parameters.

Keywords:Photovoltaic, Boost converter, Sliding mode control, Optimization, Simplex, PSO.

Design of Sliding Mode Control for Z-Source DC-DC Converter

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Abstract: In this paper, sliding mode control (SMC) for Zsource DC-DC converter (ZSC) is designed. It is assumed that the converter operates in conduction continuous mode (CCM). The equations describing the converter operation are presented and the design procedure of SMC used here is described. For validation, Matlab/Simulink software has been used. The robustness of the controller is tested for input voltage variations and load changes. The simulation results show that the effectiveness and robustness of this controller and better overall performance on the PI controller.

Keywords:DC-DC Converter, Z-Source, Sliding Mode, Control Design, Robustness, PI controller.

Invited session:

New trends in renewable energy

Mixed Integer Optimization using PSO Algorithm for Optimal Settings Overcurrent Relays in the Presence of Wind Energy Farms

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Abstract: This paper presents an optimal coordination of inverse definite minimum time (IDMT) directional overcurrent relays (DOCR) in the presence of Wind Energy Farms (WEF). Firstly, the impact of WEF on the relays coordination is focused, after that we search for the new relays setting to ensure an optimal coordination of the relays. The coordination problem is formulated as a constrained nonlinear mono-objective optimization problem. The objective function of this optimization problem is the minimization of the operation time of the associated relays. In terms of decision variables; two types of optimizations are considered in this paper, namely: real parameter optimization where, the time dial setting (TDS), and the pickup current setting ($\mathbf{I}_P$) are considered as the real decision variables of the optimization problem and the mixed integer optimization, where the IEC curve characteristic of each relay is added to the previous variables as an integer decision variable. The characteristics of the relays are always chosen arbitrary or by trial and error method. To solve this constrained non linear optimization problem, the particle swarm optimization method is used. The proposed method is validated on 8-bus power transmission test systems considering various scenarios.

Keywords- wind energy farms; directional overcurrent relay; fault current; optimal coordination; particle swarm optimization; mixed integer constrained optimization.

Robust Control of a Dual Stator Induction Generator for Wind Power Generation

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Abstract: This paper focuses on the design and analysis of a sliding mode MPPT control based on an indirect vector control of Dual stator Induction Generator (DSIG) for wind power generation. The suggested control algorithm aims to extract a maximum of power under fluctuating wind speed. The modelling of variable-speed wind energy conversion system is well explained in this paper. The field-oriented control strategy of a DSIG is presented. In order to ensure an optimum operating point and a Maximum Power Point Track (MPPT) giving online a maximum production of electric power for different wind speeds, a sliding mode controller have been suggested . The efficiency and validity of the proposed control strategy are illustrated by simulation results.

Keywords- Dual stator Induction Generator, Variable Speed Wind Turbine, Three-phase converters, Field oriented control, Variable structure systems, Sliding control.

On Line Energy Management Strategies for Fuel Cell/Battery Electric Vehicle: from Rules Logic to Fuzzy Logic Strategy

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Abstract: Compared with battery-based electric vehicles, multiple energy sources electric vehicles are one of the most promising technologies for urban transportation. Except that dynamic behavior, specific energy and specific power of each source makes their power control hard. Good energy management for such systems is required to have an optimal power distribution between different sources and load.

In this paper, electric vehicle with Proton Exchange Membrane Fuel Cell (PEMFC) as a main source connected to the DC bus via a boost DC-DC converter and lead acid battery as an auxiliary source connected to the DC bus via a buck-boost DC-DC converter. In the high control level, two on lineVehicle Energy Management Strategies (VEMS) were developed and tested: a rule-based and a fuzzy-based VEMS.The results of both strategies were discussed and compared with the main objective is to minimizing the fuel consumptionwith good control battery state of charge (SOC). Digital simulation with MATLAB/Simulink for all vehicle power train is realized applying such strategies.

Keywords- Proton Exchange Membrane Fuel Cell (PEMFC), Boost DC-DC Converter, Buck-boost DC-DCconverter, On line fuzzy-based Vehicle Energy ManagemenStrategy, fuzzy-based Vehicle Energy Managemen Strategy, state of charge (SOC), MATLAB/Simulink

Integral Sliding Mode Control for Trajectory Tracking of Wheeled Mobile Robot in Presence of Uncertainties

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Abstract: In this paper, a new method based on an Integral Sliding Mode Control (ISMC) for the trajectory tracking of wheeled mobile robots is proposed. The controller is designed to solve the reaching phase problem with the elimination of matched disturbances that consist of external perturbations and model uncertainties. We distinguish two parts in the suggested controller: a nonlinear time-varying feedback to stabilize the nominal system (system without perturbations), and an integral sliding mode controller to assess the trajectory tracking in the presence of disturbances. This controller is robust to the matched model uncertainties and disturbances during the entire motion. The effectiveness of the proposed controller is demonstrated through simulation studies for the unicycle type wheeled mobile robot and compared with nonlinear time-varying feedback. The simulation shows that proposed controller has higher robustness, global stability, higher tracking precision, and faster than the nonlinear time-varying feedback.

Keywords- Wheeled mobile robot, nonlinear time-varying feedback, uncertain system, Integral sliding mode control.

Output robust stabilization of uncertain and disturbed Takagi-Sugeno models: an LMI approach

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Abstract: This paper addresses the output feedback robust fuzzy control problem for uncertain Takagi-Sugeno (T-S) continuous fuzzy models in the presence of external disturbances and the state variables unavailable for measurement. The control scheme is based on a parallel distributed compensation (PDC) structure, a fuzzy observer and a H∞ performanceto attenuate the external disturbances. Based on quadratic Lyapunov fonction, sufficient conditions are derived for robust asymptotic output stabilization and are formulated in the format of linear matrix inequalities (LMI). To show the effectiveness of the proposed results, numerical simulations are provided on an inverted pendulum system.

keywords-Robust control; Output feedback; Takagi-Sugeno models; Parametric uncertainty; Linear matrix inequality (LMI); H∞ criterion.

DRCV: Distributed Reaffiliation Controlled Clustering Algorithmfor Vehicular Networks

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Abstract: Ad hoc networks are characterized by a variable topology and limited resources that make their management especially difficult. The application of Mobile Ad Hoc Network (MANET) technologies in the service of Intelligent Transportation Systems (ITS) has brought new challenges in maintaining communication clusters of network members for long time durations. In this context, the management by a policy seems promising to simplify the management process solution of Configuration and control of VANET networks. This solution is based on a centralized architecture; several studies [2], [6] and [13] have been accomplished to adapt it to the distributed nature and dynamic topology of the Ad hoc networks. The technique of grouping (clustering) was often restraint to this effect. In this paper, we propose a new clustering algorithm appropriate for management by policies in vehicular ad hoc networks . Our algorithm allows the formation of clusters of size and radius configurable. The stability of these clusters is enhanced by introducing factors control reaffiliations. In second step, we evaluate its performance by simulation in function of vehicles mobility.

Keywords—Ad hoc; management by policies;VANET; clustering, NS

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