Message from the Podium

Editorial

This year we are celebrating the 9th International Conference, and the fifth edition in which its organization includes the participation of three academic departments at CINVESTAV: Electrical Engineering, Computer Science and Automatic Control. The conference remains as a specialized forum where local research groups can present their recent results and proposals, interact with each other, and have the opportunity to become aware of the recent research and developments from leading institutions abroad, too. Also, the interaction with technological industry managers and government officers, keeps a special place in the activities of the conference.

This year, we received 140 submissions from 15 countries (including Mexico), from which 92 were accepted for oral presentation. We received submissions from countries such as the United States of America, China, Iran, India, Algeria, France, Russia, Colombia, Ukraine, Japan, Malaysia, among others, reflecting the international character of this conference.

As Presidents of CCE 2011, we wish to thank the Organizing Committee, the anonymous referees and the supporting personnel for their valuable time and efforts which have made possible to hold a successful 2012 9th International Conference on Electrical Engineering, Computing Science and Automatic Control (CCE’2012). We also wish to give special thanks to the authorities of CINVESTAV, as well as to the IEEE Region 9, the IEEE Electron Devices Society and to our international program committee for all their valuable help and support.

To all our attendees, we give them a warm welcome to Mexico City, wishing them a very fruitful and enriching conference, hoping that all their expectations are fulfilled.

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Dr. Mariano Gamboa Zúñiga
Dr. José Antonio Moreno Cadenas
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Arturo Escobosa
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Arturo Forner-Cordero
Biomechatronics Lab. University of Sao Paulo
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General Information

The Conference CCE 2012 will be held in Mexico City, Mexico, at the premises of Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional (CINVESTAV), Department of Electrical Engineering.

Address: Av. Instituto Politécnico Nacional 2508, Col. San Pedro Zacatenco, CP 07360, Mexico City

Web Sites:
http://cce.cinvestav.mx
http://www.cinvestav.mx
http://www.ie.cinvestav.mx

The CINVESTAV was created in 1961 by presidential decree as a public agency with legal personality and its own assets. It is considered one of the best scientific and technological research centers in México and Latin America. The CINVESTAV has twenty-eight research departments that are distributed by the nine campuses throughout Mexico (Guadalajara, Irapuato, Monterrey, Mérida, Querétaro, Saltillo, Tamaulipas, as well as the South campus and Zacatenco campus both located in Mexico City).

The research work at CINVESTAV is carried out in different areas of science and technology: Natural Sciences, Life and Health Sciences, Technology and Engineering Sciences, and Social Sciences and Humanities.

The 9th International Conference on Electrical Engineering, Computing Science and Automatic Control (CCE 2012) is organized by the Departments of Automatic Control, Computer Science, and Electrical Engineering. The Departments offer masters and Ph.D. degrees in their specialties and are focused in basic and applied research in diverse areas such as those indicated below.

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- Mathematic Theory of Automatic Control
- Artificial Vision
- Robotics
- Biomathematics
- Advanced Topics of Modern Mathematics
- Identification and State Estimation of Dynamic Systems
- Control of Technological Processes

Information
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Fax: (+52 55) 5747 3982

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- Computer graphics and visualization
- Cryptography and computer security
- Soft computing
- Computer architecture
- Software engineering
- Cooperative work
- Distributed and parallel systems
- Operating systems
- Theoretical computer science
- Artificial intelligence

Information
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Fax: (+52 55) 5747 3757

Electrical Engineering Department
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- Communications systems
- Mechatronics
- Solid-state materials, electron devices and integrated circuits

Information
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Phone: (+52 55) 5747-3800 ext. 6505
Fax: (+52 55) 5747-3976
### Schedule

**TUTORIAL COURSES**

#### Monday September 24, 2012

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<thead>
<tr>
<th>Hour</th>
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### CONFERECE CCE 2012

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<td>COMP1-COMP2</td>
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<td>11:00-11:30</td>
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<td>11:30-12:30</td>
<td>PLE3-SSM</td>
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<td>12:30-13:30</td>
<td>SSM3</td>
<td>COMP3</td>
<td>AC9</td>
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<td>13:30-15:00</td>
<td>Lunch</td>
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<td>15:00-16:00</td>
<td>SSM4</td>
<td>COMP4</td>
<td>AC10</td>
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<td>16:00-17:00</td>
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<td>17:00-17:30</td>
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<td>17:30-18:50</td>
<td>SSM5</td>
<td>COMP5</td>
<td>AC11</td>
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<td>Room 1</td>
<td>Room2</td>
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<td>9:00-10:00</td>
<td>MEC1</td>
<td>SSM6</td>
<td>ICT</td>
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<tr>
<td>11:30-12:30</td>
<td>MEC2</td>
<td>IDM-COM</td>
<td>SS</td>
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<tr>
<td>14:00-15:00</td>
<td>Closing ceremony, Closing Cocktail</td>
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</table>

**CODE SESSIONS**

**AC** AUTOMATIC CONTROL - MECHATRONICS

AC1 Distributed parameter systems
AC2 Linear systems
AC3 Optimization and optimal control
AC4 Tracking
AC5 Autonomous vehicles
AC6 Mechanical systems
AC7-AC8 Electromechanical systems/Neural networks, Fuzzy logic
AC9 Failure detection and identification
AC10 Sliding mode control
AC11 Power systems

**BIO** BIOMEDICAL ENGINEERING

BIO1 Biomedical Engineering
BIO2 Biomedical Engineering
BIO3 Biomedical Engineering

**COM** COMMUNICATIONS SYSTEMS

COM1 Communications Systems

**CS** COMPUTER SCIENCE AND COMPUTER ENGINEERING

COMP1- COMP2 Engineering and application
<table>
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<tr>
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<tbody>
<tr>
<td>COMP3</td>
<td>Programming and web services</td>
</tr>
<tr>
<td>COMP4</td>
<td>Optimization and evolutionary computing</td>
</tr>
<tr>
<td>COMP5</td>
<td>Mathematical Methods</td>
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<tr>
<td>SSM</td>
<td><strong>SOLID-STATE MATERIALS, ELECTRON DEVICES AND INTEGRATED CIRCUITS</strong></td>
</tr>
<tr>
<td>SSM1-</td>
<td>Modern Device Technology/Integrated Circuit Design</td>
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<tr>
<td>SSM2</td>
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<tr>
<td>SSM3</td>
<td>Semiconductor Device Modeling</td>
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<tr>
<td>SSM4</td>
<td>Applied Semiconductor Technology</td>
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<tr>
<td>SSM5</td>
<td>Synthesis and Characterization of Semiconductor Materials</td>
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<tr>
<td>SSM6</td>
<td>Synthesis and Characterization of Semiconductor Materials</td>
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<tr>
<td>ICT</td>
<td><strong>INFORMATION AND COMMUNICATIONS TECHNOLOGY</strong></td>
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<td>IDM</td>
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<td>TUT</td>
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<td>PLE</td>
<td>Plenary</td>
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<tr>
<td>SS</td>
<td><strong>Special Session: The Automotive Industry Needs and Areas of Opportunity</strong> Focused on Electrical Engineering</td>
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</table>
Plenaries, Tutorials and Special Session

PLE1-AC Rifat Siphahi, Ph.D.
Plenary Talk: Effects of Delays to Dynamical Behavior; Applications and Insights from Linear Systems Theory
Department of Mechanical and Industrial Engineering
Northeastern University, Boston, MA, USA

PLE2-BIO Ricardo G. Hahn, Ph.D.
Plenary Talk: A Unified Methodology for Development and Commercialization of Novel Medical Technologies
School of Medicine and Alfred E. Mann Institute for Biomedical Engineering
Professor of the University of Southern California, Los Angeles, CA, USA

PLE3-SSM Manuel Quevedo, Ph.D.
Plenary Talk: Materials and Devices Considerations for Flexible Electronics: Are Orbanic-Based Materials and Devices Really Necessary?
Department of Materials Science and Engineering
The University of Texas at Dallas, USA

PLE4-COMP Sergio Rajsbaum, Ph.D.
Plenary Talk: Two Stories about Love: the Geometry of Distributed Systems
Professor, Institute of Mathematics
National Autonomous University of Mexico (UNAM)

PLE5-MEC Manuel A. Duarte Mermou, Ph.D.
Plenary Talk: "Fractional Adaptive Control: Some Advances and Lot of Open Problems"
Professor of the Electrical Engineering Department
University of Chile

PLE6-ICT Victor(Young-il) Kwon
Plenary Talk: "Mobile e-Government Services in Smart Society"
Executive Director
Information Resource & Infrastructure Division
National Information Society Agency (NIA)
Republic of Korea
TUT1: Servicios en la Nube  
Monday September 24, 2012  
(9:00-13:30)

Arturo Vázquez y Francisco Solsona  
Google México

TUT2: Techniques to Calculate the Critical Eigenvalues of LTI Systems with Delays  
Tuesday September 25, 2012  
(9:30-17:30)

Rifat Sipahi, Ph.D.  
*Mechanical and Industrial Engineering, Northeastern University, Boston, MA. USA*

TUT3: Fundamentos de Cálculo y Control Fraccionario  
Tuesday September 25, 2012  
(14:00-18:30)

Manuel A. Duarte Mermou, Ph.D.  
*Professor, Electrical Engineering Department, University of Chile*

TUT4: Curso de operación del sistema de caracterización de semiconductores 4200-SCS  
Monday September 24, 2012  
(9:00-16:00)

SS: The Automotive Industry Needs and Areas of Opportunity Focused on Electrical Engineering  
Friday September 28, 2012  
(12:30-13:50)

Ing. Luis David González Valdez  
*Wireless Component and Security Engineer, Chrysler de México*
Program

Automatic Control (AC)

1  
Session AC1: Distributed parameter systems  
Wednesday September 26, 2012  
12:00-13:20  
Session Chair: Dr. Isaac Chairez

1.1 12:00-12:20  
Delayed-error Equations for Controller Design  
Araceli Gárate-García, Susana Vázquez-Vallín and Luis A. Márquez-Martínez  

1.2 12:20-12:40  
On the Practical Stability for a class of Switched System  
Carlos Manuel Perez, Alexander Poznyak and Vadim Azhmyakov  

1.3 12:40-13:00  
Neuro-Observer based in Backstepping Technique for Distributed Parameters Systems  
Rita Q. Fuentes, Isaac Chairez and Alexander Poznyak

2  
Session AC2: Linear systems  
Wednesday September 26, 2012  
15:00-16:00  
Session Chair: Dr. José Fermi Guerrero Castellanos

2.1 15:00-15:20  
Self-Triggered Control for the Stabilization of Linear Systems  
Sylvain Durand, Jose Fermi Guerrero Castellanos and Rogelio Lozano-Leal  

2.2 15:20-15:40  
A parametrization of all one parameter stabilizing controllers and a mixed sensitivity problem, for square systems  
René Galindo Orozco and Cutberto Daniel Conejo Rosas  

2.3 15:40-16:00  
Quadratic Stability Methodology by Parameter Dependent State Feedback for LPV Systems  
Eduardo Martinez Zambrano and René Galindo Orozco

3  
Session AC3: Optimization and optimal control  
Wednesday September 26, 2012  
17:30-18:50  
Session Chair: Dr. Vadim Azhmyakov

3.1 17:30-17:50  
Practical Stability of Control Processes Governed by Semi-explicit DAEs  
Raymundo Juárez, Vadim Azhmyakov and Alexander Poznyak  

3.2 17:50-18:10  
A Robust Dynamic Controller for a Class of Nonlinear Systems with Sample-Data Outputs  
Manuel Mera, Alex Poznyak, Vadim Azhmyakov and Andrey
3.3  18:10-18:30  Optimal growth by Dynamic Programming approach for reduced system for the Microalgae Culture.
*Irandi Gutierrez Carmona, Jorge Antonio Torres Muñoz and Alma Rosa Domínguez Bocanegra*

4  **Session AC4: Tracking**  
Wednesday September 26, 2012  
12:00-13:20  
Session Chair: **Dr. Eduardo Aranda/M.Sc. Jaime González Sierra**

4.1  12:00-12:20  Discontinuous H∞-Control of Mechanical Manipulators with Frictional Joints  
*Oscar Montano and Yury Orlov*

4.2  12:20-12:40  Experimental Comparison Between Discrete- and Continuous-Time Controllers for Multi-Agent Robots Systems  
*Eduardo Aranda-Bricaire, David Ernesto Hernández-Mendoza and Guillermo Rey Peñaloza Mendoza*

4.3  12:40-13:00  Attitude Observer and Trajectory Tracking for a Group of Unicycle-Type Robots  
*Jaime González-Sierra, Eduardo Aranda-Bricaire and Hugo Rodríguez-Cortés*

5  **Session AC5: Autonomous vehicles**  
Wednesday September 26, 2012  
15:00-16:00  
Session Chair: **Dr. Jorge Torres**

5.1  15:00-15:20  Modeling and control of a vertical take-off airplane  
*Víctor Rosas, Rogelio Lozano, Jorge Torres and Zizilia Zamudio*

5.2  15:20-15:40  State Estimation for a Bio-Inspired Hovering Robot Equipped with an Angular Sensor  
*Rodrigo Munguía and Augustin Manecy*

5.3  15:40-16:00  Depth control using artificial vision with time-delay of an AUV  
*Eduardo Campos, Jorge Antonio Torres, Sabine Mondié and Rogelio Lozano*

6  **Session AC6: Mechanical systems**  
Wednesday September 26, 2012  
17:30-18:50  
Session Chair: **Dr. Sergio Salazar**

6.1  17:30-17:50  Modeling and Control of a Lower Limb Exoskeleton with two degrees of freedom  
*Ricardo Lopez, Sergio Salazar, Jorge Torres and Rogelio Lozano*
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<tr>
<th>Session</th>
<th>Time</th>
<th>Title</th>
<th>Authors</th>
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<tr>
<td>6.2</td>
<td>17:50-18:10</td>
<td>Stability analysis and experiments for a force augmenting device</td>
<td>Suresh Kumar Gadi, Rogelio Lozano, Rubén Garrido and Antonio Osorio</td>
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<tr>
<td>6.3</td>
<td>18:10-18:30</td>
<td>A Model Matching for the Stabilization of the Two Wheels Inverted Pendulum</td>
<td>Oscar Octavio Gutiérrez-Frías and Alberto Luviano-Juarez</td>
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<tr>
<td>7</td>
<td>9:00-11:00</td>
<td>Session AC7-AC8: Electromechanical systems/Neural networks, Fuzzy logic</td>
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<tr>
<td>7.1</td>
<td>9:00-9:20</td>
<td>Digital Simulation of the Conventional DTC with Fuzzy Speed Regulator for PM Synchronous Motor Drives</td>
<td>Roberto Morales-Caporal, Rafael Ordoñez-Flores, Edmundo Bonilla-Huerta, Omar Sandre-Hernández and Ricardo Alvarez Salas</td>
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<tr>
<td>7.2</td>
<td>9:20-9:40</td>
<td>Optimization of Hybrid Mechanical Systems</td>
<td>Arturo Gil, Vadim Azhmyakov and Mikhail Basin</td>
</tr>
<tr>
<td>7.3</td>
<td>9:40-10:00</td>
<td>Closed-loop identification analysis of a DC servomechanism: A Passive Approach</td>
<td>Roger Miranda Colorado, José Luis Luna Pérez, Augusto Acuña Leal and Liborio Bortoni Anzures</td>
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<tr>
<td>7.4</td>
<td>10:00-10:20</td>
<td>Nonlinear Control for Plants with Partial Information via Takagi-Sugeno models: an Application on the Twin Rotor MIMO System</td>
<td>Temoatzin González, Pedro Rivera and Miguel Bernal</td>
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<tr>
<td>7.5</td>
<td>10:20-10:40</td>
<td>Inverse Optimal Neural Control with Speed Gradient for a Power Electric System with Changes in Loads</td>
<td>Enrique A. Lastire, Alma Y. Alanis and Edgar N. Sanchez</td>
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<tr>
<td>7.6</td>
<td>10:40-11:00</td>
<td>FPGA-Based Space Vector PWM with Artificial Neural Networks</td>
<td>Joyce Osorio, Pedro Ponce and Arturo Molina</td>
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<td>8</td>
<td>12:30-13:30</td>
<td>Session AC9: Failure detection and identification</td>
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<td>8.1</td>
<td>12:30-12:50</td>
<td>Using a Realization Technique for System Identification: Application on a Hydraulic Testbed</td>
<td>Brian Manuel González-Contreras, Isaac Hilario-Contreras, Miguel Angel Carrasco-Aguilar and Leticia Flores-Pulido</td>
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<tr>
<td>8.2</td>
<td>12:50-13:10</td>
<td>Leak Isolation with Temperature Compensation in Pipelines.</td>
<td>Alejandro Pizano and Ofelia Begovich</td>
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</table>
8.3 13:10-13:30 Instrumenting and Programming a Virtual Instrument for an Open Loop System to Control Gliding Centrifugal Thermal Plasma
Gerardo Jiménez-Aviles, Ricardo Valdivia-Barrientos, Joel-Osvaldo Pacheco-Sotelo, Jesús Silva-Rosas, Fidel Ramos-Flores, Marquidia Pacheco-Pacheco and Carlos Rivera-Rodríguez

9 Session AC10: Sliding mode control
Thursday September 27, 2012
15:00-16:00
Session Chair: Dr. Rubén Garrido
9.1 15:00-15:20 HOSM Block Control of SPIM
Guillermo Rubio, Juan D. Sanchez, Jose M. Cañedo and Alexander G. Loukianov
9.2 15:20-15:40 Super-Twisting Sensorless Control of Linear Induction Motors
Alexander Loukianov, Jorge Rivera, Alma Alanis and Juan José Raygoza
9.3 15:40-16:00 Super-Twisting Sliding Mode Control of Synchronous Motors
Jediael Machín Almeida, Alexander Loukianov and Jose Manuel Cañedo Castañeda

10 Session AC11: Power systems
Thursday September 27, 2012
17:30-18:50
Session Chair: Dr. Jorge Dávila
10.1 17:30-17:50 Robust Quasi-Continuous Sliding-Mode Control of a Variable-Speed Wind Turbine
Jován O. Mérida, Jorge A. Dávila and Luis T. Aguilar
10.2 17:50-18:10 Discontinuous Output Regulation for a DC-to-AC Boost Converter
Alexander Loukianov, Jorge Rivera, Florentino Chavira and Susana Ortega
10.3 18:10-18:30 Evaluating the Performance of the BTB Converter under Unbalanced Voltage Sags
Ricardo Sierra, Janeth Alcalá, Victor Cardenas, Javier Perez-Ramirez and Ana Rivera
10.4 18:30-18:50 Linear State Estimation Model Using Phasor Measurement Unit (PMU) Technology
Sandeep Soni, Sudhir Bhil, Dhirendra Mehta and Sushama Wagh

Biomedical engineering (BIO)

11 Session BIO1: Biomedical engineering
Wednesday September 26, 2012
12:00-13:20
Session Chair: Dr. Juan Manuel Gutiérrez Salgado

11.1 12:00-12:20 Method for Automatic Detection and Classification of N1 and P2 Auditory Evoked Potentials in EEG recordings
Jennifer Ladd Parada and Carlos Alvarado Serrano

11.2 12:20-12:40 Time and Amplitude Relationships of the Ballistocardiogram in Vertical and Horizontal Direction
Pablo Luna-Lozano and Carlos Alvarado-Serrano

11.3 12:40-13:00 A Simplified Method for Numerically Solving the Impedance Equation in the Plane
Ariana Bucio, Raul Castillo-Perez, Marco Ramirez and Cesar Marco Antonio Robles

11.4 13:00-13:20 Characterization and testing of PZLT ferroelectric ceramics with two Pt implants
Carlos Gonzalez and Ernesto Suaste

12
Session BIO2: Biomedical engineering
Wednesday September 26, 2012
15:00-16:00
Session Chair: Dr. Marco Ramírez T.

12.1 15:00-15:20 Modification of the Germination and the Total Length of Wheat Seedling by an Infrared-Continuous Wave Semiconductor Laser.
Mauricio Hernández, Alexandre Michtchenko and Olga Budagovskaya

12.2 15:20-15:40 Laser Diagnostics of Fruits in Storage
Alexandre Michtchenko, Mauricio Hernández and Olga Budagovskaya

12.3 15:40-16:00 Tumor Breast Phantom vs Breast Phantom Microwave Ablation: Thermal Experimentation and Electric Property Measurements
Rocio Ortega, Lorenzo Leija and Arturo Vera

13
Session BIO3: Biomedical engineering
Wednesday September 26, 2012
17:30-18:50
Session Chair: Dr. Roberto Muñoz Guerrero

13.1 17:30-17:50 Enhancing Ultrasound Images using the Recursive p-step Unbiased FIR Filter
Luis Javier Morales-Mendoza, René Fabián Vazquez-Bautista, Celia Calderón-Ramón, Efren Morales-Mendoza, Yuriy Shmaliy and Jaime Martínez-Castillo

13.2 17:50-18:10 Pressure Distribution Analysis of Focused Shock Wave by Using Finite Element Method
Angélica Báez, Pablo Rogelio Hernández, Arturo Vera, Eladio Cardiel and Lorenzo Leija

13.3 18:10-18:30 High-intensity Focused Ultrasound Thermal Mapping by using a Thermocouple embedded in a Tissue-Mimicking Material
Raquel Martinez, Arturo Vera and Lorenzo Leija

13.4 18:30-18:50 Experimental Determination of the Amplitude Attenuation Coefficient of Ultrasound in Pure Water: a Comparison between Some Pulse Techniques
Daniel Novelo Galicia, Arturo Vera Hernández and Lorenzo Leija Salas

Computer science and computer engineering (COMP)

14 Session COMP1-COMP2: Engineering and application
Thursday September 27, 2012
9:00-11:00
Session Chair: Dr. Francisco Rodríguez/Dr. Amilcar Meneses

14.1 9:00-9:20 A Novel Adaptive Filtering for Audio Signals Using Artificial Hydrocarbon Networks
Hiram Ponce Espinosa, Pedro Ponce Cruz and Arturo Molina Gutiérrez

14.2 9:20-9:40 Communication-aware Scalability Analysis Based on Critical Path
Yufei Lin, Yuhua Tang, Yun Liu and Xinhai Xu

14.3 9:40-10:00 Application of Tabu Search for Transmission Expansion Planning considering Power Quality Aspects
Sigridt García-Martínez, Elisa Espinosa-Juárez and J. Jesús Rico-Melgoza

14.4 10:00-10:20 A Vision Interface System to Predict the Visual Output of different Retinal Architectures
Edgar Yair Bautista López, Laura Cristina García Villalpando, José Antonio Loaiza Brito, Luis Niño de Rivera Y Oyarzábal and Ricardo Israel Calzada Salas

14.5 10:20-10:40 Artificial Neural Networks as Auxiliary Tools in the Diagnosis of Malnutrition Related Diseases
Antonio Arista-Jalife and H.A. Arista-Viveros

14.6 10:40-11:00 Optimal Detection of Multiplicative Watermarks in Laplacian Channels
Mario Gonzalez-Lee, Luis Javier Morales-Mendoza, René Fabián Vazquez-Bautista and Efren Morales-Mendoza

15 Session COMP3: Programming and web services
Thursday September 27, 2012
12:30-13:30
Session Chair: Dr. Oliver Schütze

15.1 12:30-12:50 UML Model of a standard API for cloud computing application development
Miguel Felipe Perez Escalera and Miguel Angel León Chávez

15.2 12:50-13:10 A Game Theoretic Approach for Modeling Optimal Data Sharing on Online Social Networks
Charles Kamhoua, Kevin Kwiat and Joon Park

15.3 13:10-13:30 Building Topic Maps from Relational Databases
Adan Jose-Garcia, Ivan Lopez-Arevalo and Victor Sosa-Sosa

16
Session COMP4: Optimization and evolutionary computing
Thursday September 27, 2012
15:00-16:00
Session Chair: Dr. Luis Gerardo de la Fraga

16.1 15:00-15:20 Towards Type-Safe and Context-based Behavior Adaptation
Changpeng Zhu, Yinliang Zhao and Bo Han

16.2 15:20-15:40 Grasp Quality for the Object Transportation by Communities of Mobile Robots
Ezra Federico Parra-González and José Gabriel Ramírez-Torres

16.3 15:40-16:00 Improvement of Voltage Sags Indices by Applying a Reconfiguration Technique Based on Genetic Algorithms
Elisa Espinosa and Jorge Lucio

17
Session COMP5: Mathematical Methods
Thursday September 27, 2012
17:30-18:50
Session Chair: Dr. Guillermo Morales

17.1 17:30-17:50 On the Design of Special Hash Functions for Multiple Hash Tables
Eleazar Jimenez Serrano

17.2 17:50-18:10 Batch source-code plagiarism detection using an algorithm for the bounded longest common subsequence problem
Rodrigo Alexander Castro Campos and Francisco Javier Zaragoza Martínez

17.3 18:10-18:30 Obstacle avoidance using PSO
Carlos Alberto López Franco, Juan Antonio Zepeda, Nancy Arana Daniel and Lilibet López-Franco

17.4 18:30-18:50 Dynamic Web Services Selection Using a Hidden Markov Model
Daniel G. Cantón Puerto, Victor Uc Cetina and Francisco Moo Mena
Solid-state materials, electron devices and integrated circuits (SSM)

**18**  
**Session SSM1-SSM2 Modern Device Technology/ICD-Integrated Circuit Design**  
**Thursday September 27, 2012**  
**9:00-11:00**

**Session Chair:** Dr. Alfredo Reyes

18.1 9:00-9:20  
Three stage low noise operational amplifier design for a 0.18 um CMOS process  
Ayub Soltani, Masoud Yaghmaie, Behrooz Razeghi, Reza Pourandoost, Saber Izadpanah Tous and Abbas Golmakani

18.2 9:20-9:40  
Extraction Noise Transport Time and its Impact over the Four Noise Parameters of Advanced SiGe HBT  
Luis Pineda Loyda Florencia, Ramirez García Eloy and Enciso Aguilar Mauro Alberto

18.3 9:40-10:00  
Preparation, deposition and characterization of PTFTs based on PCDTBT/PMMA  
Fernando Ulloa, José Sánchez and Magali Estrada

18.4 10:00-10:20  
FGMOS Four-Quadrant Analog Multiplier  
Jesús de la Cruz-Alejo, A. Santiago Medina Vazquez and Luz Noe Oliva-Moreno

18.5 10:20-10:40  
Modified Standard Cell Methodology for VLSI Layout Compaction  
Ehecatl Joel Chavez-Martinez, Moises Chavez-Martinez and Marco Antonio Gurrola-Navarro

18.6 10:40-11:00  
4-Bit Arithmetic Logic Unit (ALU) based on Neuron MOS Transistors  
Eleazar Cortes, Mario Reyes, Luis Flores and Alejandro

**19**  
**Session SSM3-Semiconductor Device Modeling**  
**Thursday September 27, 2012**  
**12:30-13:30**

**Session Chair:** Dr. Gabriel Romero

19.1 12:30-12:50  
Transport of heat and electricity in p-n semiconductor structures  
Yuri G. Gurevich and Igor Lashkevych

19.2 12:50-13:10  
Simple Mathematical Model for Solar Cell Development Forecasting  
Gaspar Casados-Cruz and Arturo Morales-Acevedo

19.3 13:10-13:30  
An Approach: FPGA based Dynamically Reconfigurable Architecture to enable several scheme controls for Power Converters
20  
Session SSM4-Applied Semiconductor Technology  
Thursday September 27, 2012  
15:00-16:00  
Session Chair: Dr. Felipe Gómez  

20.1  15:00-15:20  
Micropulsed system for studying thermal properties of metallic nano-films at room conditions  
J. M. Lugo, V. Rejon and A. I. Oliva  

20.2  15:20-15:40  
Power-Quality Model Based on IGBT Dynamic-Conduction for Non-Polluting Lighting Applications  
Roberto Baca, Jose Eduardo Huerta, Jose Alberto Andraca and Ramon Peña  

20.3  15:40-16:00  
Automation of a crystal growth system by the liquid phase epitaxy technique  
Francisco De Anda and Francisco Sánchez  

21  
Session SSM5-Synthesis and Characterization of Semiconductor Materials  
Thursday September 27, 2012  
17:30-18:50  
Session Chair: Dr. Yasuhiro Matsumoto  

21.1  17:30-17:50  
Simplified adjusting and simulation of a pseudo Gaussian function in voltage domain generated with FGMOS transistors on circuit simulation software exportable to a multi-domain platform.  
Edgar Norman Vazquez-Acosta, Mario Alfredo Reyes-Barranca, Salvador Medoza-Acevedo and Jose Luis Gonzalez-Vidal  

21.2  17:50-18:10  
Doping Effect on the Physical Properties of Zinc Oxide Thin Films  
Heberto Gómez, Jose L. Gonzalez, Gonzalo A. Torees, M. De La L. Olvera and Arturo Maldonado  

21.3  18:10-18:30  
Characterization and Fabrication of SiOx Nano-metric Films, obtained by Reactive Sputtering  
Jesús Alarcón Salazar, Mariano Aceves Mirajes, Sergio Roman López and Ciro Falcony  

22  
Session SSM6-Synthesis and Characterization of Semiconductor Materials  
Friday September 28, 2012  
9:00-10:00  
Session Chair: Dr. Mauricio Ortega
22.1 9:00-9:20  Effect of Doping Concentration and Substrate Temperature on the Physical Properties of Indium-doped Zinc Oxide Thin Films
Rajesh Roshan Biswal, Arturo Maldonado and Maria De La Luz Olvera

22.2 9:20-9:40  Synthesis of Tin Oxide Powders by Homogeneous Precipitation. Structural and Morphological Characterization
Venkata Krishna Karthik Tangirala, Maria De La Luz Olvera Amador and Arturo Maldonado Alvarez

Information and Communications Technology (ICT)

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Session ICT- Information and Communications Technology (ICT)

Friday September 28, 2012
9:00-10:00
Session Chair: Dr. Giselle M. Galván Tejada

23.1 9:00-9:20  Automatic classification of the frequency chirp in directly modulated lasers using cross–correlation
Veronica Rivera-Silva, Alonso Millan-Mejia and Ramon Gutierrez-Castrejon

O. Herminio Chávez Román, Volodymyr Ponomaryov and Ricardo Peralta-Fabi

23.3 9:40-10:00  Modeling the RFID Radio Channel applied to Vehicular Identification as a Waveguide Environment
Ricardo Meneses, Roberto Linares and Laura Montes

Mechatronics (MEC)

24

Session MEC1-Robotic Systems
Friday September 28, 2012
9:00-10:00
Session Chair: Dr. Daniel Melchor

24.1 9:00-9:20  On Robot Motion Control via Adaptive Neural Networks
Sergio Puga-Guzmán, Javier Moreno-Valenzuela and Víctor Santibáñez

24.2 9:20-9:40  Design and Control of a Robot with Two Fingers
Victor Hilario Mendez-Salas, Marco Antonio Oliver-Salazar, Dariusz Szwedorwicz-Wasik and Gerardo Silva-Navarro

24.3 9:40-10:00  A New AUV Configuration With Four Tilting Thrusters: Navigation and Hover Tasks.
Ivan Torres, Jorge Torres and Rogelio Lozano

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Session MEC2-Electromechanical Systems
Friday September 28, 2012
12:30-13:50
Session Chair: Dr. Daniel Melchor

25.1 12:30-12:50 Metronome Synchronization using Feedback Control
Israel Lugo Cardenas, Miguel Luis Ramirez Barrios, Guadalupe Maldonado Montiel, Alberto Soria López and Juan Carlos Martinez García

25.2 12:50-13:10 Experimental Comparison of Control Techniques for a Permanent Magnet Synchronous Motor
Christian Noe Huerta-Saucedo, Ricardo Alvarez-Salas, John Alexander Cortes-Romero, Victor Cardenas, Roberto Morales Caporal and Felipe Pazos

Ricardo Alvarez Salas, Miguel Angel Esparza Gurrola, Homero Miranda Vidales, Eduardo Cabal Yepez, Arturo Garcia Perez, Rene De Jesus Romero Troncoso and Roque Osornio Rios

25.4 13:30-13:50 2-D High Precision Laser Sensor for Detecting Small Defects in PCBs
Daniel Lopez-Escogido and Adriano De Luca

Interactive Design and Manufacturing (IDM)

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IDM-Interactive Design and Manufacturing
Friday September 28, 2012
12:30-13:50
Session Chair: Dr. Amilcar Meneses

26.1 12:30-12:50 Object-Oriented Programming as an alternative to industrial control
Abraham Moreno Reyna, Arturo Gómez Ortega, Noe Sierra Romero, Diego Armando Díaz Vargas, Gerardo Antonio Félix Zárate, Samuel Ernesto Fernández Murillo and Samantha Lidia Narváez Granados

26.2 12:50-13:10 VIM: Development of a CAD-Viewer for iOS oriented to Manufacture
Samuel Ernesto Fernández Murillo, Diego Armando Díaz Vargas, Gerardo Antonio Félix Zarate, Arturo Gómez Ortega, Noe Sierra Romero and Abraham Moreno Reyna
26.3 13:10-13:30  Moiré Patterns in Red
Hector Zapata, Francisco Fernandez and Ana Leonor Rivera

26.4 13:30-13:50  Comparison of Satellite Antenna Feeders for Fixed Applications
Mario Reyes-Ayala and Hildeberto Jardon-Aguilar
Keynote Speakers

Rifat Sipahi, Ph.D.

Department of Mechanical and Industrial Engineering
Northeastern University, Boston, MA. USA

Personal web page: http://www1.coe.neu.edu/~rifat/

Plenary Talk: Effects of Delays to Dynamical Behavior; Applications and Insights from Linear Systems Theory

Many of us may have experienced how time delays in dynamical systems can create confusing effects on system behavior. Such systems are found in many applications in engineering, physics, and operations research, and even in daily life. In this talk, I will first give an overview of such applications, and present how the presence of delays may impact real-world systems. Next, I will discuss the effects of delays, both detrimental and sometimes beneficial to dynamic behavior, and argue that consideration of delays in system modeling is essential for properly controlling such systems; otherwise the consequences could be catastrophic. I will then summarize the underlying mathematics of the associated stability theory, and next look into some fundamental control problems with delays, via linear systems theory, in order to gain qualitative insight about how delays affect stability and the ability to control. I will conclude my talk with observations, existing challenges in the field, and upcoming trends.

Biography

Rifat Sipahi received the B.Sc. degree in mechanical engineering from Istanbul Technical University, Istanbul, Turkey, in 2000, and the M.Sc. and Ph.D. degrees in mechanical engineering from the University of Connecticut, Storrs, in 2003 and 2005, respectively.

He joined the Department of Mechanical and Industrial Engineering, Northeastern University, Boston, MA, as an Assistant Professor in 2006, and since then he has been directing the Complex Dynamical Systems and Control Laboratory (CDSCL).

Dr. Sipahi was awarded the Chateaubriand Postdoctoral Scholarship of the French Government to conduct research at Universite de Technologie de Compiegne, France, during 2005–2006. He
is the recipient of a 2011 DARPA Young Faculty Award. He is a member of ASME Dynamic Systems and Control Division and IEEE. His research interests include system level approach to understanding the interconnections among delayed dynamical systems, stability, and network/topology of coupled systems arising in engineering, and physics problems.

**Tutorial: Techniques to Calculate the Critical Eigenvalues of LTI Systems with Delays**

In this short course, I will first of all discuss the essentials of stability analysis of LTI systems with delays using frequency domain tools, and explain how stability of such systems can be studied with respect to the delay parameter. Essential in this analysis is the calculation of the critical eigenvalues of the LTI system with delays. I will present several techniques for such calculations, and discuss delay-dependent and delay-independent stability properties. During the course, I will also ask questions to the audience, to strengthen the learning and to show how some special cases should be handled. The audience does not need any tools, except paper and pencil; however those interested to get engaged with the lecture are welcome to bring a laptop with MatLab and/or a symbolic manipulator, such as Mathematica or Maple.
Ricardo G. Hahn, Ph.D.

School of Medicine and Alfred E. Mann Institute for Biomedical Engineering
Professor of the University of Southern California, Los Angeles, CA, USA

Personal web page: http://ami.usc.edu/about/rhahn.php

Plenary Talk: A Unified Methodology for Development and Commercialization of Novel Medical Technologies

This presentation will describe a method for development and commercialization of medical devices under one umbrella. The expertise necessary to successfully accelerate the commercialization of these products includes:

- Understanding Intellectual property
- Establishing a sound engineering and manufacturing method
- Developing expertise in all Regulatory and FDA requirements
- Having a tailored Marketing strategy appropriate for each product
- Detail for each of these components will be presented

Biography:

Ricardo Guillermo Hahn is professor of Family Medicine at the University of Southern California School of Medicine. Born in Buenos Aires, Argentina, Dr. Hahn earned an undergraduate degree and a Master’s degree in Preventive Medicine at the University of Washington, Seattle before attending medical school there. He completed a residency in Family Medicine at the Medical University of South Carolina in Charleston and a fellowship in Emergency Medicine at the University of California, San Francisco. He is a board-certified family physician in practice at the Keck School of Medicine at the University of Southern California.

Prior to joining the faculty at USC in 1995, Dr. Hahn held faculty positions at UCSF, University of Michigan, Medical University of South Carolina, and the University of Tennessee in Memphis. He served as Chair of the Department of Family Medicine from 1995 until 2006. During that time he grew the department to a $18 million operation.
Dr. Hahn is a teacher, administrator, consultant, researcher, inventor and author. He serves on the editorial board of five scientific journals and is a member of numerous professional societies. Dr. Hahn’s research interests include the development and use of technical tools specific to the practice of Family Medicine, principles of rural practice, systems of access to health care, population based disease prevention, and postgraduate training models in Family Medicine.
Plenary Talk: Materials and Devices Considerations for Flexible Electronics: Are Organic-Based Materials and Devices Really Necessary?

The field of flexible electronics has expanded tremendously over the past few years. Similar to what happened in silicon integrated circuit technology 40 years ago; flexible electronics are now at a point where system design and process integration will drive the technology. Flexible electronics will likely push the limits of material performance, process integration, circuit design, and system integration to demonstrate the full potential of flexible electronics. In general, key components for any flexible electronic application include thin film transistors. In order to be competitive with state-of-the-art aSi:H thin film transistors, any other thin film transistor technology must show reproducible transistor parameters such as mobility, threshold voltage, drive current and reliability. However, a grand challenge in flexible, thin-film-transistor (TFT) circuitry is the development of complementary metal oxide semiconductor (CMOS) circuits. Although flexible digital circuits, flexible sensors, flexible batteries and solar cells have already been demonstrated, the missing technology piece that must be developed is flexible analog circuitry. For example, an operational amplifier will enable the interface to most sensors and actuators, significantly expanding the functionality of flexible electronic systems.

In this talk, we will discuss advantages and disadvantages of organic and inorganic materials for flexible electronics. In particular, we introduce n- and p-type chalcogenide-based materials that can be used as the building blocks for analog CMOS-based circuits. We will also introduce the use of chemical bath deposition as an alternative to deposit these materials and will discuss the correlation between device characteristics and materials properties. Photolithography-based chalcogenide-based TFTs processed by chemical bath deposition achieved mobilities in the order of 10-25 cm^2/V·s. We also present the impact of semiconductor thickness, gate dielectrics and contact in device performance. In addition, NAND, NOR and Inverters are demonstrated using chalcogenide-based materials integrated with either a-Si or pentacene. Device processing
is carried out at a maximum processing temperature of 110°C, which is compatible with most plastic substrates.

Biography:

RESEARCH SUMMARY
Flexible electronics is an exciting technology which requires expertise in several areas such as physics, chemistry and engineering. Therefore, the students in our group will not only gain experience with state-of-the-art instrumentation and techniques but also gain an understanding of the inter-disciplinary nature of this area. Students also interact with our collaborators at several US universities and laboratories, as well as with collaborators abroad. Flexible electronics has many new applications, ranging from large area sensors to flexible displays to roll-up photovoltaics. However, to make flexible electronics a viable technology a number of key components still need to be developed including memory, logic, analog devices and amplifiers. The Flexible Electronics group in the Materials Science Department at UTD, is focused in the development and integration of these different components. Current projects include:

Sensors for Detecting Radiation. We work in new technologies for nuclear threat detection, including the fundamental interactions of neutrons and charged particles with matter. We design and fabricate complex circuits and test devices for sensitivity and radiation hardness. We work in collaboration with the Gen-II fabrication facility at the Flexible Display Center at Arizona State University.

Nano-Engineered Materials for Flexible Electronics. (Metals, Dielectrics, Semiconductors). The students work on the development of nano-structured materials for contacts, dielectrics and semiconductors for flexible electronics. They learn about fundamental materials synthesis and characterization as well as device fabrication to correlate materials properties with device performance.

Process Integration (nMOS, pMOS, CMOS, etc). In this area the group explores the issues associated with the effect of materials properties and chemistry and structure of the electrode/organic interface with the electrical performance of organic thin film transistor (OTFT) devices. This work will be performed in collaboration with Centro de Investigacion en Materiales Avanzados (CIMAV), which is one of Mexico's leading research laboratories in nanoscale science.

Device modeling and Simulation. We work in electrostatic simulations to model electronic transport in molecular systems, which in conjunction with device fabrication and testing, aid in improving the understanding of organic semiconductor materials and devices. We fabricate representative organic semiconductor devices with different molecules, grain sizes, grain orientations, and other parameters; measure their electrical characteristics, and develop, validate, and refine original mathematical and computer models to describe the electrical characteristics of the devices.
Energy Harvesting and Storage. In this area the group works on the development of alternate energy storage and harvesting technologies. In particular, the group focuses on thermoelectric interface engineering, novel acceptor and donor materials for organic solar cells, and novel MEMS devices based on piezoelectric active materials. Super capacitors based on high-k particles blended in organic materials are also studied for energy storage applications.

EDUCATION
Ph.D. Materials Science & Engineering University of North Texas 06/02
M. S. Materials Science & Engineering Saltillo Institute of Technology 06/98
B. Sc. Chemistry University of Sonora 06/96

EXPERIENCE
Associate Professor, University of Texas at Dallas, USA, 09/10 – Now
Adjunct Professor, University of North Texas, USA, 07/03 – Now
Adjunct Professor, University of Sonora, Mexico, 01/06 – Now
Research Professor, University of Texas at Dallas, USA, 04/07 – 08/10
Member Technical Staff, Texas Instruments, Inc., 06/02 – 04/07
Member Technical, Staff SEMATECH, 06/04 – 12/06
Research Assistant, University of North Texas, 08/98 – 06/02
Sergio Rajsbaum, Ph.D.

Professor, Institute of Mathematics
Nacional Autonomous University of México (UNAM)

Plenary Talk: Two Stories about Love: the Geometry of Distributed Systems

Distributed computing encompasses a wide range of systems and models. At one extreme, there are tiny graphical processing units and specialized devices, in which large arrays of simple processors work in lock-step. In the middle, desktops and servers contain several multithreaded, multicore processors, which use shared memory communication to work on common tasks.

At the other extreme, “cloud” computing and peer-to-peer systems may encompass thousands of machines that span every continent. These systems appear to have little in common besides the concern with complexity, failures and timing. Yet, they aim of this talk is to reveal the astonishing fact that they do have much in common, and what they have in common is that computing in a distributed system is essentially a form of stretching one geometric object to make it fit into another in a way determined by the problem.

Two simple stories will be used to illustrate that topology provides the common framework that explains essential properties of these models.

Biography:

Sergio Rajsbaum received a degree in Computer Engineering from the National Autonomous University of Mexico (UNAM) in 1985, and a PhD in the Computer Science Department at the Israeli Institute of Technology-Technion in 1991, under the supervision of Shimon Even. In 1991 he joined the Institute of Mathematics at UNAM, where he is currently a Professor. He was a visiting scientist at the Laboratory for Computer Science of MIT 1993-1995, in the Theory of Distributed Systems Group of Nancy Lynch. As part of this post-doctoral stay, he also visited the Cambridge Research Laboratory of HP. He was a Research Staff member there from September 1999 to September 2002, on Sabbatical leave, and has spent shorter research visits
in several other universities, mainly University of Rennes, University of Paris, Technion, Weizmann Institute and UCLA. His research interests are in the theory of distributed computing, especially issues related to coordination, complexity and computability. He is also interested in graph theory and algorithms. He has been a Program Committee member of dozens of international conferences, and chair of the program committee for Latin American Theoretical Informatics LATIN02, for ACM PODC03, and for ENCO6. He has been Steering Committee member of several international conferences, such as DISC, LADC, LATIN, PODC. He is currently the Chair of the Steering Committee of the ACM Principles of Distributed Conference (PODC).
Manuel A. Duarte Mermou, Ph.D.

Professor Electrical Engineering Department
University of Chile

Personal web page: http://www.cec.uchile.cl/~mduartem/

**Plenary Talk: "Fractional Adaptive Control: Some Advances and Lot of Open Problems"

A pesar que el cálculo fraccionario es casi tan antiguo como el cálculo integral-diferencial clásico, sólo recientemente se ha empleado en el área de modelación y control de sistemas. En el área de control, los primeros resultados exitosos fueron su aplicación al control de plantas lineales de parámetros conocidos e invariantes en el tiempo, generándose importantes resultados que permiten analizar la estabilidad de este tipo de sistemas. Recientemente ha habido esfuerzos por extender estos resultados al caso de plantas no lineales y/o de parámetros desconocidos, pero aquí, los resultados obtenidos han sido más bien modestos.

En esta charla se realiza primeramente un resumen de los principales resultados en el campo del control adaptable fraccionario presentados por varios autores y que tiene carácter de survey. Luego se presentan algunos resultados obtenidos por nuestro grupo de trabajo, que permiten resolver algunos problemas que se presentan en el control adaptable fraccionario empleando el enfoque de modelos de error. Finalmente se exponen los problemas de investigación en los cuales actualmente nos encontramos trabajando y que tienen el carácter de problemas abiertos.

**Biography:**

He got the following degrees:

Ph.D. in Electrical Engineering, 1988, Yale University, New Haven, Connecticut, USA.
M.Phil. in Electrical Engineering, 1986, Yale University, New Haven, Connecticut, USA.
M.Sc. in Electrical Engineering, 1985, Yale University, New Haven, Connecticut, USA.
E.E., June 17, 1977, University of Chile, Santiago, Chile.
B.Sc. in Electrical Engineering, November 12, 1976, University of Chile, Santiago, Chile.
He is member of:
ACCA (Chilean Association of Automatic Control) National Member of IFAC. Since 1980. Founder member.
IEEE (The Institute of Electrical and Electronics Engineers). Member since 1978. Currently Senior Member.

His research interests include:
Robust Adaptive Control (Linear and Nonlinear).
System Identification and Parameter Estimation.
Intelligent Control and Applications
Technology for Automation

**Tutorial: Fundamentos de Cálculo y Control Fraccionario**

Este curso entrega las bases del cálculo fraccionario, entendido como el cálculo en que las derivadas e integrales pueden ser de orden arbitrario (real o complejo) y no necesariamente entero, como ocurre en el cálculo tradicional. Una vez establecidas las bases del cálculo fraccionario, se estudian sus derivaciones hacia el control fraccionario de plantas enteras o fraccionarias, empleando controladores de orden fraccionario. Finalmente se entregan algunos ejemplos de aplicación tanto a nivel de simulaciones como reales, en los cuales se muestran las bondades del control fraccionario.

**Temario:**
1. Conceptos básicos de cálculo fraccionario.
2. Ecuaciones diferenciales fraccionarias.
3. Formulación en variables de estado para sistemas fraccionarios.
4. Análisis de estabilidad para sistemas dinámicos fraccionarios.
5. Diseño de controladores PID fraccionarios
6. Ejemplos de aplicaciones de control fraccionario.
7. Investigación futura en control fraccionario.
Plenary Talk: Mobile e-Government Services in Smart Society

The global world is rapidly turning into a knowledge-based society into a smart society with state-of-the-art technologies. Most people use smartphone services which include high-resolution video, web sites and high-speed data access via Wi-Fi and mobile broadband. Wireless devices like smartphones, smart Pad and smart TVs are leading a convenient and productive lifestyle and the smart work system allows people to work outside of the office. Besides, Social networking services like Twitter and Facebook are not only used to create a human network but also contribute in creating a voice for the people, which was a traditional role of the media.

Meanwhile, m-Government is the extension of e-Government to mobile platforms as well as the strategic use of government services and applications which are possible using mobile telephones, smart pad and wireless internet infrastructure. It can help make public information and government services available "anytime, anywhere" and that the mobility of these devices mandates their employment in government functions. In the presentation, it will be delivered on the trend of mobile services and the challenge of e-Government services and the case of m-Government services in Korea. He will present on the mobile e-government framework and the open government data initiative and the goals of the open data for providing the mobile e-Government services in smart society.

Biography

Young-il (Victor) Kwon is Executive Director of Information Resource Division at the National Information Society Agency (NIA) while e-Government Standard Framework(eGovFrame) Center. He has worked for 15 years on the National IT Infrastructure, e-Government project and information resource management since 1997. He had worked at the Mexico-Korea IT Cooperation Center (ITCC MEXKOR) as an IT consultant for three years (Nov. 2003~ Oct. 2006). His job experience is mainly at the fields of broadband infrastructure and IT strategy planning at the public sector with Ministry of Information and Communications (MIC) and Ministry of Public
Administration and Security (MOPAS). Prior to joining the NCA (National Computerization Agency, former NIA), he worked as an assistant manager in the private sector during 4 years. Mr. Kwon received his Master degree of Telecommunications from Korea Advanced Institute of Science and Technology (KAIST) in 1998. Now he studies IT service management for Ph.D. degree in Soongsil University.
Tutorial and Special Session Speakers

Arturo Vázquez
Customer Solutions Engineer
Google México

Francisco Solsona
Program Manager
Google México

Tutorial: Servicios en la nube

Biography

Arturo Vázquez: Es programador y arquitecto de software con más de 15 años de experiencia en desarrollo de software. Actualmente se desempeña como Customer Solutions Engineer en Google ayudando a los anunciantes y agencias más importantes integrando sus sistemas con AdWords y ayudándolos a crear experiencias interactivas únicas en YouTube. Antes de unirse a Google fue empresario, co-fundador y líder técnico en el área de desarrollo de software para instituciones financieras y de seguridad nacional. También en el pasado ha impartido cursos en la Facultad de Ciencias de la UNAM de la que es egresado de la licenciatura en Ciencias de la Computación.

Francisco Solsona: Es Program Manager y Country Lead de Developer Relations de Google en México y parte de América Latina, se enfoca en fortalecer la comunidad de desarrolladores, ejecutando programas estratégicos de DevRel y empoderando a desarrolladores promoviendo eventos de alta calidad; así como fomentando su relación con inversionistas, empresas e instituciones educativas. Como entrenamiento para dirigir Developer Relations de Google en la región, trabajó por más de 10 años en la UNAM, como Coordinador de Cómputo de la Facultad de Ciencias y lideró varios proyectos de TI exitosos. Tiene amplia experiencia como profesor de ciencias de la computación y escribió un par de libros de fundamentos de computación.
Ing. Luis David González Valdez
Wireless Component and Security Engineer
Chrysler de México

**Special Session: The Automotive Industry Needs and Areas of Opportunity Focused on Electrical Engineering**

The more recent history of the automotive industry has been characterized by an increasing use of electronics. The driving force for this trend can be traced primarily to the continual growth of customer wishes for a modern automobile and stricter government regulations.

This presentation addresses the implementation and interconnection of electronic components in the vehicle as well as the advantages of Electronic Control Units (ECU) interconnected versus independent modules working in the automobile.

This will include the way to implement these interconnections using basic concepts of networking and the CAN protocol (Controller Area Network) used at Chrysler. The latest technological applications regarding electronic engineering will be explained in order to illustrate the subject of this presentation.
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de La Cruz-Alejo, Jesús

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De Luca, Adriano

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Durand, Sylvain
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Dávila, Jorge A.
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Abstracts

Automatic Control (AC)

1 Session AC1: Distributed parameter systems
Wednesday September 26, 2012
12:00-13:20

1.1 Delayed-error Equations for Controller Design
Araceli Gárate-García, Susana Vázquez-Vallín and Luis A. Márquez-Martínez

Abstract: A methodology to solve the trajectory tracking problem for systems with noise position signal is proposed in this paper. Such signal is obtained from direct measurement, and must be filtered to reduce unwanted noise, and to estimate its time-derivative. It is shown that the use of delay-differential error equations is instrumental to achieve the stability despite a constant delay, which is inherent to the filtering process.

1.2 On the Practical Stability for a class of Switched System
Carlos Manuel Perez, Alexander Poznyak and Vadim Azhmyakov

Abstract: This paper addresses a problem of robust control for a class of switched systems with time-delays. We deal with controllable nonlinear models that satisfy a quasi-Lipschitz condition and include bounded perturbations. The stabilization issue is carried out by two linear feedback controls: the static and the switching one. We also apply the extended version of the invariant ellipsoid method in combination with the Lyapunov-Krasovskii stability approach. Sufficient conditions of practical stability are derived in terms of Linear Matrix Inequalities (LMIs). The result is illustrated by a numerical example.

1.3 Neuro-Observer based in Backstepping Technique for Distributed Parameters Systems
Rita Q. Fuentes, Isaac Chairez and Alexander Poznyak

Abstract: The aim of this manuscript is to present an observer design for partially known distributed parameters systems described by Partial Dierential Equations (PDE) using Differential Neural Networks (DNN) methodology and backstepping-like procedure. A Volterra-like integral transformation is used to change the coordinates of the error dynamics into exponentially stable target system. This gives us the output injection functions of the observer which are obtained by solving a PDE system. DNN are used to find an explicit solution to the PDE system and to make the observer gains to be discontinuous which have well known advantages. Theoretical results were proved using the Lyapunov theory. A numerical example demonstrates the proposed method effectiveness.

2 Session AC2: Linear systems
Wednesday September 26, 2012
15:00-16:00
2.1 Self-Triggered Control for the Stabilization of Linear Systems
Sylvain Durand, Jose Fermi Guerrero Castellanos and Rogelio Lozano-Leal

Abstract: Contrary to the classical (time-triggered) principle that samples the system states and calculates the control signal in a periodic fashion, a self-triggered control predicts the next time at which the states must be sampled and the control signal updated and applied. The main advantage of self-triggered control implementation is that it eliminates the resource utilization for continuously monitoring the states. In this paper, a new self-triggered control strategy is proposed. We propose to emulate the universal event-based formula -- developed in previous work -- to calculate the feedback law and the next activation time. We claim that our proposal behaves better than the existing self-triggered approaches due to the universal formula properties. The study is restricted to the stabilization of linear systems. Some simulations are presented comparing the proposal with existing techniques.

2.2 A parametrization of all one parameter stabilizing controllers and a mixed sensitivity problem, for square systems
René Galindo Orozco and Cutberto Daniel Conejo Rosas

Abstract: Explicit formulas of the Parametrization of All one parameter Stabilizing Controllers (PASC) for square systems, are presented. Multi Input Multi Output (MIMO), strictly proper, lumped and Linear Time Invariant (LTI) systems with stabilizable and detectable realizations are considered. It is assumed that the state dimension is even, the input dimension is half the state dimension, and the plant is strongly stabilizable and detectable. The separation principle is applied to design a dynamic output control in a controller-observer feedback configuration. The results for the observer are gotten by duality. For both controller and observer, right and left coprime factorizations of the transfer function in terms of the state space realization are proposed, right and left Diophantine equations are solved, and the controller and observer belong to the PASC. Conditions to get strong stability are given and the free parameters of the stabilizing controllers are fixed solving a Mixed Sensitivity Problem (MISP). The results are illustrated through a simulation example of a two-cart system.

2.3 Quadratic Stability Methodology by Parameter Dependent State Feedback for LPV Systems
Eduardo Martinez Zambrano and René Galindo Orozco

Abstract: This paper presents an alternative methodology to solve the quadratic stabilization problem via parameter dependent state feedback. Stability of the closed loop LPV system is guaranteed in each vertex and its control law inside the polytope is gotten by interpolation. this technique is proved using a parameter dependent Lyapunov function of the closed loop system considering an upper bound of the rate variations of the parameters. The results are illustrated by a simulation example of a two-cart system.
### 3 Session AC3: Optimization and optimal control

**Wednesday September 26, 2012**

**17:30-18:50**

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#### 3.1 Practical Stability of Control Processes Governed by Semi-explicit DAEs

*Raymundo Juárez, Vadim Azhmyakov and Alexander Poznyak*

**Abstract:** This paper deals with a new approach to robust control design for a class of nonlinearly affine control systems. The dynamical models under consideration are described by a special class of structured implicit differential equations called semi-explicit differential-algebraic equations (of index one), in the presence of additive bounded uncertainties. The proposed robust feedback design procedure is based on an extended version of the classical invariant ellipsoid technique that we call the Attractive Ellipsoid (AE) method. The theoretic schemes elaborated in our contribution are illustrated by a simple computational example.

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#### 3.2 A Robust Dynamic Controller for a Class of Nonlinear Systems with Sample-Data Outputs

*Manuel Mera, Alex Poznyak, Vadim Azhmyakov and Andrey Polyakov*

**Abstract:** In this paper we study a class of continues nonlinear control systems associated with the specific sampled outputs. The dynamical model under consideration is described by ordinary differential equations in the presence of additive bounded uncertainties. We propose a linear-type control design procedure that guarantees the robustness property of the closed-loop realization. The proposed design method incorporates a concept of the dynamic feedback controller and a newly elaborated extended version of the classic invariant ellipsoid method. The applicability of the proposed control design scheme is illustrated by a computational example. A brief discussion on the numerical issues is also included.

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#### 3.3 Optimal growth by Dynamic Programming approach for reduced system for the Microalgae Culture.

*Irandi Gutierrez Carmona, Jorge Antonio Torres Muñoz and Alma Rosa Dominguez Bocanegra*

**Abstract:** The optimal microalgae growth problem of the photosynthetic factory (PSF) is studied here. The objective is to maximize the photosynthetic production rate (related proportionally to the specific growth rate of microalgae) by manipulating the irradiance. Since microalgae growth is affected by slow and fast dynamics, an optimal control on the well known reduced model is shown. Since the optimal control obtained does not depend on the states of the system but only in the time, it can be assumed as an open loop control. This is an important result because measure cost can be omitted.

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### 4 Session AC4: Tracking

**Wednesday September 26, 2012**

**12:00-13:20**

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#### 4.1 Discontinuous H∞-Control of Mechanical Manipulators with Frictional Joints
Oscar Montano and Yury Orlov

**Abstract:** Nonlinear $H_\infty$-controller synthesis is developed for discontinuous time-varying systems via measurement feedback. Theoretical results are applied to a position tracking control problem for mechanical systems with friction. The friction model chosen for treatment is confined to the Coulomb model augmented with viscous friction. Performance issues of the nonlinear $H_\infty$-tracking controller are first illustrated in a numerical simulation and then are supported by an experimental study made for a three degrees-of-freedom robot manipulator.

4.2 Experimental Comparison Between Discrete- and Continuous-Time Controllers for Multi-Agent Robots Systems

**Eduardo Aranda-Bricaire, David Ernesto Hernández-Mendoza and Guillermo Rey Peñaloza Mendoza**

**Abstract:** This paper presents an experimental comparison between discrete- and continuous-time formation and marching controllers for Multi-Agent Systems. The analysis is applied to the kinematic model of unicycle-type robots where the output function is a point off the robots’ wheels axis. The control strategies are based on Artificial Potential Functions. The discrete-time model is obtained using Euler approximation. The comparison is made by matching the sum of the control signals of all the robots. Since there is an algebraic relation between the control signals and the energy applied to the system, if the overall control is equal for both schemes then the errors of the discrete- and continuous-time schemes can be compared.

4.3 Attitude Observer and Trajectory Tracking for a Group of Unicycle-Type Robots

**Jaime González-Sierra, Eduardo Aranda-Bricaire and Hugo Rodríguez-Cortés**

**Abstract:** This paper presents three trajectory tracking control strategies for groups unicycle-type robots based on the leader-followers scheme using an observer in order to estimate the orientation angle of each robot. The leader robot converges asymptotically to a smooth trajectory while the follower robots are formed in an undirected open-chain configuration at the same time. The control laws are based on a dynamical extension of the kinematic model of each robot. The output functions to be controlled are the midpoint of the wheels axis of every robot. This choice leads to an ill defined control law when the robot is at rest. To avoid such singularities, a complementary control law is enabled momentarily when the linear velocity of the unicycles is close to zero. Numerical simulations complete the paper.

5 Session AC5: Autonomous vehicles

**Wednesday September 26, 2012 15:00-16:00**

5.1 Modeling and control of a vertical take-off airplane

**Víctor Rosas, Rogelio Lozano, Jorge Torres and Zizilia Zamudio**

**Abstract:** This paper presents the mathematical model of a fixed wing UAV (Unmanned Aerial Vehicle). The UAV is not a tail-sitter configuration and takes-off with
the fuselage at the horizontal position. An experimental prototype driven by four brushless motors has been built including the onboard avionics. The applied control law is based on separated saturation functions. Numerical simulations have shown the satisfactory performance of the proposed control law. The prototype has also been tested experimentally and the control strategy has achieved that orientation angles have been regulated close to the origin.

5.2 State Estimation for a Bio-Inspired Hovering Robot Equipped with an Angular Sensor
Rodrigo Munguía and Augustin Manecy

Abstract: The present paper describes a methodology to estimate the attitude and the position of a bio-inspired robot as well the position of a target. The robot is equipped with a decoupled eye yielding an angular measurement relative to a target and doesn’t use IMU. An Extended Kalman Filter is designed to estimate robot and target states. Simulation results show that the estimator is able to converge to the actual states, and reject some perturbations. It is important to highlight that the method assumes that the initial position of the target is unknown. As a consequence no initial guess for the target position is needed.

5.3 Depth control using artificial vision with time-delay of an AUV
Eduardo Campos, Jorge Antonio Torres, Sabine Mondié and Rogelio Lozano

Abstract: The purpose of this paper is to present the analysis of the dynamics immersion of an Autonomous Underwater Vehicle considering the time-delay produced by implementing artificial vision algorithm. The parameter tuning of the PD controller is based on the analysis of the stability region taking into account the vision delay. The PD controller goal is to keep the vehicle in a region close to the landmark, and the performance is shown in simulation and real-time experimental results.

6 Session AC6: Mechanical systems
Wednesday September 26, 2012
17:30-18:50

6.1 Modeling and Control of a Lower Limb Exoskeleton with two degrees of freedom
Ricardo Lopez, Sergio Salazar, Jorge Torres and Rogelio Lozano

Abstract: The exoskeletons are biomechanisms used for amplification of strength, load heavy objects, increase speed and human resistance. For this reason the exoskeletons have many medical and military applications. The present paper concerns about construction and control of exoskeleton assisted by SEA (Series Elastic Actuators) having two degrees of freedom (knee and ankle). This exoskeleton offers a reduction in effort required by the user to reach and keep the stand up position as well as to performs some exercises like flexing the leg, etc.

6.2 Stability analysis and experiments for a force augmenting device
Suresh Kumar Gadi, Rogelio Lozano, Rubén Garrido and Antonio Osorio
Abstract: We present preliminary results of a one degree of freedom (DOF) linear moving force augmenting device (FAD) with a force sensor for enhancing the lifting capabilities of a human user. We perform a stability test of the feedback loop formed by the device and a model of the human operator. It is shown that the operator lifts a small fraction of the total weight of the load. The proposed control scheme is illustrated using numerical simulations and an experiment.

6.3 A Model Matching for the Stabilization of the Two Wheels Inverted Pendulum
Oscar Octavio Gutiérrez-Frias and Alberto Luviano-Juarez

Abstract: In this article, a model matching controller for the stabilization of the Two Wheels Inverted Pendulum is present. The stabilization strategy consists in forcing the closed-loop system to behave as another nonlinear target system with some stability properties. To this end, we solve two matching conditions that allow us to shape a suitable target system and we obtain the stabilizing controller. The resulting closed-loop system is locally asymptotically exponentially stable, with a very large domain of attraction.

7 Session AC7-AC8: Electromechanical systems/Neural networks, Fuzzy logic
Thursday September 27, 2012
9:00-11:00

7.1 Digital Simulation of the Conventional DTC with Fuzzy Speed

Abstract: This paper introduced the design, the programming and the simulation of the conventional Direct torque Control (DTC) with fuzzy speed regulator for PM synchronous motors. First the conventional DTC scheme with classical Proportional Integral (PI) speed controller is programmed and simulated. Then a proposed fuzzy-logic-based-speed controller is designed and embedded on the DTC scheme in order to improve the speed signal response under different operating points. Simulated results confirm that the proposed intelligent controller provides better results than the commonly used classical controller one.
mechanical systems and also discuss some conceptual computational algorithms.

### 7.3 Closed-loop identification analysis of a DC servomechanism: A Passive Approach

Roger Miranda Colorado, José Luis Luna Pérez, Augusto Acuña Leal and Liborio Bortoni Anzures

**Abstract:** This paper deals with the analysis of a closed-loop identification technique applied to a DC servomechanism from a passivity point of view. It is shown that the closed-loop system together with the identification algorithm can be divided into simpler subsystems easier to analyze and then, many properties related to passivity and stability can be deduced. Furthermore, it is shown that with this separation approach we have the freedom to select many controller structures, which could let to improve the performance of the identification algorithm, even in presence of perturbation signals.

### 7.4 Nonlinear Control for Plants with Partial Information via Takagi-Sugeno models: an Application on the Twin Rotor MIMO System

Temoatzin González, Pedro Rivera and Miguel Bernal

**Abstract:** This work is concerned with the synthesis of nonlinear controllers for plants where full state information is not available. By means of the equivalent Takagi-Sugeno form of the nonlinear model, conditions were found that allow a parallel distributed compensation of the model to be constructed only with partial information of the state and no need of an observer. These conditions are expressed in terms of linear matrix inequalities which are efficiently solved by convex optimization techniques in commercially available software. The proposed approach is successfully applied to the stabilization of a twin rotor MIMO system and compared with another partial-information technique.

### 7.5 Inverse Optimal Neural Control with Speed Gradient for a Power Electric System with Changes in Loads

Enrique A. Lastire, Alma Y. Alanis and Edgar N. Sanchez

**Abstract:** In this paper an inverse optimal neural controller with speed gradient (SG) for discrete-time unknown nonlinear systems, in presence of external disturbances and parameter uncertainties is presented. It is based on a discrete-time recurrent high order neural network (RHONN) trained with an extended Kalman filter (EKF)-based algorithm. A reduced neural model for synchronous machine is proposed for the stabilization of nine bus system in the presence of a fault in a line of transmission with some variations in loads.

### 7.6 FPGA-Based Space Vector PWM with Artificial Neural Networks

Joycer Osorio, Pedro Ponce and Arturo Molina

**Abstract:** This article presents the improvement of a PWM technique, called Space Vector PWM (SVPWM), using an Artificial Neural Network (ANN) to minimize the mathematical complexity involved with the SVPWM. The latter is a pulse-width modulation technique that is widely implemented to control AC electric motors. The results obtained from this research...
work will be used for further implementation of artificial intelligence techniques to control electric vehicle powertrains. Matlab is implemented for the ANN design and Labview for the FPGA programming and implementation.

8 Session AC9: Failure detection and identification
Thursday September 27, 2012
12:30-13:30

8.1 Using a Realization Technique for System Identification: Application on a Hydraulic Testbed
Brian Manuel González-Contreras, Isaac Hilario-Contreras, Miguel Angel Carrasco-Aguilar and Leticia Flores-Pulido

Abstract: Practitioner engineers in both academic and industrial areas, are often faced with the challenge of identifying the model of a given system or process in order to setup a controller or to extract some useful information. Among the existing identification algorithms, those being numerically simple and stable are more attractive for practitioners. This paper deals with identification of state-space models, i.e., the state space matrices A, B, C and D for multivariable dynamic systems directly from test data (data-driven). In order to guarantee numerical reliability and modest computational complexity compared with other identification techniques, in this paper, we propose a synergistic identification technique based on the principal components analysis (PCA) and subspace identification method (SIM) under white noise assumptions. The proposed technique identifies the parity space--PS (or null space) from input/output data, and from there, the matrices related to the system through the extended observability matrix and a block triangular Toeplitz matrix. In order to show its capability, the proposed identification technique is applied to an academic test bed that is related to a hydraulic process.

8.2 Leak Isolation with Temperature Compensation in Pipelines.
Alejandro Pizano and Ofelia Begovich

Abstract: In this paper an update for the friction coefficient and the kinematic viscosity is proposed in order to enhance the performance of a leak isolation algorithm LIA in face of temperature changes. The performance of the enhanced LIA is compared in simulation with the original one. The results shows a better performance of the enhanced LIA under temperature changes.

8.3 Instrumenting and Programming a Virtual Instrument for an Open Loop System to Control Gliding Centrifugal Thermal Plasma
Gerardo Jiménez-Aviles, Ricardo Valdivia-Barrientos, Joel-Osvaldo Pacheco-Sotelo, Jesús Silva-Rosas, Fidel Ramos-Flores, Marquidia Pacheco-Pacheco and Carlos Rivera-Rodríguez

Abstract: This paper describes: 1) the implementation of one system for controlling and monitoring physical variables involved in starting and sustaining a three-phase centrifuged gliding-arc (TPCGA) discharge called gliding centrifugal thermal plasma (GCTP), and 2) the analysis of data collected in spreadsheets by a virtual instrument (VI) to explain plasma
behavior. The goal of this work was to program a VI through LabVIEW™ for establishing a central unit to control the performing of the GCTP, and for recording the measurements of the analog signals involved in the process. Data are used to support the analysis and diagnosis steps. In addition, it could also help to propose a closed loop control design, because of the identification of extreme values. Instrumentation also considers the installation of an AC voltage source, gas flow valves, data acquisition cards, and current, pressure, and temperature sensors. For security reasons, a remote interface version of the VI was uploaded to internet. It can be approached when toxic gases are treated.

9th International Conference on Electrical Engineering, Computing Science and Automatic Control (CCE 2012)

Alexander Loukianov, Jorge Rivera, Alma Alanis and Juan José Raygoza

Abstract: In this work, a sensorless control scheme is presented for linear induction motors. The secondary fluxes are algebraically calculated by first determining the primary fluxes, then, a super-twistig observer for secondary fluxes is designed in order to retrieve the back-EMF components by means of the equivalent control method. Based on these components, the linear velocity is determined and used in a linear velocity and load force observer, where the estimated variables along with primary current and voltage measurements are used to control the linear induction motor for the tracking of a reference linear velocity signal and a square secondary flux modulus, all by means of a super-twisting controller. Simulations show that the proposed observer based controller scheme performs well when tracking a time varying linear velocity signal.

9.1 HOSM Block Control of SPIM
Guillermo Rubio, Juan D. Sanchez, Jose M. Cañedo and Alexander G. Loukianov

Abstract: In the continuation of authors studies on control and estimation for Single-Phase Induction Motor (SPIM), a new observer-based controller using second order sliding mode (SM) algorithms is proposed here. The scheme observer-controller only uses measurements of the rotor speed and stator currents. The complete scheme is robust to uncertainties in the rotor resistances, and a bounded time-varying load torque.

9.2 Super-Twisting Sensorless Control of Linear Induction Motors

9.3 Super-Twisting Sliding Mode Control of Synchronous Motors
Jediael Machin Almeida, Alexander Loukianov and Jose Manuel Cañedo Castañeda

Abstract: Based on a nonlinear complete order model of a synchronous motor, a robust second order sliding mode observer based control scheme is proposed. To design this scheme a super-twisting sliding mode control and adaptive backstepping techniques, are implemented. A nonlinear reduced order observer is designed for estimation of the rotor fluxes. The simulation result shows the effectiveness of the proposed controller.
10 Session AC11: Power systems
Thursday September 27, 2012
17:30-18:50

10.1 Robust Quasi-Continuous Sliding-Mode Control of a Variable-Speed Wind Turbine
Jován O. Mérida, Jorge A. Dávila and Luis T. Aguilar

Abstract: In this paper, a quasi-continuous sliding-mode strategy is done which solve the problem of power generation for variable-speed wind turbine systems. The control objective is to maximize the extracted energy from the wind while reducing mechanical loads. The properties of the proposed controller are robustness to parametric uncertainties of the turbine, robustness with respect to external disturbances, robustness to unmodeled dynamics and accuracy, with an accuracy of higher order and finite reaching time. The high-order sliding-mode controller is applied to reduce the effects of chattering in the generated torque that could lead to increased mechanical stress because of strong torque variations. We use a realistic model which take into account the nonlinear dynamic aspect of the wind turbine and the turbulent nature of the wind. We assume that only the rotor speed and electric power are available from measurements on the wind turbine. In order to validate the mathematical model and evaluate the performance of proposed controller, we used the National Renewable Energy Laboratory (NREL) aerelastic wind turbine simulator FAST. Simulation and validation results show that the proposed control strategy has improvements in comparison with the existing controllers.

10.2 Discontinuous Output Regulation for a DC-to-AC Boost Converter
Alexander Loukianov, Jorge Rivera, Florentino Chavira and Susana Ortega

Abstract: This work presents the design of a discontinuous output regulator for a DC-to-AC power conversion problem on a boost converter, for asymptotic output trajectory tracking. The steady state reference signal for the inductor current is proposed as an approximated solution of the well known Francis-Isidori-Byrnes equations, then, by a proper selection of a sliding surface one can stabilize the non-minimum phase inductor current tracking variable. Finally, by means of numerical simulations one verifies the performance of the proposed control strategy.

10.3 Evaluating the Performance of the BTB Converter under Unbalanced Voltage Sags
Ricardo Sierra, Janeth Alcalá, Victor Cardenas, Javier Perez-Ramírez and Ana Rivera

Abstract: In this work, a control structure to maintain the power flow transference in renewable energy systems based on wind turbines operating under unbalanced voltage conditions is presented. In the proposed scheme, the Back-to-Back (BTB) converter preserves the electrical cogeneration under the occurrence of voltage sags type B, C and D in three-phase systems. The control modeling is developed in the dq reference frame and two control schemes are proposed to control the BTB
Biomedical engineering (BIO)

11 Session BIO1: Biomedical engineering
Wednesday September 26, 2012
12:00-13:20

11.1 Method for Automatic Detection and Classification of N1 and P2 Auditory Evoked Potentials in EEG recordings
Jennifer Ladd Parada and Carlos Alvarado Serrano

Abstract: The current averaging method for event related evoked potentials does not allow to study the potentials’ variability, thus a detection algorithm that allows to recognise the potentials elicited by each stimulus is desirable. This paper compares Neural Networks and Supported Vector Machines as classifiers to be integrated to an automated detection algorithm. EEG recordings of 5 subjects (3 female, 2 male) were made, while auditory stimulus was provided. The recordings were filtered with a 2nd order Butterworth lowpass filter with cutoff frequency at 40 Hz. A free database provided by California Institute of Technology with several auditory evoked potential (EP) events was used to train the models used to identify the N100-P200 complex. Once a model was achieved, it was first validated with new data, and then incorporated to an algorithm that identified the complex in a non segmented EEG recording. An average sensitivity of 93.26% was achieved with only 136 false positives in over 25 minutes of 6 channel EEG recording. These results prove that individual detection of EPs is possible, thus enabling future studies in variability.

11.2 Time and Amplitude Relationships of the Ballistocardiogram in Vertical and Horizontal Direction
Pablo Luna-Lozano and Carlos Alvarado-Serrano

Biomedical engineering (BIO)
Abstract: The ballistocardiogram (BCG) is the record of the reaction forces of the body due to the mechanical action of the heart and the blood flow in the main arteries. Currently the BCG is commonly recorded in longitudinal direction (head-to-foot) and has been proposed as a complementary tool to estimate hemodynamic changes either alone or simultaneous with an additional cardiac signal used as a reference. However, the relationship between the BCG in different directions has not received much attention. In this work, the vertical and horizontal BCG in seated subjects are analyzed and their amplitude and time relationship are explored. Three different analyses have been performed: each separate BCG, between BCG signals, and between both BCG signals and the electrocardiogram. Time analysis of both BCG signals show that the I wave in the horizontal precedes that in the vertical direction, which contrast to the reported previously in the bibliography. The H wave was usually smaller in the horizontal BCG than in the vertical BCG, or even absent in the former. Two-axis BCG, which is easily recorded in seated persons, can be used as a complementary tool to assess the cardiovascular system.

11.3 A Simplified Method for Numerically Solving the Impedance Equation in the Plane
Ariana Bucio, Raul Castillo-Perez, Marco Ramirez and Cesar Marco Antonio Robles

Abstract: Abstract—Employing elements of the modern Pseudoanalytic Function Theory, we propose one of the most simplified numerical methods for solving the forward boundary value problem of the two-dimensional Impedance Equation, remarking the possible contribution the obtained results, into the modern theory of the Electrical Impedance Tomography.

11.4 Characterization and testing of PZLT ferroelectric ceramics with two Pt implants
Carlos Gonzalez and Ernesto Suaste

Abstract: Recently, a new PLZT bulk single plate, called ceramic-controlled piezoelectric with two Pt wires (CCP2) has been produced; this CCP2 has two (300 µm of diameter and 1 cm long) Pt-wire implants. These isolation was validated using four experimental setups, one of them determine that ceramic-controlled piezoelectric with two Pt wires (CCP2) support up to 6 kV DC before it cracks (short cut). The second experimental setup determined high resistance about 3.9X10^9 Ω and 1.8X10^9 Ω measured on lateral sides and among Pt wires of CCP2 respectively. The third experimental setup was to obtain the current leakage from CCP2 and it was 6 nA. The fourth experimental setup was to obtain frequency response that was the maximum up to 2.2 MHz and was a high pass filter.

12 Session BIO2: Biomedical engineering
Wednesday September 26, 2012
15:00-16:00

12.1 Modification of the Germination and the Total Length of Wheat Seedling by an Infrared-Continuous Wave Semiconductor Laser.
Mauricio Hernández, Alexandre Michtchenko and Olga Budagovskaya
Abstract: The present work analyses the stimulation effects caused by a continuous wave semiconductor laser in the infrared spectra on wheat seeds. To stimulate the wheat seeds fifteen laser treatments were used. The germination and the total length of wheat seedlings were analyzed. The highest effects were obtained for an intensity of laser radiation of \( I = 60 \text{ mW/cm}^2 \) and exposition times of 30s and 60s. The intensity of laser radiation and the exposition time are important parameters that can improve the germination and the growth of wheat seedlings.

12.2 Laser Diagnostics of Fruits In Storage
Alexandre Michtchenko, Mauricio Hernández and Olga Budagovskaya

Abstract: The parameters of induced chlorophyll fluorescence can reveal the post-harvest effect of internal and external factors on various apple and pear fruits being used as example. Dynamic index determining drop rate of fluorescence intensity in slow induction phase is considered to be the most sensitive one. The given methods allow high precise diagnostics of fruit functional state for optimization of storage period and terms

12.3 Tumor Breast Phantom vs Breast Phantom Microwave Ablation: Thermal Experimentation and Electric Property Measurements
Rocio Ortega, Lorenzo Leija and Arturo Vera

Abstract: Thermal experimentation and electric properties measurements are presented, using tumor breast phantom and breast phantom built on our laboratory. Electric properties were measured, to find similar characteristics between breast and tumor breast tissue and phantoms. For tumor breast phantom, we obtained a variation of 4.1216 for dielectric constant and 0.3798 S/m for electric conductivity. Breast phantom had a variation of 0.7065 for permittivity and electric conductivity had a variation of 0.0066 S/m. Microwave ablation therapy was applied on both phantoms for five minutes, with 10 watts of power. According to literature reports, tumor breast tissue presents higher temperature than breast tissue, but our results present breast phantom temperature higher than tumor tissue. It is necessary to find other materials for tumor breast phantom to get higher temperatures than breast phantom.

13 Session BIO3: Biomedical engineering
Wednesday September 26, 2012
17:30-18:50

13.1 Enhancing Ultrasound Images using the Recursive p-step Unbiased FIR Filter
Luis Javier Morales-Mendoza, René Fabián Vazquez-Bautista, Celia Calderón-Ramón, Efren Morales-Mendoza, Yuriy Shmaliy and Jaime Martinez-Castillo

Abstract: In this paper, we present a computational scheme for the implementation of p-step UFIR filter to ultrasound image processing. The recursive scheme is focused both signal to noise ratio and root mean-square-error on filter improved performance. In this way, quantitative evaluations are computed to verify the performance carried out by the new recursive computational scheme under metrics. On the other hand, qualitative evaluations are showed for both cases:
signals (one dimensional) and images (two dimensional). Finally, this efficient computational algorithm manifests an outstanding signal/image enhancing with strong metric convergence despite the computational complexity.

13.2 Pressure Distribution Analysis of Focused Shock Wave by Using Finite Element Method
Angélica Báez, Pablo Rogelio Hernández, Arturo Vera, Eladio Cardiel and Lorenzo Leija

Abstract: The aim of this study is to simulate the focusing of a shock wave to analyze the pressure generated by shock wave and to verify that the focus has the smallest width of the wavefront and the maximum pressure value. It was necessary to consider a specific geometry to achieve the focusing of a shock wave; in this case a semi-ellipse was used. When a shock wave is generated in a semi-ellipse, a part of the wave is transmitted and the remaining wave is reflected. The simulation was achieved by using the finite element method because this method allows obtaining a numerical solution at any point in the considered domain. For the non-reflected wave its pressure decreases as it moves and scatters as it moves away from the semi-ellipse. The part of the wave that is reflected on the surface of the semi-ellipse focuses later at a focal point while the width of its waveform is reduced and its pressure increases. Furthermore, the pressure obtained during the trajectory of the reflected wave is not zero and may damage surrounding materials, like organs in a lithotripsy treatment, surrounding the focal point.

13.3 High-intensity Focused Ultrasound Thermal Mapping by using a Thermocouple embedded in a Tissue-Mimicking Material
Raquel Martinez, Arturo Vera and Lorenzo Leija

Abstract: High-intensity focused ultrasound is a non invasive technique for tumor ablation. Focused ultrasound concentrates energy at a small spot called “focus”. Temperature elevation at the focus can reach over 56°C rapidly. This causes irreversible damages to cells and provokes coagulative necrosis. Common acoustic characterization is performed by scanning with a hydrophone across and along the beam path. The disadvantage of this technique is that it has to be done at low power in order to avoid hydrophone damage. Thermocouple displacement across and along the beam path allows the temperature measurement at high acoustic power or at similar clinical conditions. In this paper, it is presented the temperature measurement as a complementary technique to characterize acoustic fields and to explore the thermal distribution at focus. HIFU thermal mapping is performed by recording the temperature sensed by a hypodermic thermocouple embedded in a tissue mimicking material. The thermal distribution of a HIFU transducer with focal distance of 17 mm is reported. Temperature maps 2 mm ahead and 2 mm behind the focal distance with a 1 mm z-displacement are presented. HIFU transducer was excited with a 1.9 MHz continuous wave at 20 W. Thermal maps showed a different temperature distribution for each transversal plane reconstructed.

13.4 Experimental Determination of the Amplitude Attenuation Coefficient of
Ultrasound in Pure Water: a Comparison between Some Pulse Techniques  
*Daniel Novelo Galicia, Arturo Vera Hernández and Lorenzo Leija Salas*

**Abstract:** The aim of this paper is to compare the results obtained from three experiments carried out to determine the amplitude attenuation coefficient of bi-distilled degassed water. Pulse techniques were implemented in through transmission and pulse-echo configurations. A pulser device and a function generator were employed to drive transducers of 1 MHz and 5 MHz. In two of the three experiments, a sweep along the ultrasonic propagation path was performed by an electronic positioning system in order to register the decaying amplitude of the ultrasonic beam at several points within the distance between the emitter and the receiver or target. Results were obtained by estimating the exponential function that described the behavior of the far field zone of the radiated ultrasound. Obtained values of the attenuation coefficient did not show concordance with the one defined by literature. Errors related to the discrepancies are presumably associated with the frequencies involved but they have not been completely identified. Nevertheless, experiments yielded successively better results.

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14.1 A Novel Adaptive Filtering for Audio Signals Using Artificial Hydrocarbon Networks  
*Hiram Ponce Espinosa, Pedro Ponce Cruz and Arturo Molina Gutiérrez*

**Abstract:** The present paper introduces a novel adaptive filtering for audio signals corrupted with white noise. The audio filter is based on artificial hydrocarbon networks (AHNs), a novel approach inspired on organic chemistry for stability, well-forming and easy-spanning topologies. In that sense, an AHN-molecular structure adapts its parameters in a specific window to cancel signal noise from original audio sequence using the notion of filtering given by AHN-topologies. Results of the present approach show that artificial hydrocarbon networks can achieve audio filtering for noisy signals. Then, a comparison between AHN-filtering and FIR filtering is presented. In addition, the AHN-filtering is implemented on DSP NI-Speedy 33 hardware.

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14.2 Communication-aware Scalability Analysis Based on Critical Path  
*Yufei Lin, Yuhua Tang, Yun Liu and Xinhai Xu*

**Abstract:** With the scale of parallel computing system growing up, the influence of the communication overhead cannot be ignored. Parallel speedup is the most commonly used metric for evaluating scalability in parallel computing, and we propose communication-aware speedup based on the traditional speedup to quantitatively analyze the system scalability. This paper presents the definition of
communication-aware scalability, discusses the communication-aware scalability by using critical path, and then quantitatively classifies the systems according to their communication-aware scalabilities. Through case studies, we analyze the communication-aware scalabilities of some parallel systems. A significant conclusion of this paper is that the system is scalable, if the communication overhead increases at a rate with lower exponent than parallel workload.

14.3 Application of Tabu Search for Transmission Expansion Planning considering Power Quality Aspects
Sigridt García-Martinez, Elisa Espinosa-Juárez and J. Jesús Rico-Melgoza

Abstract: In this paper an optimization process based on the application of the Tabu Search is developed to expand the electrical networks searching the topology that minimizes the voltage sag/year number in the electrical system. A case study on an IEEE test system is presented for addressing a static transmission expansion planning in a IEEE test system in order to show the application of the developed methodology.

14.4 A Vision Interface System to Predict the Visual Output of different Retinal Architectures
Edgar Yair Bautista López, Laura Cristina García Villalpando, José Antonio Loaiza Brito, Luis Niño de Rivera Y Oyarzábal and Ricardo Israel Calzada Salas

Abstract: Foveated retina have been studied in the last decades by researchers in order to design bio-inspired new artificial light sensing artifacts which visual properties could be applied in many different fields. A key point is the effect of different space photoreceptors distribution over the retina layout. The space distribution of photoreceptors in different retina arrangement define new vision properties of those artifacts, then researchers and designers require new software tools to predict the visual performance of new retina architectures, where distribution of the photoreceptors can be defined according to a set of different geometrical patterns. Animal world is full of different photoreceptors retinal distribution examples that let animals acquired specific skills for living. We discuses in these paper a new friendly software tool that can be applied to predict the performance of different photoreceptor arrangements in both: natural or artificial retinas. The friendly Software presented in these paper is called Vision Interface System (VIS). The VIS predicts the visual performance of four different foveated models. The Loaiza[1], The Maximum and Minimum, the Poligonal and The Fuga foveated models.

14.5 Artificial Neural Networks as Auxiliary Tools in the Diagnosis of Malnutrition Related Diseases
Antonio Arista-Jalife and H.A. Arista-Viveros

Abstract: We present the application of Self-Organizing Maps, combined with multi-layer Artificial Neural Networks, as a reliable auxiliary tool for the diagnosis of twelve common diseases, related with feeding difficulties on children upto twelve years old. The posed tool succeeds to pre diagnose with 96.2% of accuracy the proper diseases, under certain conditions of truncate information input.
14.6 Optimal Detection of Multiplicative Watermarks in Laplacian Channels
Mario Gonzalez-Lee, Luis Javier Morales-Mendoza, René Fabián Vazquez-Bautista and Efren Morales-Mendoza

Abstract: In this work, we propose a model for an optimal detector of digital watermarks for Laplacian channels, the watermark embedding algorithm is the multiplicative embedding rule in time domain, the optimal detection equation and the threshold equation are derived using maximum likelihood (ML) and Neyman-Pearson criterion. The resulting system is blind and has very low complexity. Computer simulations are carried out applying the proposed model to audio signals and results prove that the proposed system is able to detect watermarks even if the watermarked object was severely attacked by noise, low pass filtering among other attacks.

15 Session COMP3: Programming and web services
Thursday September 27, 2012
12:30-13:30

15.1 UML Model of a standard API for cloud computing application development
Miguel Felipe Perez Escalera and Miguel Angel León Chávez

Abstract: This paper proposes a model of a standard application programming interface (API) for common services used by cloud applications. It aims to homogenize the development over clouds in order to ease portability. The model includes the analysis, design and implementation using the Unified Modeling Language (UML). The paper discusses also quality criteria for its evaluation.

15.2 A Game Theoretic Approach for Modeling Optimal Data Sharing on Online Social Networks
Charles Kamhoua, Kevin Kwiat and Joon Park

Abstract: Today, Online Social Network (OSN) services have evolved as the highest-growing medium, enabling various online activities on one platform. However, they also bring new threats and privacy issues to the community. In a reliable OSN service, a user should be able to set up his or her desired level of information sharing with a certain group of other users. Unfortunately, there are attackers that may attempt to expose OSN users’ private information or conceal the information that the user would like to share with other users. Therefore, in this paper, we propose a game theoretic approach for helping OSN users determine their optimum policy on OSNs in terms of data sharing, based on a two-player (i.e., agent and opponent) zero-sum Markov game model.

15.3 Building Topic Maps from Relational Databases
Adan Jose-Garcia, Ivan Lopez-Arevalo and Victor Sosa-Sosa

Abstract: Relational Databases (RDB) have been traditionally widely used as the backend database for information systems. Considering that RDBs contain valuable data, the challenge is to find out how to improve accessing and sharing knowledge
that resides in databases. The use of topic maps is one solution for representing that knowledge. However, manual development of topic maps is a difficult, time consuming and subjective task if there is not a common guideline. The existing topic maps building approaches convert RDBs without considering the knowledge residing in the database. This paper proposes an automatic approach that considers the background knowledge in the building process of topic maps. The proposed model was implemented and applied on a benchmark of RDBs. The resulted topic maps were validated syntactically using the Ontopia Vizigator tool and validated semantically through the inference of information using the Tolog query language. The results found in our experiments are encouraging.

16 Session COMP4: Optimization and evolutionary computing
Thursday September 27, 2012
15:00-16:00

16.1 Towards Type-Safe and Context-based Behavior Adaptation
Changpeng Zhu, Yinliang Zhao and Bo Han

Abstract: Object composition is often advocated as a more flexible approach to specialize the behavior of objects dynamically. In this paper, we propose Dynamic Object Evolution Featherweight Java (DOEFJ), an extension of Featherweight Java with object composition and consultation, to support dynamic behavior adjustment of the program. In DOEFJ, instances of layered classes are created at run-time by the runtime system and are specialized in object composition. According to the current execution context, objects can be evolved by object composition to obtain new context-specific methods. A consultant based mechanism ensures that these new methods are correctly executed. With these mechanisms, the DOEFJ program can dynamically adapts its behavior to the current execution context. The sound type system of DOEFJ assures that no "message-not-understood" errors occur at run-time.

16.2 Grasp Quality for the Object Transportation by Communities of Mobile Robots
Ezra Federico Parra-González and José Gabriel Ramírez-Torres

Abstract: The box-pushing problem, where a community of mobile robots must move an object in cluttered environments, represents a very interesting challenge for the development of coordination schemes for multiagent systems, with multiple practical applications. In this paper we present a brief review of the cooperative multi robot box pushing problem and the related trends, and we describe the strategy that we propose to solve it. Specifically in this work we will addresses the problem of grasping a polygonal object that will be manipulated by mobile robots that only can push the object. The strategy was inspired in the way that robotic hands grasp objects.

16.3 Improvement of Voltage Sags Indices by Applying a Reconfiguration Technique Based on Genetic Algorithms
Elisa Espinosa and Jorge Lucio

Abstract: This paper presents an application of genetic algorithms to the improvement of voltage sags indices by reconfiguration of an electrical system. Considering known
reference indices of voltage sags at system buses, the proposed methodology leads to a new configuration where the buses with previous indices of voltage sags outside the range of the reference values are reduced in order to minimize these values. In this paper, in order to streamline the solution process the Genetic Algorithm Matlab Toolbox® was used to solve the formulated optimization problem. The performance of the proposed methodology is assessed by means of case studies applied in the IEEE 24-bus Reliability Test System and in the IEEE 118-bus Test System.

17 Session COMP5: Mathematical Methods
Thursday September 27, 2012
17:30-18:50

17.1 On the Design of Special Hash Functions for Multiple Hash Tables
Eleazar Jimenez Serrano

Abstract: One drawback of bitstate hashing, the traditional probabilistic state space analysis method, is the possible large amount of wasted memory for achieving a high probability of no address collision. We look at trade-off between hashing speed and memory assigned for hashing. This paper presents a method using multiple hash tables and special hash functions and shows relevant results not just in increasing the probability of no address collision but in reducing the memory for hashing.

17.2 Batch source-code plagiarism detection using an algorithm for the bounded longest common subsequence problem

Rodrigo Alexander Castro Campos and Francisco Javier Zaragoza Martinez

Abstract: Source-code plagiarism detection is an unfortunate but necessary activity when reviewing assignments of programming courses. While being reasonably easy to fool, string-based comparisons offer a high degree of accuracy with almost no false positives and usually a good string similarity metric is the length of their longest common subsequence. In the case of two strings, the dynamic programming algorithm for this calculation unfortunately takes quadratic time even if the strings are equal. In this paper we present an algorithm that, given a batch of source-code files, efficiently finds all pairs of similar files by preprocessing the files and then using a fast branch-and-bound algorithm to find only those pairs whose longest common subsequence is indicative of plagiarism.

17.3 Obstacle avoidance using PSO
Carlos Alberto López Franco, Juan Antonio Zepeda, Nancy Arana Daniel and Lilibet López-Franco

Abstract: In this paper we present an obstacle avoidance algorithm based on Particle Swarm Optimization (PSO), which is a stochastic optimization technique. The PSO algorithm was modified in order to solve the proposed problem, in our case each particle of the PSO represents a new position, during the PSO algorithm each particle is tested to see if it represents a valid position. The best PSO particle represents the new subgoal, this goal is used by a controller to move the robot from its current position to the subgoal. The algorithm is tested with different maps, that
show the robot's path avoiding obstacles and reaching the goal.

17.4 Dynamic Web Services Selection Using a Hidden Markov Model
Daniel G. Cantón Puerto, Víctor Uc Cetina and Francisco Moo MENA

Abstract: In a service oriented architecture based on web services exists the possibility of failures occurring at the time a transaction between web services starts. These failures are undesired because they reduce the system's performance. In this paper we propose to reduce the number of system's failures by employing a hidden Markov model that assists in the selection of web services by using a QoS-based model.

Solid-state materials, electron devices and integrated circuits (SSM)

18 Session SSM1-SSM2 Modern Device Technology/ICD-Integrated Circuit Design
Thursday September 27, 2012
9:00-11:00

18.1 Three stage low noise operational amplifier design for a 0.18 um CMOS process
Ayub Soltani, Masoud Yaghmaie, Behrooz Razeghi, Reza Pourandoost, Saber Izadpanah Tous and Abbas Golmakani

Abstract: A new three stage low-noise, high-gain operational amplifier (Op-Amp) is proposed in this paper. Design strategies are discussed for minimizing noise and increasing gain. Multipath nested Miller compensation used for three stage operational amplifier. The circuit is designed in the 0.18µm CMOS technology. The HSPICE software was used for simulation. The simulation results show that the amplifier has a 128.5 dB open-loop DC gain and a unity gain-bandwidth of 794 MHz. Also input-referred noise of this circuit is 1.233 (nV/√Hz) at 1 MHz frequency.

18.2 Extraction Noise Transport Time and its Impact over the Four Noise Parameters of Advanced SiGe HBT
Luis Pineda Loyda Florencia, Ramirez Garcia Eloy and Enciso Aguilar Mauro Alberto

Abstract: This paper introduces some results concerning the high frequency noise analysis, along with the noise transport time extraction and its impact over the microwave noise performances of SiGe heterojunction bipolar transistors (HBT). Our methodology of noise analysis can be extended to investigate the impact of the technological variations of the base over the microwave noise performances of high speed SiGe HBTs.

18.3 Preparation, deposition and characterization of PTFTs based on PCDTBT/PMMA
Fernando Ulloa, José Sánchez and Magali Estrada

Abstract: Abstract – Frequency dependent capacitance-voltage characteristics of organic thin-film transistor based on poly[N-
9'- heptadecanyl-2,7-carbazole-alt-5,5-(4',7'-di-2-thienyl-2', 1', 3' -benzothiadiazole)] as active layer are investigated. In this paper, we characterize MIS structures and PTFTs made with PCDTBT as active layer and PMMA as dielectric. The properties of the interface between the dielectric and the active layer are analyzed using CV curves and compared to those obtained for P3HT as active layer. Furthermore, we show that the technique can be used to extract device parameters such as the mobility, and the distribution of states DOS in the active layer of the PTFTs, as well as quantitative information on the influence of charge trapping on transport and other device parameters were obtained and analyzed.

18.4 FGMOS Four-Quadrant Analog Multiplier
Jesús de La Cruz-Alejo, A. Santiago Medina Vazquez and Luz Noe Oliva-Moreno

Abstract: An accurate and suitable FGMOS four quadrant analog multiplier is successfully designed in this paper. The multiplier architecture under study is consisted of elementary floating gate CMOS transistors formed by squaring transistors and current mirrors. It is based on the square-law dependence of the MOS-transistor drain current on the gate-to-source voltage. To demonstrate the relevance of the design, aspect ratios of the transistors is taken into account, such that all the transistors are operating in saturation region. Also, in order to provide a highly linear behavior of the multiplier, the design proposed present significant benefits in terms of linearity, threshold mismatch, bandwidth, dynamic range and low power and low voltage. The multiplier is designed for SCN 0.13µm technology, the power supply is 0.5V and the power consumption is 1.56µW.

18.5 Modified Standard Cell Methodology for VLSI Layout Compaction
Ehecatl Joel Chavez-Martinez, Moises Chavez-Martinez and Marco Antonio Gurrola-Navarro

Abstract: A modification of the standard cell methodology to obtain area reduction in synthesized digital system layouts is presented. The proposed modifications consist in the full-custom redesign of the standard cell library and the application of a compaction algorithm in the step of cell placement. The effectiveness of the methodology has been shown compacting the cores of four digital systems. In the test were obtained reductions 22% minimum with a minimal increase in computational time.

18.6 4-Bit Arithmetic Logic Unit (ALU) based on Neuron MOS Transistors
Eleazar Cortes, Mario Reyes, Luis Flores and Alejandro

Abstract: A methodology is proposed for the design of a 4-Bit Arithmetic Logic Unit (ALU) based on Soft-Hardware-Logic (SHL). The core of the implementation is based on the device known as neu-MOS (v-MOS), a floating-gate MOS transistor with more than one control gate used for the digital signal processing. This configuration is reconfigurable modifying only the external voltages applied to an intermediate stage of programmable CMOS inverters, without any circuitry change, in contrast with conventional digital implementations. Here it is demonstrated that using a universal
circuit, basic Boolean functions like AND, NAND, OR, NOR, Exclusive-OR and Exclusive-NOR can be configured using Multiple-Input Floating-Gate (MIFG) Transistors or neu-MOS. Based on a graphical method called Floating-gate Potential Diagram (FPD), a very basic 4-Bit ALU was designed and simulated for a couple of arithmetic and logic functions taking advantage of the weighted sum performed at the floating gate of the neu-MOS. Weighted inputs can be obtained from the FPD and then converted to effective capacitances choosing a given CMOS technology, OnSemi’s 0.5 um technology, for instance. Results obtained from simulations of the proposed design are compared with experimental results of ALUs configured with a FPGA evaluation kit and Motorola’s MC14581B ALU chip.

19.1 Transport of heat and electricity in p-n semiconductor structures
Yuri G. Gurevich and Igor Lashkevych

Abstract: The paper is devoted to the analysis of thermoelectric cooling phenomena in a p-n semiconductor structure. The formulation of an adequate self-consistent theoretical model describing the effect is presented. The role of the recombination rate as a new source of heat in linear approximation of the electric current was discussed, leading to a reformulation of the heat balance equations. The importance of redistribution of nonequilibrium charge carriers, which has been ignored in most publications on this subject, is also shown. Moreover, it is proved that the thermoelectric cooling in the conventional theory, which does not take into account the influence of the nonequilibrium charge carriers, is not correct. In the present work it is demonstrated that the Peltier effect strongly depends on the recombination rate. In particular, it is shown that the sign of the Peltier effect changes with the value of the recombination rate.

19.2 Simple Mathematical Model for Solar Cell Development Forecasting
Gaspar Casados-Cruz and Arturo Morales-Acevedo

Abstract: Solar cells are made of several materials and device structures with the main goal of having maximum efficiency at low cost. Some types of solar cells have shown a rapid efficiency progress whereas others seem to remain constant as a consequence of different factors such as the technological and economic ones. Using information published by the National Renewable Energy Laboratory (NREL) about the increase of solar cells record efficiency we are proposing a mathematical model which let us estimate the evolution in the near future for the different cell technologies. Here, as an example, we use data for solar cells made with representative materials and structures of each of the three “PV generations”.

19.3 An Approach: FPGA based Dynamically Reconfigurable Architecture to enable several scheme controls for Power Converters
Abstract: This paper presents an alternative approach for dynamic reconfiguration (DR) that enables a Field Programmable Gate Array (FPGA) to reconfigure itself dynamically through a parallel memory without using an internal configuration access port (ICAP). This approach aims to save two configurations of two fixed designed schemes of control by Pulse Width Modulation (PWM) in Intel Strata Flash Parallel NOR PROM, available on target in order to show capabilities of the FPGAs slices for making DR applied to the control and simulation of power electronics systems in real time (RT). The methodology followed to achieve the objective of this work was Multi-boot. It has been implemented on a Spartan-3E XC3S500E Starter Board FPGA from Xilinx, but it can also be extrapolate for any other FPGAs architectures devices, such as Virtex Xilinx families, with ICAPs.

20.1 Micropulsed system for studying thermal properties of metallic nano-films at room conditions

J. M. Lugo, V. Rejon and A. I. Oliva

Abstract: An electronic system for controlling electrical current pulses with variable time in the 10-500μs range is described. The system is capable to measure and control changes on the electrical resistance (i.e, temperature) at room conditions, when micropulses are applied on the nano-thickness metallic films deposited on thick substrates. The proposed system is mainly formed by three sections: the micropulses generator which works with a PIC 16F84A device, the signals processor (AD712 and LT1210 amplifiers, and an AD734 multiplier/divider), and the data acquisition section consisting in a digital oscilloscope Tektronix model DPO 4050. Applying controlled micropulses from 10 to 500 μs and measuring the corresponding changes of temperature through the changes of the electrical resistance on the metallic films, it is possible to determine the heat capacity of metallic films at low dimensional scale. The developed micropulsed device is used to characterize gold thin films deposited on polymeric substrates. Preliminary results show that the heat capacity value of a 100 nm-gold film is 118 +/− 7 nJ/°C.

20.2 Power-Quality Model Based on IGBT Dynamic-Conduction for Non-Polluting Lighting Applications

Roberto Baca, Jose Eduardo Huerta, Jose Alberto Andraca and Ramon Peña

Abstract: In this paper, a power-quality model based on dynamic-conduction of the modern switching power devices is presented. The power-quality analysis is needed due to the serious problems by the compact fluorescent lamps (CFL) technology, including generation of poor power-quality and the risks on the human health because the CFL contain mercury. The proposed model utilizes normalized symbolic functions of the current conduction functions defined by closed time intervals, which has been applied to a single-phase AC-DC converter. Also, the total harmonic distortion (THD) is evaluated.
to demonstrate the improvement of the power quality as a function of the normalized Fourier coefficients. The principle of operation of the single-phase AC-DC converter is presented and the results indicate that power quality would be enhanced using incandescent lamps with lower power consumption.

20.3 Automation of a crystal growth system by the liquid phase epitaxy technique
Francisco De Anda and Francisco Sánchez

Abstract: The mechanical design, electronics and the control program developed in order to perform, automatically, the deposition of crystalline layers on substrates using the liquid phase epitaxy technique is described. The implementation of the system includes the hardware and control software of the substrate movements, the gas flow system, the temperature program and the monitoring of the main physical variables such as temperature, humidity, flow, pressure etc.. The movement the substrate is done by means of a solenoid whose core is coupled to the slider of the graphite boat. This system was proposed in order to maintain the hermeticity of the system which is vital to achieve the epitaxial growth and to decrease the power of the electric motor that drives the solenoid.

21.1 Simplified adjusting and simulation of a pseudo Gaussian function in voltage domain generated with FGMOS transistors on circuit simulation software exportable to a multi-domain platform.
Edgar Norman Vazquez-Acosta, Mario Alfredo Reyes-Barranca, Salvador Medoza-Acevedo and Jose Luis Gonzalez-Vidal

Abstract: Simulation software is a fundamental tool that should be used when designing systems dealing with circuit interaction, for instance. Nevertheless, there exist some inconveniences that limit and make specific software hard to use in this task. On one side, it may require a large processing hardware capacity, and on the other, simulation time increases substantially if the model complexity and accuracy required is high [1]. This work presents the procedure for adjusting and simulating a programmable pseudo Gaussian function generator implemented with eight FGMOS transistors in an analog and mixed-signal circuit simulator (Pspice®) with the interaction of a multi-domain design and simulation platform based on dynamic systems (Simulink® of Matlab®). Using the results, the best value of charge in each one of the eight transistor’s floating gates to generate a desired form of the Gaussian function can be known: This function can maintain its form thanks to the FGMOS features, using a Fowler-Nordheim charge injection. [2, 3] The main goal of this study is to show how an automated adjust using FGMOS transistors can be made in order to reach a desired and repeatable output. This is very useful because it can be used to program an artificial neuronal network.
21.2 Doping Effect on the Physical Properties of Zinc Oxide Thin Films
Heberto Gómez, Jose L. Gonzalez, Gonzalo A. Torees, M. De La L. Olvera and Arturo Maldonado

Abstract: 10-3 Ωcm, was presented in indium-doped ZnO films. SEM micrographs show a surface morphology dependent on the dopant element. The ZnO:Ga, ZnO:F, and ZnO:In films show a rough surface, whereas the surface corresponding to ZnO:Al film shows a smoother surface texture. All deposited films show an average optical transmittance in the UV-vis spectra oscillating between 75-80 %. Green light emission from F-doped ZnO was observed when excited by 325 nm He–Cd laser, which means that these films are good candidate for green light-emitting devices.

Gallium, aluminum, fluorine, and indium doped ZnO (ZnO:Ga, ZnO:Al, ZnO:F, and ZnO:In) thin films have been deposited by the chemical spray technique on soda lime-glass-silica substrates. The effect of different dopant elements on the electrical, optical, structural, and morphological properties has been investigated. The X-ray diffraction (XRD) patterns reveal that all deposited films are polycrystalline with a hexagonal wurtzite-type structure with a (002) preferential orientation for ZnO:Al, and ZnO:F, and (101) for ZnO:In, and ZnO:Ga films. The lowest electrical resistivity, around 1.5

21.3 Characterization and Fabrication of SiOx Nano-metric Films, obtained by Reactive Sputtering
Jesús Alarcón Salazar, Mariano Aceves Mirajes, Sergio Roman López and Ciro Falcony

Abstract: Nano-metric layers were obtained by reactive sputtering using different oxygen/argon (O/Ar) flow rates. Si and SiO targets were used to make SiOx films (x≤2) and these were annealed at three different temperatures, 600 ºC, 900 ºC and 1100 ºC during 30 minutes, in N2 ambient. The samples were characterized by Null Ellipsometry, Fourier Transform Infra Red (FTIR) spectroscopy, Photoluminescence (PL) and Atomic Force Microscopy (AFM). Results show that the as deposited films are off stoichiometric silicon, which move towards stoichiometric SiO2 with annealing. Poor photoluminescence was found. Average roughness (Sa) was determined between 2 a 4 nm after thermal treatments (TT).

22 Session SSM6-Synthesis and Characterization of Semiconductor Materials
Friday September 28, 2012
9:00-10:00

22.1 Effect of Doping Concentration and Substrate Temperature on the Physical Properties of Indium-doped Zinc Oxide Thin Films
Rajesh Roshan Biswal, Arturo Maldonado and Maria De La Luz Olvera

Abstract: Conductive and transparent Indium-doped zinc oxide (ZnO:In) thin films were deposited on glass substrates by the ultrasonic spray pyrolysis technique. Films were prepared from 0.2 M starting solutions of zinc acetate dissolved in a mixture of water, acetic acid and methanol. Indium acetate was used as In source at three different atomic concentrations, namely, 1, 2, and 3 at %. The effect of the Indium
concentration in the starting solution on the electrical, structural, morphological, and optical characteristics of the films was studied. Electrical resistivity as low as $2 \times 10^{-3} \Omega \text{cm}$, electron mobility around $12 \text{ cm}^2/\text{V-s}$, carrier concentration in the range $2.19 \times 10^{20}$ to $3.4 \times 10^{20} \text{ cm}^{-3}$, and an optical transmittance in the range $65\% - 75\%$ were achieved for 3 at % ZnO:In thin films. All films were polycrystalline, growing preferentially along the (002) and (101) directions, depending on the indium concentration in the starting solution. Shape and grain size were dependent on the [In/Zn] ratio in the starting solutions as well.

### 22.2 Synthesis of Tin Oxide Powders by Homogeneous Precipitation. Structural and Morphological Characterization

*Venkata Krishna Karthik Tangirala, Maria De La Luz Olvera Amador and Arturo Maldonado Alvarez*

**Abstract:** Tin oxide (SnO$_2$) powders were synthesized by two different routes by using the homogenous precipitation method. In both routes tin chloride (SnCl$_4$•5H$_2$O) was used as Sn precursor. First route consisted in preparing, separately, aqueous solutions of tin chloride and urea (CH$_4$N$_2$O) with identical molar concentration (0.05, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.8, and 1.2). The starting solutions were obtained from a 1:2 mix of Sn and Urea solutions (volume proportion), and then simultaneously stirred and heated at $93\pm 5^\circ\text{C}$, until the solutions are completely precipitated (the precipitation started at $80^\circ\text{C}$). In the second route the same tin chloride starting solution was used, but the precipitation was activated with ammonia (NH$_4$OH) instead of urea. The ammonia was added drop by drop until the pH reached a value of 12. In this route, the molarity values were varied from 0.05M to 1.3M. The precipitates were filtered and dried in a normal atmosphere (air at room temperature) at $100^\circ\text{C}$ for 24 hr. For some trials the repeatability of the process was tested, in both routes. Finally, all synthesized powders were calcined in a normal atmosphere at 6000C, 8000C, and 10000C. Structural analysis, before and after calcination, of all synthesized powders was performed by X-Ray diffraction (XRD) to confirm the SnO$_2$ phase. The morphological characteristics of the powders were analyzed by Scanning Electron Microscopy (SEM) technique. Effects of precipitation agent (urea and ammonia) and the calcination temperatures on structural and morphological properties of SnO$_2$ powders are reported in this work.

### Information and Communications Technology (ICT)

#### 23 Session ICT- Information and Communications Technology (ICT)

**Friday September 28, 2012**

**9:00-10:00**

#### 23.1 Automatic classification of the frequency chirp in directly modulated lasers using cross–correlation

*Veronica Rivera-Silva, Alonso Millan-Mejia and Ramon Gutierrez-Castrejon*

**Abstract:** An automatic method to discriminate between adiabatic and transient–chirp dominated directly
modulated semiconductor lasers (DML), useful to classify telecommunications transmitters, is presented. It is based on calculating the cross-correlation between the optical power and chirp waveforms of the device under test and the use of a decision threshold. The accuracy of the algorithm is demonstrated using simulated signals obtained from a well-tested laser model complemented with experimentally-derived parameters for several real lasers. By modifying the confinement factor, the laser chirp behavior can gradually be transformed from transient to adiabatic, thus enabling the validation of the proposed algorithm. Correct classification results are reported. Due to its flexibility, ease of implementation, simplicity and accuracy, the classification algorithm here put forward, represents a practical tool for testing and fabrication of DMLs.

23.2 Image Super Resolution Using Interpolation and Edge Extraction in Wavelet Transform Space
O. Herminio Chávez Román, Volodymyr Ponomaryov and Ricardo Peralta-Fabi

Abstract: This paper presents the results obtained using a technique based on the mutual interpolation between the image of the high frequency (HF) sub-band decomposition obtained by discrete wavelet transform (DWT) and the input image. To improve the image edges it is introduced an intermediate stage that consists of the edges` extraction through from a filter. Following, the HF sub-band images and the input LR image are mutually interpolated, and finally, all sub-band images are combined to generate a new high-resolution (HR) image using Inverse DWT (IDWT). Statistical simulation results indicate that the designed method performs better at improving than do existing methods, both in terms of objective criteria (PSNR, MAE and SSIM) and based on the more subjective measure of human vision.

23.3 Modeling the RFID Radio Channel applied to Vehicular Identification as a Waveguide Environment
Ricardo Meneses, Roberto Linares and Laura Montes

Abstract: The Radio Frequency Identification System, a wireless communication system, recently it is being applied to vehicular identification; this motivates the analysis of the propagation environment for outdoor RFID systems. The RFID System applied to the vehicular identification consists of the reader, the tag and the radio channel, which is made up by the ground (asphalt), the free space and surrounded by walls (buses, vans, sport cars, etc., located at adjacent lanes), So, radio link behavior, the radio channel can be analyzed considered it, involved in a tunnel environment and modeled as a waveguide in order to obtain the electromagnetic performance knowledge.

Mechatronics (MEC)

24  Session MEC1-Robotic Systems
Friday September 28, 2012
9:00-10:00
24.1 On Robot Motion Control via Adaptive Neural Networks
Sergio Puga-Guzmán, Javier Moreno-Valenzuela and Víctor Santibañez

Abstract: In this paper, a nonlinear proportional--derivative controller plus adaptive neuronal network compensation is proposed. With the aim of estimating the desired applied torque, a neural network is used. Then, adaptation laws for the input and output weights are derived. Asymptotic convergence of the position and velocity tracking errors is proven, while the input and output weights of the neural network are showed to be uniformly bounded. The proposed scheme has been experimentally validated in real time in a horizontal two degrees--of--freedom robot. Experimental results confirmed the practical feasibility of the proposed adaptive neural network--based controller.

24.2 Design and Control of a Robot with Two Fingers
Victor Hilario Mendez-Salas, Marco Antonio Oliver-Salazar, Dariusz Szwedowicz-Wasik and Gerardo Silva-Navarro

Abstract: The design, construction, integration, control and experimental tests for a two-fingers robot hand driven by pneumatic muscles is presented. Each finger has three degrees of freedom (DOF) and is actuated with six muscles working in antagonism (12 muscles in total). For control purposes discrete-time PID controllers are synthesized to control the angular positions for each finger, which are then embedded into a Digital Signal Controller (DSC). Several experimental tests show the good operation of the robot hand.

24.3 A New AUV Configuration With Four Tilting Thrusters: Navigation and Hover Tasks.
Ivan Torres, Jorge Torres and Rogelio Lozano

Abstract: This paper presents the study, development and implementation of an attitude controller for an AUV (Autonomous Underwater Vehicle). The goal is the hover stabilization of the prototype taking in account the dynamic modeling of translation and orientation. Missions were performed at slow speed to evaluated real time autonomous navigation. The control is based on a saturated PD control law. Results are presented from real time experiments.

25 Session MEC2-Electromechanical Systems
Friday September 28, 2012
12:30-13:50

25.1 Metronome Synchronization using Feedback Control
Israel Lugo Cardenas, Miguel Luis Ramirez Barrios, Guadalupe Maldonado Montiel, Alberto Soria López and Juan Carlos Martínez García

Abstract: This paper concerns controlled in-phase synchronization of two mechanically coupled metronomes. A Proportional and Derivative feedback control as well as a feedback linearizing controller are proposed as control laws in order to minimize the synchronization time. Experiments in a laboratory prototype show the feasibility of the proposed control law.
25.2 Experimental Comparison of Control Techniques for a Permanent Magnet Synchronous Motor

Christian Noe Huerta-Saucedo, Ricardo Alvarez-Salas, John Alexander Cortes-Romero, Victor Cardenas, Roberto Morales Caporal and Felipe Pazo

Abstract: In this paper, a comparison between the Field-Oriented Control (FOC) scheme and the Generalized Proportional Integral (GPI) controller for a permanent magnet synchronous motor (PMSM) is presented. The GPI controller scheme consists in two stages, the first one is a speed control loop which gives the reference control signals, the second stage is a current controller which generates finally the voltage signals. Experimental results show the characteristics of both control techniques.

25.3 Real-Time Emulator of an Induction Motor: FPGA-based Implementation

Ricardo Alvarez Salas, Miguel Angel Esparza Gurrola, Homero Miranda Vidales, Eduardo Cabal Yepez, Arturo Garcia Perez, Rene De Jesus Romero Troncoso and Roque Osornio Rios

Abstract: This paper presents an educational tool based on a novel approach to develop an FPGA-based real-time emulator of an induction motor using the dynamic model as base of the implementation. The method exploits the parallelism and high speed characteristics of the FPGA. Variable fixed point representation of the external and internal signal is used. The speed rate of operation after the implementation is in the range of hundreds of nanoseconds. The emulator architecture is presented as well as peripheral units implemented along with the this main unit. The real-time emulator is tested and validated by experimentation under start up and parameter variation conditions.

25.4 2-D High Precision Laser Sensor for Detecting Small Defects in PCBs

Daniel Lopez-Escogido and Adriano De Luca

Abstract: Through the use of automatic inspection systems is possible to improve the Printed Circuits Board (PCB) manufacturing and reduce the fail rate in this process. In this paper an automatic inspection system for detecting small PCB defects is presented, the system uses a 2-D high precision laser sensor; this kind of laser sensor allows getting high precision measurements with an error of units of micrometers. The sensor is able to detect Surface-Mount Devices (SMD) onto PCB’s surface in order to performa defect-detection process. The system uses an open, modular and scalable architecture for controlling a robotic motion in two axes, also a graphic application coded in java for data processing and unify all the inspection system’s components is developed. Finally a judgment algorithm for defect-detection evaluation using binary matrices is added to the system. The aim of this system is that it can detect small PCB defects using a 2-D laser sensor and that is possible to implement it in a production line. Design, tests and results gotten are shown.

Interactive Design and Manufacturing (IDM)
26  IDM-Interactive Design and Manufacturing
Friday September 28, 2012
12:30-13:50

26.1 Object-Oriented Programming as an alternative to industrial control
Abraham Moreno Reyna, Arturo Gómez Ortega, Noe Sierra Romero, Diego Armando Díaz Vargas, Gerardo Antonio Félix Zárate, Samuel Ernesto Fernández Murillo and Samantha Lidia Narváez Granados

Abstract: Object oriented programing has been developing for 30 years so far, however, it’s in the last decade that it has kept a fast growing and developing of methodologies, by using speed and processing capability advances in the develop of high complexity software. Along with this advances, automation industry has introduced and modified different methodologies such as Petri Hierarchized Net and its sub web and modules, being able to get profit from multiprocessing and apply tasks at the same time for the automate. In this article, we present similarities in concepts and structure of Object-Oriented Programming with languages of functional blocs and Petri Hierarchy Nets. We will conclude the differences in which a programmer approaches the program structure and uses them, as well as the way it is possible to introduce new concepts of object-oriented programming to these languages, such as classes and inheritances, to make easier and reducing programming developing timing in high complexity automation programs. Furthermore, the improvements that programming design brings into object-oriented in automation fields are mentioned, the develop of automation programs, in particular, as well as the impact that a harder formalization could have on concepts and methodologies.

26.2 VIM: Development of a CAD-Viewer for iOS oriented to Manufacture
Samuel Ernesto Fernández Murillo, Diego Armando Díaz Vargas, Gerardo Antonio Félix Zárate, Arturo Gómez Ortega, Noe Sierra Romero and Abraham Moreno Reyna

Abstract: This project consists on an application development with an architecture client-server for CAD files visualization used in a manufacture department, it is orientated to mobile devices based on Apple’s mobile operating system (iOS). The client application was designed and implemented using the development IDE: XCode (Apple’s property), in another side the server application was based on the infrastructure offered by the data repository (Dropbox), this data are consulted through its urls directions lodged and organized in a data base tables designed using PostgreSQL. The objective was to create an intuitive application easy to be used with the finality that the different departments related to the manufacture could access to it at the same time by its own mobile device, and to make possible to use the models and products information with its particular proposes.

26.3 Moiré Patterns in Red
Hector Zapata, Francisco Fernandez and Ana Leonor Rivera

Abstract: Design, construction and evaluation of a prototype to detect red
interference Moiré patterns are presented. Bands are generated by a red solid state laser whose light beam is transmitted through gratings constructed ad-hoc with Moiré patterns. These gratings are produced using photochemical techniques and a programming original code. A printed circuit board (PCB) of commercial red photodiodes mounted in a mechanical assembly optical rail ensures experiment reproducibility and allows light intensity quantification in different areas of the selected transmitted pattern.

26.4 Comparison of Satellite Antenna Feeders for Fixed Applications

Mario Reyes-Ayala and Hildeberto Jardon-Aguilar

Abstract: m can represent cross-polarization selectivity variations wider than 10 dBμ. This paper shows the comparison of some of the most important satellite antenna feeders for fixed applications. The design procedure of the feeders is carried out in order to contrast their main electrical features with their manufacturing tolerance. The considered characteristics are: antenna gain, beamwidth, cross-polarization discrimination, side and back lobes relation. Mechanical tolerance of +/- 10.