



Centro de Investigación y de Estudios Avanzados del I.P.N.
Departamento de Ingeniería Eléctrica

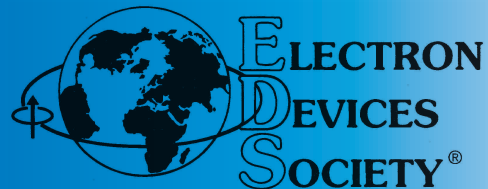


***2007 4th International Conference on Electrical and
Electronics Engineering (ICEEE 2007) and
XIII Conferencia de Ingeniería Eléctrica (CIE 2007)
Mexico City, Mexico
September 5-7, 2007***

Final Program & Abstract Book



Tlaloc
The god of rain and
fertility
National Museum of
Anthropology and
History in Mexico City



Centro de Investigación y de Estudios Avanzados del IPN
Departamento de Ingeniería Eléctrica



**2007 4th International Conference on
Electrical and Electronics Engineering
(2007 4th ICEEE)
Mexico City
September 5-7, 2007**



Final Program & Abstract Book

<http://www.ie.cinvestav.mx>
<http://iceee.ie.cinvestav.mx>

This book was elaborated using L^AT_EX2e.
Copyright © 2007 Cinvestav,
August 2007

Contents

Message from the Podium	4
2007 4th ICEEE Organizing Committee	4
Topic Chairs	6
Reviewers	7
Final Program	10
Courses	18
Round table session	20
General Information	21
Keynote Speakers	22
Plenary Conferences Abstracts	23
Abstract Book	26
Author Index	54

Message from the Podium

Dear Colleagues:

I am Honored to preside the Fourth International Electrical Engineering Congress. The evolution of the congress has been reflected in the broad diversity and high quality of the papers presented. We have received papers from various parts of the world, enabling us to share experiences in research and development. The main goal of this congress is precisely to share and integrate experiences in the disciplines we foster at our institution with other prestigious International Institutions. The connections we have with our colleagues, through work on related projects, will allow us to better our graduate programs and contribution to society. Thanks to the hard work of the organizing committee, as well as to the anonymous but extremely important work of the revisors, the best theoretical-experimental papers of the specialty have been selected for presentation at our Congress. As President of the Congress, I thank the organizing committee, the offices of the Director and the Head of the Department, the revisors, and all of those who have directly or indirectly made the Congress possible. I invite you to share the academic stay of our guests and enjoy the City of Palaces, with its magnificent museums and pre-Hispanic surroundings.

I welcome you all to your Congress.

PHD Arturo Minor Martínez

2007 4th ICEEE Organizing Committee

Dr. Arturo Minor Martínez
(General Chair)

Dr. Luis Gerardo de la Fraga
(Proceedings Editor)

Dr. Aldo Orozco Lugo
(Technical Program)

Dr. Ernesto Suaste-Gómez
(Industrial Relations and Exhibit)

Dr. Carlos Alvarado Serrano
(Logistic and courses)

Technical Support

Judith Esparza
(System and On-Line Submission)

Ricardo Gómez
(Exhibiting Assistant)

Cinvestav's Conference Management System
(On-Line Paper Submission and Reviewing System,
a free software available upon request)

Topic Chairs

- Bioengineering and Medical Electronics

Dr. Roberto Muñoz

- Communication Systems

Raúl García Ruiz

- Computer Science

Dra. Ana María Martínez Enríquez

- Electronic Circuits

- Solid-State Electronics and VLSI

Dr. Felipe Gómez Castañeda

- Electrical Power

Dr. Abraham Claudio Sánchez (CENIDET)

- Mechatronics and Automatic Control

Dr. Alejandro Rodríguez Ángeles

- Semiconductor Materials

Dr. Ramón Peña Sierra

Reviewers

Abraham Claudio Sánchez	CENIDET
Aldo G. Orozco-Lugo	CINVESTAV-IPN
Alejandro Rodriguez Angeles	CINVESTAV
Alejandro Avila Garcia	CINVESTAV
Alfredo Odon Rodriguez	UAM Iztapalapa
Andres Ivan Oliva Arias	Cinvestav IPN, Unidad Mérida
Antonio Cerdeira	Department of Electrical Engineering, Cinvestav.
Antonio Marin-Hernandez	Facultad de Fisica e Inteligencia Artificial Universidad Veracruzana
Antonio F Mondragon Torres	Texas Instruments, Dallas, USA
Arturo Velazquez Ventura	CICESE
Arturo Berrones	Universidad Autonoma de Nuevo Leon
Arturo Veloz Guerrero	Intel Tecnologia de Mexico
Carlos Alvarado-Serrano	CINVESTAV-IPN
Carlos A De La Cruz Blas	Universidad Publica de Navarra. Spain
Carlos Alberto Cruz Villar	CINVESTAV-IPN, Electrical Engineering Department
Christopher Druzgalski	California State University, Long Beach, USA
Claudio Castellanos Sanchez	LTI del Cinvestav-Tamaulipas
Daniel Ulises Campos-Delgado	Universidad Autónoma de San Luis Potosí Facultad de Ciencias
David Salazar	CICESE
Debrup Chakraborty	CINVESTAV-IPN
Decouchant Dominique	(1) Laboratoire LIG Grenoble - France (2) Dpto de Computacion - CINVESTAV-IPN - Mexico
Demetrio Villanueva	Centro de Neuro Rehabilitacion Abril
Deniz Ozdemir	Universidad Autónoma de Nuevo Leon, FIME - Posgrado en Ing. de Sistemas
Efrain Alcorta	Universidad Autónoma de Nuevo León
Elisa Schaeffer	Universidad Autónoma de Nuevo León
Enrique Daltabuit	CEM Polanco DGSCA UNAM
Federico Sandoval-Ibarra	CINVESTAV-Guadalajara Unit
Felipe Gomez Castaneda	CINVESTAV-IPN, Departamento de Ingeniería Eléctrica
Fernando Lopez	Autonomous University of Nuevo Leon
Fernando Martin Montes Gonzalez	Universidad Veracruzana
Francisco J. de Anda Salazar	ICCO-UASLP
Francisco Javier Gonzalez	Instituto de Investigación en Comunicación Óptica, Universidad Autónoma de San Luis Potosi
George Moore	University of Ulster
Giselle Galvan-Tejada	CINVESTAV-IPN
Guillermo Morales-Luna	Cinvestav-IPN
Guillermo de Jesus Hoyos Rivera	Universidad Veracruzana
Hebertt Sira Ramirez	Cinvestav-IPN
hector benitez-perez	IIMAS UNAM

Hector-Gabriel Acosta-Mesa	Universidad Veracruzana
Hernandez Matos Erique Luis	Universidad Autonoma Metropolitana Unidad Iztapalapa
Hugo Rodriguez Cortes	CINVESTAV
Ieroham Baruch	CINVESTAV-IPN, Dept. of Automatic Control
Igor Litvinchev	Universidad Autonoma de Nuevo Leon Facultad de Ingenieria Mecanica y Electrica Posgrado en Ingenieria de Sistemas
Ivan Lopez-Arevalo	Laboratory of Information Systems (Cinvestav Tamaulipas)
Jaime Leybón Ibarra	Instituto Nacional de Rehabilitación
Javier E. Gonzalez Villarruel eduardo	ITESM CEM
Jorge Alberto Morales-Saldaña	Universidad Autonoma de San Luis Potosi Facultad de Ingenieria
José Hoyo	Instituto Tecnológico de Hermosillo
Jose Guadalupe Rodriguez Garcia	Cinvestav-IPN
Jose Luis Medina Monroy	CICESE
Jose Miguel Rocha Perez	Instituto Nacional De Astrofisica, Optica y Electronica
Josefina Gutierrez Martinez	Instituto Nacional de Rehabilitación
Juan Humberto Sossa Azuela	Centro de Investigacion en Computacion Instituto Politecnico Nacional
Juan Manuel Hernandez Cid	ITESO
Lluis Marsal	University Rovira i Virgili
Luis Gerardo Vela Valdés	CENIDET
Luis Gerardo de la Fraga	Computer Science Department, Cinvestav.
Manuel Aguilar Cornejo	Universidad Autonoma Metropolitana Unidad Iztapalapa
Marco I. Ramirez-Sosa	Robotica y Manufactura Avanzada Cinvestav Unidad Saltillo
Mariano Aceves Mijares	INAOE
Mario Alfredo Reyes Barranta	Cinvestav-IPN
Martin Velasco Villa	CINVESTAV-IPN
Martinez Enriquez Ana Maria	CINVESTAV, Computer Science Department
Mauricio Lara	Cinvestav-IPN
Mauricio Cabrera-Rios	Universidad Autónoma de Nuevo León Posgrado en Ingeniería de Sistemas
Maximo Lopez Lopez	Physics Department, Cinvestav-IPN
Miguel Garcia Rocha	Physics Department/CINVESTAV
Nicandro Cruz Ramirez	Facultad de Fisica e Inteligencia Artificial Universidad Veracruzana
Oliverio Arellano Cardenas	Cinvestav
Oscar Infante	Instituto Nal. de Cardiología
Pedro Mejia Alvarez	CINVESTAV-IPN
Rafael Castro-Linares	CINVESTAV-IPN Department of Electrical Engineering
Ramón Peña Sierra	Electrical Engineering Department/CINVESTAV
Ramon Parra-Michel	CINVESTAV-IPN, Campus Guadalajara
Richard Marquez	Cinvestav-IPN
Roberto Muñoz	CINVESTAV
Rodolfo Quintero Romo	CINVESTAV

Ruben Garrido CINVESTAV-IPN. Departamento de Control Automático
Sanchez- Salguero Hugo LIPSE-ESIME-IPN
Silva-Navarro Gerardo CINVESTAV-IPN, Mechatronics Section
Sonia Guadalupe Mendoza Chapa Departamento de Computación CINVESTAV-IPN
Vicente Parra Vega .. Robotica y Manufactura Avanzada Unidad Saltillo CINVESTAV
Victor Rangel Licea Facultad de Ingenieria, UNAM
VICTOR CARDENAS Universidad Autonoma de San Luis Potosi
Victor-Manuel Ramos-Ramos Universidad Autónoma Metropolitana-Iztapalapa
Yasuhiro Matsumoto CINVESTAV-IPN

Final Program

Wednesday 5, September 2007				
		Room 1	Room 2	Room 3
8:30	9:30	Registration		
9:30	9:50	Opening Ceremony		
10:00	11:00	PLE1	CS1	BIO1
11:00	11:30	Break	Break	Break
11:30	12:30	MEC1	CS2	BIO2
12:30	13:30	MEC1	CS2	BIO2
13:30	15:00	Lunch	Lunch	Lunch
15:00	16:00	MEC2	COM1	SSE1
16:00	17:00	MEC2	COM1	SSE1
17:00	18:00	–	–	–
18:00	–	Welcome cocktail		

Thursday 6, September 2007					Friday 7, September 2007				
		Room 1	Room 2	Room 3			Room 1	Room 2	Room 3
9:00	10:00	BIO3	MEC3	EP	9:00	10:00	–	EC1	SEM1
10:00	11:00	PLE2	MEC3	EP	10:00	11:00	PLE4	EC1	–
11:00	11:30	Break	Break	Break	11:00	11:30	Break	Break	Break
11:30	12:30	PLE3	CS3	SSE2	11:30	12:30	PLE5	EC2	SEM2
12:30	13:30	Round-T	CS3	SSE2	13:00	–	Closing Ceremony		
13:30	15:00	Lunch	Lunch	Lunch					
15:00	17:00	COM2	–	SSE3					

Symbol list: **BIO** Bioengineering and Medical Electronics

COM Communication Systems

CS Computer Science

EC Electronic Circuits

EP Electrical Power

MEC Mechatronics and Automatic Control

PLE Plenary conference

Round-T Round Table

SEM Semiconductor Materials

SSE Solid-State Electronics and VLSI

1 BIO1 Bioengineering and Medical Electronics

Wednesday 10:00–11:00 Room 3

Chair: Dr. Arturo Minor

- | | |
|--|----|
| 1.1. 10:00–10:20 Modeling Chromatic Pupillary Responses in Healthy People | 26 |
| 1.2. 10:20–10:40 Epoch Parameterization by Gabor Atom Density in Experimental Epilepsy | 26 |
| 1.3. 10:40–11:00 Assistant System For aid in the Interlocking of Intramedullary Nails Used to Fix Long Bones Fractured | 26 |

2 BIO2 Bioengineering and Medical Electronics

Wednesday 11:30–13:50 Room 3

Chair: Dr. Arturo Vera

- | | |
|---|----|
| 2.1. 11:30–11:50 A Hands Gesture System Of Control For An Intelligent Wheelchair. | 27 |
| 2.2. 11:50–12:10 Dispersion of Ratios of Ventricular Repolarization Intervals in Normal Subjects and Old Myocardial Infarction Patients | 27 |
| 2.3. 12:10–12:30 Development of lead-free $(\text{Bi}_{1/2}\text{Na}_{1/2})\text{BaTiO}_3$ Piezoelectric Ceramics for clinical Applications | 27 |
| 2.4. 12:30–12:50 Pupillary response interpretation to white noise audible stimuli ... | 28 |
| 2.5. 12:50–13:10 Development of an Educational Simulator and Graphical User Interface for Diabetic Patients | 28 |
| 2.6. 13:10–13:30 CT-Projections Hardware Raw Data Acquisition System for Image Reconstruction | 28 |

3 BIO3 Bioengineering and Medical Electronics

Thursday 9:00–10:00 Room 1

Chair: Dr. Enrique Chong

- | | |
|--|----|
| 3.1. 9:00–9:20 Design of a Transcutaneous Electrical Stimulator to Avoid the Postoperative Intestinal Effects | 29 |
| 3.2. 9:20–9:40 Electrocardiograph of Twelve Derivations, Low Current Consumption, Powered and Communicated for USB | 29 |
| 3.3. 9:40–10:00 On-line Simulation Tool for the Design and Analysis of Lower-limb Prosthetic Devices | 30 |

4 COM1 Communication Systems

Wednesday 15:00–17:00 Room 2

Chair: Dr. Aldo Orozco

- 4.1. 15:00–15:20 An Efficient Architecture for Detection of Linear Dispersion Space-Time Codes Based on QR Decomposition 30
- 4.2. 15:20–15:40 Digital Channel Modeling through Chaotic Generators 30
- 4.3. 15:40–16:00 Distributed Power Control Algorithms in the Uplink of Wireless Systems 31
- 4.4. 16:00–16:20 Sampling Reconstruction Procedure for a Markovian Gaussian Non-stationary Process in the presence of Jitter 31
- 4.5. 16:20–16:40 Frequency Offset Estimation and Compensation Using Superimposed Training 31
- 4.6. 16:40–17:00 HAP-Based Monitoring of the Emissions Produced by Terrestrial Microwave Systems 31

5 COM2 Communication Systems

Thursday 15:00–16:40 Room 1

Chair: Dr. Mauricio Lara

- 5.1. 15:00–15:20 Improved carrier frequency offset estimation using data-dependent superimposed training 32
- 5.2. 15:20–15:40 Analysis and Comparison of Optimized Multi-Pump Distributed Raman Amplifier 32
- 5.3. 15:40–16:00 160 Gb/s XOR Gate Using Bulk SOA Turbo-Switched Mach-Zehnder Interferometer 32
- 5.4. 16:00–16:20 Distributed Power Control Performance in DS-CDMA Systems with Adaptive Quantization 33
- 5.5. 16:20–16:40 Linear Dispersion Codes Generation from Hybrid STBC-VBLAST Architectures 33

6 CS1 Computer Science

Wednesday 10:00–11:00 Room 2

Chair: Dr. Felipe Gómez

- 6.1. 10:00–10:20 Multi-Class Support Vector Machines for Large Data Sets via Minimum Enclosing Ball Clustering 33

- 6.2. 10:20–10:40 Qubits structure and coherence in a one-way quantum computer . 34
- 6.3. 10:40–11:00 A method for designing CNN templates 34

7 CS2 Computer Science
Wednesday 11:30–13:30 Room 2
Chair: Dr. Gerardo de la Fraga

- 7.1. 11:30–11:50 Fragile Watermarking for Color Image Authentication 34
- 7.2. 11:50–12:10 The Extreme Vertices Model in the n-Dimensional Space (nD-EVM):
 A Novel Representation Scheme for Orthogonal Polytopes 35
- 7.3. 12:10–12:30 Realtss: a real-time scheduler simulator 35
- 7.4. 12:30–12:50 Reinforcement Learning and Dynamic Planning Applied to Virtual
 Humans Animation 35
- 7.5. 12:50–13:10 A μ -Calculus Approach for the Synthesis of Discrete-Event Super-
 visors with Safety Specifications 36
- 7.6. 13:10–13:30 An improvement on the Symbolic L* Algorithm 36

8 CS3 Computer Science
Thursday 11:30–12:50 Room 2
Chair: Dr. Sergio Chapa

- 8.1. 11:30–11:50 Projection-Based Coordination Control of Automated Manufacturing
 Systems 36
- 8.2. 11:50–12:10 Providing SIP services support on Mobile networks 36
- 8.3. 12:10–12:30 Building an infrastructure for DNSSECbis in Mexico 37
- 8.4. 12:30–12:50 From Desktop Applications Towards Ajax Web Applications 37

9 EC1 Electronic Circuits
Friday 9:00–10:20 Room 2
Chair: Dr. Richard Márquez

- 9.1. 9:00–9:20 Improved Direct Interface Circuit for Resistive Full- and Half-Bridge
 Sensors 37
- 9.2. 9:20–9:40 LOCOL: Leakage Reduction Tool Based on Transistor Reordering and
 Local Stacking 38

9.3.	9:40–10:00 A Real-time AAC/MP3-type Audio Codec on the 16-bit dsPIC Architecture	38
9.4.	10:00–10:20 On the Generalized-Proportional-Integral Sliding mode Control of the “Boost-Boost” Converter	38
10	EC2 Electronic Circuits	
	Friday 11:30–12:50 Room 2	
	Chair: Dr. Yasuhiro Matsumoto	
10.1.	11:30–11:50 Low Cost Ultrasonic Anemometer	39
10.2.	11:50–12:10 Design and Characterization of Low Phase Noise C-band SiGe HBT Amplifier	39
10.3.	12:10–12:30 Phase Analysis of a Variable Gain Amplifier Controlled Through Matching Networks	39
10.4.	12:30–12:50 Graphical Analysis of Transformed Feedback Bilinear Expressions Applied to Differential Active Phase Shifters Design	39
11	EP Electrical Power	
	Thursday 9:00–11:00 Room 3	
	Chair: Dr. David Elías	
11.1.	9:00–9:20 A New Algorithm for Load Balancing and Power Factor Correction in Multi-phase (Six-phase) Load Circuits	40
11.2.	9:20–9:40 Steady-State Inductance Calculation of a Turbine Generator in the ABC Reference Frame	40
11.3.	9:40–10:00 Estimation of Two-axis Synchronous Machine Parameters using Non-Deterministic Tools	40
11.4.	10:00–10:20 Real-Time Outage and Non-Outage Fault Location for Weakly Meshed Distribution Networks Using Directional and Non-Directional Fault Indicators ...	41
11.5.	10:20–10:40 Observer Based Control for a Single Phase Active Rectifier	41
11.6.	10:40–11:00 Unknown Input Observer for Induction Motors:Experimental Evaluation	41

12 MEC1 Mechatronics and Automatic Control**Wednesday 11:30–13:30 Room 1****Chair: Dr. Martín Velasco**

- | | | |
|-------|---|----|
| 12.1. | 11:30–11:50 On-line Algebraic Identification of Eccentricity in Active Vibration Control of Rotor-Bearing Systems | 42 |
| 12.2. | 11:50–12:10 Geometric Design of Lead/Lag Compensators Meeting a Hinf Specification | 42 |
| 12.3. | 12:10–12:30 Decentralized Fuzzy Gain Scheduling Control for an Open Irrigation Canal Prototype | 42 |
| 12.4. | 12:30–12:50 Nonlinear Uncertain Servomechanism Tracking using an Integral Observer | 42 |
| 12.5. | 12:50–13:10 Dynamical Sliding Mode Control of a MagLev System with 3 DOFs: Experimental Results | 43 |
| 12.6. | 13:10–13:30 Computed-Torque Control of an Omnidirectional Mobile Robot ... | 43 |

13 MEC2 Mechatronics and Automatic Control**Wednesday 15:00–17:00 Room 1****Chair: Dr. Gerardo Silva**

- | | | |
|-------|--|----|
| 13.1. | 15:00–15:20 Modeling and inventory regulation of dynamic supply chains through ordering policies | 43 |
| 13.2. | 15:20–15:40 On the Implementation of Control Laws for Finite Spectrum Assignment: the Multiple Delays Case | 44 |
| 13.3. | 15:40–16:00 On the Output Feedback Control of a Completely Unknown DC-Motor: Fast Algebraic Based Adaptation. | 44 |
| 13.4. | 16:00–16:20 Stable synchronization control for two ball and beam systems | 44 |
| 13.5. | 16:20–16:40 Finite Element Analysis and Design of a CubeSat Class Picosatellite Structure | 44 |
| 13.6. | 16:40–17:00 On the Analysis and Control of a flexible link Robot | 45 |

14 MEC3 Mechatronics and Automatic Control**Thursday 9:00–11:00 Room 2****Chair: Dr. Alejandro Rodríguez**

- | | | |
|-------|---|----|
| 14.1. | 9:00–9:20 Sliding PID Control for Trajectory Tracking of a 2 DOF Robot Manipulator: Simulations and Experiments | 45 |
|-------|---|----|

14.2.	9:20–9:40	On the GPI balancing control of an uncertain Jeffcot rotor model	45
14.3.	9:40–10:00	Estimation of the Precursor Power and Internal Reactivity in a Nuclear Reactor by a Neural Observer	46
14.4.	10:00–10:20	Experimental Results on the Semiactive Sliding-Mode Control of the Unbalance Response in a Rotor-Bearing System Supported on MR Dampers .	46
14.5.	10:20–10:40	Fault diagnosis by means of sliding mode techniques	46
14.6.	10:40–11:00	Basic Small Fixed Wing Aircraft Sizing Optimizing	47

15 SEM1 Semiconductor Materials

Friday 9:00–10:00 Room 3

Chair: Dr. Ramón Peña

15.1.	9:00–9:20	Chemical composition and resistivity of sprayed CuInS ₂ thin films for solar cells	47
15.2.	9:20–9:40	Crystallization of SbTe Phase Change Optical Films	48
15.3.	9:40–10:00	Origin of Stimulated Emission in Nanostructured Silicon p-n Junction	48

16 SEM2 Semiconductor Materials

Friday 11:30–12:30 Room 3

Chair: Dr. Ramón Peña

16.1.	11:30–11:50	Study of the Crystallization Process of Cu ₂ O Samples from Polycrystalline Copper Plates.	48
16.2.	11:50–12:10	Cathodoluminescence of Silicon Rich Oxide with nitrogen incorporated	49
16.3.	12:10–12:30	Field Emission from Palladium Oxide Nanostructures Grown on Si Substrates at Atmospheric Pressure	49

17 SSE1 Solid-State Electronics and VLSI

Wednesday 15:00–17:00 Room 3

Chair: Dr. Alfredo Reyes

17.1.	15:00–15:20	Quantum mechanical modeling of charge trapping/detrapping phenomena in CMOS structures with high-k dielectric	49
17.2.	15:20–15:40	Thin Film Bulk Acoustic Wave Resonators for their application in Microwave Filters	50

- 17.3. 15:40–16:00 A Signal Probability Based Self-Controlling Leakage Reduction Technique For CMOS Circuits 50
- 17.4. 16:00–16:20 Verilog-A Implementation of ICS Model for PD SOI Devices 50
- 17.5. 16:20–16:40 Adaptive Signal Identification Using LMS Filter with an Analog Memory Cell 51
- 17.6. 16:40–17:00 Lowest Temperature at Thermoelectric Cooling 51

18 SSE2 Solid-State Electronics and VLSI

Thursday 12:30–13:50 Room 3

Chair: Dr. Felipe Gómez

- 18.1. 12:30–12:50 Comparative analysis between the STRATIX II (Altera) and VIRTEX 4 (Xilinx) for implementing a LVDS bus receiver 51
- 18.2. 12:50–13:10 An Experimental Comparison of Clock Distribution Networks for Systems on Chip 51
- 18.3. 13:10–13:30 Analysis of the Threshold Voltage BSIM-Model for a Short Channel PD-SOI DTMOS 52
- 18.4. 13:30–13:50 Model for a CMOS Bit-Level Product Cell 52

19 SSE3 Solid-State Electronics and VLSI

Thursday 15:00–16:20 Room 3

Chair: Dr. Alfredo Reyes

- 19.1. 15:00–15:20 Programmable Inverter Based on Neuron MOS Transistor 52
- 19.2. 15:20–15:40 On Force-Free Magnetic Fields with non-constant proportionality factor and their applications to High Temperature Superconductor 52
- 19.3. 15:40–16:00 Study of the influence of the complex carbon-hydrogen in GaAs films grown by MOCVD 53
- 19.4. 16:00–16:20 Voltage Source Circuit Based on CMOS Floating-Gate Memory .. 53

Courses

On September 3 and 4 2007, we are organizing tutorial courses to be offered in the installation of CINVESTAV in Mexico City. These courses are oriented to professionals and students of electrical and electronics engineering or related areas. A maximum of 50 persons can attend each course. The fee per course is

- \$ 100.00 US Dollars for professional engineers
- \$ 50.00 US Dollars for students

If You pay the cost of the conference, You will be able to take one from the courses below mentioned

1. Synchronisation and Control

Prof. Henk Nijmeijer
Department of Mechanical Engineering
Eindhoven University of Technology

Date: Tuesday, September 3 (Duration: 5 hours)
Schedule : 9:00 – 14:00
Language : English
Place : CINVESTAV - IPN, Mexico City.

Contents of the course:

- Part I Introduction
- Part II An observer view on synchronization
- Part III Controlled Synchronization
- Part IV (Partial) synchronization in diffusive networks
- Part V Communication and Synchronization
- Part VI Coordination of mechanical systems

The subject of the course has become very popular in the last decades. First, mostly from a physics/biology viewpoint studies focussed on how synchronization arises in coupled systems. More recently, the subject also is receiving considerable attention in the control community and also captures the study of coordination of large sets of actuators.

From a control perspective synchronization has much in common with the observer problem, and this viewpoint will be extensively used during the course. Controlled synchronization combines feedback control with observer theory. As part of the course,

students will work on a number of illustrative hand-out exercises.

2. Signals and Systems in Medical Diagnostics - current practices, trends, and needs

Christopher Druzgalski, Ph.D

PAHCE (Pan American Health Care Exchanges), Los Alamitos, California.

California State University , Long Beach , California

Date: Tuesday, September 4 (Duration: 5 hours)

Schedule : 9:00 – 14:00

Language : English / Spanish

Place : CINVESTAV - IPN, Mexico City.

Contents of the course:

Detection including continuous monitoring, transmission, and processing of biological signals for diagnostic applications represent one of the most challenging technological demands. In particular, demand for noninvasive or minimally invasive diagnostic procedures and patient safety constraints set the design and utilization limits of electrodes, transducers, sensors, and instrumentation for medical applications. Further, the demand for expanded availability of technology based diagnostics and communication at the point-of-care. Specifically, the content focus includes a spectrum of diagnostically available or desirable signals, possible solutions for enhanced detection, recording, signal transmission, various devices, design limitations and clinical applications of particular instrumentation, as well as the technology of choice for selected medical applications. In particular, the topics include overview of Electrical Engineering areas contributory to Medical Diagnostics, Survey of the Medical Engineering Industry, Review of Biological Signals, Recording of Physiological Signals, Electrodes, Sensors and Transducers, Amplification of Signals, Patient Monitoring, Advances in Medical Instrumentation, Safety and Reliability Concerns, Selected Standards and Practices for Medical Devices, and Future Trends. The discussions of fundamentals, advanced design, and practical applications encompass clinical, industrial, and research aspects.

3. Tópicos Selectos de Compatibilidad Electromagnética (only in Spanish)

ETS-Lindgren

Martes 4 de septiembre, 15:00–19:00 hrs.

- *Parte 1: Medición del índice SAR “Specific absorption rate” producido por teléfonos celulares y otros dispositivos inalámbricos*

En este segmento del curso se abordará la teoría detrás de este tipo de mediciones, las normas vigentes de protección de radiaciones electromagnéticas en seres humanos, los requerimientos de los sistemas de medición de acuerdo a las

normas del IEEE e IEC, así como los retos que imponen las nuevas tecnologías de dispositivos inalámbricos para la medición del SAR.

- *Parte 2: Cámaras anecoicas para prueba de antenas y medición de patrones de radiación*

En esta segunda parte se examinarán los blindajes de RF para una cámara anecoica, el material absorbente para ondas electromagnéticas, los diferentes tipos de antenas, el software para medición y representación de los datos en tres dimensiones para obtener los patrones de radiación, así como los parámetros a medir de las antenas y los procedimientos de prueba de acuerdo a las normas vigentes.

Round table session

Round Table: Different opportunities for the creation o new business companies based on advanced technological developments

Chair: Ricardo Gómez

Thursday September 6, 2007

12:30-14:00

Mesa Redonda (in Spanish):

Diferentes alternativas para la creación de nuevos negocios basados en desarrollos tecnológicos avanzados

Chair: Ricardo Gómez

Thursday September 6, 2007

12:30-14:00

Abstract:Several issues regarding the creation of new high technology companies will be addressed in this round table. Some of the topics to be discussed are the patent protection of new ideas, the importance of the marketing research, the business plan as a guide for the company development, the function of the business incubator to increase survival rates for innovative startup companies, the support options provided by government entities, financing and the actual entrepreneur experience with their high technology products in Mexico.

Resumen: En esta mesa redonda se explorarán diferentes temas relacionados con la creación de una nueva empresa a partir de un desarrollo tecnológico de vanguardia. Se abordarán entre otros tópicos la protección intelectual de las invenciones, los estudios de mercado, la elaboración de un plan de negocios, las ventajas de iniciar un negocio a través de una incubadora de empresas, los diferentes apoyos brindados por las entidades gubernamentales, el financiamiento y la experiencia real de empresarios dedicados a la comercialización de productos de alta tecnología.

General Information

The Conference will be held in Mexico City at premises of CINVESTAV-IPN. Cinvestav is an important research Institute of Mexico; it was created on april 17, 1961.

CINVESTAV is located at the north of the city on Avenida Instituto Politécnico Nacional No. 2508, corner with Calzada Ticomán, Col. San Pedro Zacatenco, Delegación Gustavo A. Madero, CP. 07360 México, D.F., México Mexico City (Spanish : Ciudad de México) is the federal capital of and largest city in Mexico . It geographically spans the north portion of the Distrito Federal ("D.F."), although the metropolitan area extends to the state of México to the north of the Federal District, and to the state of Hidalgo. According to government statistics Mexico City is the second largest most populous conurbation in North America , and third in the world, after Tokyo , and New York , with approximately 18 million people. Though its urban area is the third most populous in the world, what is officially known as Mexico City (under the limits of the Federal District) is the most populous city in the world; that is, the greatest number of people governed by one mayor.

Keynote Speakers

Prof. Henk Nijmeijer

Eindhoven University of Technology, The Netherlands

Convergency and frequency reponse functions in nonlinear systems

(abstract in p. 23)

Wednesday, September 5, 2007; 10:00-11:00

PLE1, Room 1

Prof. Manuel Laguna

University of Colorado at Boulder, U.S.A.

The OptQuest Engine: A Commercial Application of Metaheuristic Optimization

(abstract in p. 23)

Thursday, September 6, 2007; 10:00-11:00

PLE2, Room 1

Prof. Simon Haykin

McMaster University, Canada

Cognitive Dynamic Systems

(abstract in p. 24)

Thursday, September 6, 2007. 11:30-12:30

PLE3, Room 1

Prof. Esther Rodríguez-Villegas

Imperial College, England

Design Issues for Low-Power and Low-Voltage FGMOSFET Systems

(abstract in p. 24)

Friday, September 7, 2007. 10:00-11:00

PLE4, Room 1

Prof. Christopher Druzgalski

California State University, U.S.A.

Engineering human senses - biosensors

(abstract in p. 25)

Friday, September 7, 2007. 11:30-12:30

PLE5, Room 1

Plenary Conferences Abstracts

1 Convergency and frequency reponse functions in nonlinear systems

Prof. Henk Nijmeijer
Eindhoven University of Technology, The Netherlands

The purpose of the talk is twofold. First, it is argued that the notion of convergency, that stems from Russian literature in the 50-60s of the last century, is extremely useful in the context of various nonlinear control synthesis problems. Convergency, which is closely related to notions like input to state stability or incremental stability, requires that for any bounded input, the system possesses a unique limiting solution. During the talk, convergency will be introduced, and its use in the regulator problem will be demonstrated.

The second contribution of the talk focuses on frequency response functions for the class of convergent nonlinear control systems. For this particular class, which encompasses standard linear systems, one can thus discuss the performance of the system using 'linear' Bode magnitude plots. An example featuring the approach will finally be treated. The work reported is based on joint work with Alexey Pavlov (NTNU, Trondheim) and Nathan van de Wouw (TU/e, Eindhoven).

2 The OptQuest Engine: A Commercial Application of Metaheuristic Optimization

Prof. Manuel Laguna
University of Colorado at Boulder, U.S.A.

Many optimization problems in industry are too complex to be given tractable mathematical formulations. Nonlinearities, combinatorial relationships and uncertainty often render challenging practical problems inaccessible to modeling except by resorting to more comprehensive tools like computer simulation. Advances in the field of metaheuristics have led to the creation of optimization engines that successfully guide a series of complex evaluations with the goal of finding optimal values for the decision variables.

Our presentation first focuses on how scatter search has been adapted to create OptQuest. An overview of the OptQuest engine highlights this part of the presentation. We then show the functionality of OptQuest, both as part of other software systems (such as simulation packages) and as a stand-alone engine. Then, we provide several examples of real-world settings where OptQuest has been applied. Finally, we discuss specialized OptQuest versions that tackle particularly difficult problems.

3 Cognitive Dynamic Systems

Prof. Simon Haykin
McMaster University, Canada

In this lecture I will cover :

- 3.1. Fundamental tools of Cognitive dynamic systems: neural computation, dynamic programming, and Kalman filtering.
- 3.2. Applications:
 - (a) Cognitive radio
 - (b) Cognitive radar
 - (c) Perceptual decoding of information in the auditory systems with emphasis on Kalman-like filtering

4 Design Issues for Low-Power and Low-Voltage FGMOSFET Systems

Prof. Esther Rodríguez-Villegas
Imperial College, England

Motivated by consumer demand for smaller, more portable electronic devices that operate for longer on their existing battery packs, cutting edge electronic circuits need to be even more power efficient. For the circuit designer, this requires an understanding of the latest low voltage and low power techniques, one of the most promising of which (mostly for biomedical applications) makes use of the floating gate MOS (FGMOS) transistor. Whilst a conventional MOS transistor has only one input, the FGMOS transistors often have several. This fact, along with some other remarkable properties of this very interesting device, offers the designer many extra degrees of freedom that can significantly improve power efficiency. By using FGMOS transistor in the right way- establishing appropriate relationships between their inputs- it is possible to achieve design tradeoffs that are not possible with conventional MOS devices. This is especially true when power consumption and supply voltage are the main design constraints.

This talk will give an overview of how to use FGMOS and pseudo-FGMOS transistors when power reduction is the main aim. It will be shown how to use the FGMOS, to design circuits that: a) can operate at power supply voltage levels which are well below the limits the particular technology is supposed to operate at, and b) consume less power than the minimum power a circuit designed with only MOS devices in the same technology with the same performance would require. The two main design targets will be low voltage and low power. They will be achieved by pursuing four different subgoals:

- 4.1. Reduce the circuit complexity: As the circuitry gets simpler (fewer devices), less current branches are required, and therefore the power consumption decreases.

This also has other benefits related to the frequency response, since the number of internal nodes is smaller.

- 4.2. Simplify the signal processing: Complex functions are easier to implement using FGMOS transistors. These will be used in nonlinear signal processing to reduce the voltage demands.
- 4.3. Shift the signal levels: The devices will be biased in the most appropriate operating region for a wider range of input signals, by shifting the effective threshold voltages accordingly in the FGMOS transistors. This can be achieved without the need of extra level shifters, although in some cases it can be detrimental as well.
- 4.4. Facilitate the tuning: Tuning becomes even more of an issue in a low voltage context, where variations are more critical since they can bias the devices out of their intended operating region. FGMOS transistors increase the number of degrees of freedom available to tune/program the circuits.

The talk will present the device as a powerful mathematic/electronic element, which offers three very important properties in the low voltage and low power context: Flexibility, Controllability, Tunability. Flexibility to implement both linear as well as complex nonlinear functions in a compact and easy fashion, this leading to the consequent simplification of the circuits. Controllability, since the effective threshold voltage of every single transistor can be controlled separately according to the operating range needs. Tunability, because it is a multiple input device and can be designed to be tuned just by adding extra inputs.

5 Engineering human senses - biosensors

Prof. Christopher Druzgalski
California State University, U.S.A.

A range of technological advances including areas of electronic circuits and power electronics, solid state physics, materials and bioacceptable packaging, allow the expansion of diagnostic and therapeutic device/instrument design into human sensory mechanisms. Engineering efforts and advancement in the development of substitutes and/or supplemental systems primarily focused on the design of assistive devices for human hearing and vision, as they are perceived as the two most essential human senses. However, the development of evaluation techniques and assistive devices associated with the senses of human balance, touch, smell, and taste due to their intricacies face barriers of engineering design. These factors combined with complexities of chronic chemosensory problems contribute to the fact that the Bionic Ear or Cochlear Prosthesis and the Visual Prosthesis designs receive much larger attention than the Electronic Nose or the e-Tongue. One can note that smell and taste are among the most difficult senses to quantify and reproduce.

The presentation will focus on selected topics including sensory related patientd sensor technologies.

Abstract Book

1 BIO1 Bioengineering and Medical Electronics

1.1 Modeling Chromatic Pupillary Responses in Healthy People

Dolores Rodriguez, Ernesto Suaste Cinvestav-IPN, Departamento de Ingeniería Eléctrica, Sección de Bioelectrónica

We propose a model to determinate pupillary changes due to chromatic stimulus. The pupillary diameters (PD) from 44 subjects with normal vision of colors were measured. These PD were elicited by 26 different chromatic stimuli (from 400 to 650 nm). The proposed model establishes the pupillary behavior for different colors. To determinate this model, we consider the characteristics of the subject (age and gender), stimulus (luminance and wavelength) as the diameter of their pupil (for white stimulus). With our approach the maximum coefficient of correlation obtained was of 1.0 in 90% of the cases analyzed (PD measured and calculated). This proposed model is the first all over the world.

1.2 Epoch Parameterization by Gabor Atom Density in Experimental Epilepsy

Arturo Sotelo Orozco, Enrique D. Guíjarro Estelles, Manuel de Jesús García Ortega, Carlos E. Vázquez López Tecnológico de Tijuana, Departamento de Ingeniería Eléctrica y Electrónica

An Electroencephalogram (EEG), during an epilepsy episode can change dramatically from the normal state into a high amplitude low frequency signal and suddenly return

to the normal state. It is possible to identify some stages in the epilepsy seizure, the most representative of them: basal, preictal, ictal and postictal. ECoG are highly non-periodical signals, so they are analyzed with T-F algorithms, in order to follow up its frequency evolution through the seizure stages. Each seizure stage has different frequency components and they show up at different time. Experimental epilepsy produced by kindling model in rats is used; signals are recorded at cortex level. The ECoG is decomposed by means of the Matching Pursuit algorithm into Gabor atoms, so the Gabor Atom Density could be a measure of the epoch, which tells us if an epoch from an ECoG belongs to one of the four seizure stages.

1.3 Assistant System For aid in the Interlocking of Intramedullary Nails Used to Fix Long Bones Fractured

Rigoberto Martínez, Arturo Minor CINVESTAV

Each year are performed more than 492,000 surgeries on the world for repair fractures in long bones. The most used method to fix this problem is the closed intramedullary nailing. According to surgeons the most difficult task is the interlocking of the nail. The present work proposes a new system for detection of the intramedullary nail's holes used in rehabilitation of fractures in long bones (tibia and femur). The proposed method is based on the use of permanent magnets and magnetic sensors to locate the exact point where the bone must be drilled for the interlocking of the nail. The proposed system is aiming to diminish the great radiation doses to surgeons and patients. The suggested device is portable and supplied by batteries to provide a total autonomy, easy to use and great reli-

ability.

2 BIO2 Bioengineering and Medical Electronics

2.1 A Hands Gesture System Of Control For An Intelligent Wheelchair.

Ruben Posada Gomez, Luis Humberto Sanchez Medel, Giner Alor Hernandez, Albino Martínez-Sibaja, Alberto Alfonso Aguilar-Laserre, Lorenzo Leija-Salas, Ruben Posada Gomez

Departamento de Posgrado e Investigación, Instituto Tecnológico de Orizaba

When an unfortunate event affects the motor capacity of a person, it is necessary to use devices like wheelchairs that offer a means of displacement for patients with motor problems of the inferior members. Some patients that cannot manipulate the wheelchair with their arms due to a lack of force or psychomotor problems in the superior members, request electric wheelchairs, frequently manipulated with joysticks; however the joystick manipulation is even not practical and frequently it must be handled with the mouth. The present article presents the partial results in the development of a wheelchair controlled by an intuitive interface, where the instructions are given by hand gesture instructions. The advances are presented in the realization of the control software using a Webcam and some distances and presence sensors controlled by a PIC microcontroller that establishes the communication with a program developed in Labview.

2.2 Dispersion of Ratios of Ventricular Repolarization Intervals in Normal Subjects and Old Myocardial Infarction Patients

Ismael Hugo Landeros-Guzman, Gabriel Vega-Martínez, Carlos Alvarado-Serrano, Juan Ramos-Castro, Ramon Pallás-Areny
CINVESTAV - IPN

We evaluate the dispersions in ratios of ventricular repolarization intervals, in order to determine whether they improve the separation between 10 normal subjects and 10 patients with old myocardial infarction compared with dispersion of ventricular repolarization intervals. All the ratios dispersions were larger in OMI patients than in normal subjects and the best separation between groups was obtained with the dispersions of ratios Tpe/JT and Tpe/QT. These novel indices could improve the identification of post-MI patients with risk of malignant ventricular arrhythmias.

2.3 Development of lead-free $(\text{Bi}_{1/2}\text{Na}_{1/2})\text{BaTiO}_3$ Piezoelectric Ceramics for clinical Applications

Roberto Rodriguez Ruiz, Agustín Flores Cuautle, Ernesto Suaste Gomez
CINVESTAV

The present paper provides a method to obtain lead-free piezoelectric ceramics based on bismuth sodium titanate (BNBT), as well as the characterization of these, the elaboration consists from the dust mixture to the sinterized pieces in a furnace, the BNBT systems had been studied for their dielectric and piezoelectric properties, the characterization consists of determining the Curie temperature and resonance frequency. BNBT ceramics present similar characteristics that

PZT ceramics. Because of his high frequency of resonance they can be used in biomedical applications, concretely in ultrasound applications.

2.4 Pupillary response interpretation to white noise audible stimuli

Eduardo Martínez, Carlos Omar González Morán, Ma. Dolores Rodríguez, Ernesto Suaste Gómez
 Department of Electrical Engineering,
 CINVESTAV-IPN, México D.F., México

This paper is focused to analyze the pupillary responses elicited by an audible stimulus (white noise). The stimulus durations were 150 ms, 250 ms and 2 s. And each one was applied twice, at 5 s and 15 s. The test was performed on photopic conditions in 5 men subjects from 25 years old to 29 years old.

2.5 Development of an Educational Simulator and Graphical User Interface for Diabetic Patients

Martin Hernandez-Ordonez, Omar Montaño, Daniel U. Campos-Delgado, Elvia Palacios
 UASLP

This paper presents an educational simulator and graphical user interface for type 1 diabetes patients. The educational simulator is conformed by three mathematical models which describe the glucose-insulin dynamics using a compartmental model, with additional equations to reproduce aerobic exercise, gastric glucose absorption by the gut, and subcutaneous insulin absorption. Moreover, multiple daily doses and continuous insulin infusions can be simulated in

order to implement an intensive insulin therapy. The mathematical models, integration methods and insulin dosing strategies were implemented in Java programming language. As a result, the Java Educational Diabetes Management Advisor (JEDMA) shows the influence of exercise periods, food intakes, and intensive insulin therapies on the glucose concentrations.

2.6 CT-Projections Hardware Raw Data Acquisition System for Image Reconstruction.

Alejandro Guzman De Leon, José Antonio Hernández Peralta, Miguel Cadena Méndez, David Rojas Montes de Oca
 Universidad Autonoma Metropolitana-Iztapalapa

Computed Tomography (CT) is a very competitive medical imaging field, where worldwide manufactures are constantly improving the state of the art investing huge amounts of money to assure sales. Therefore, warranties and maintenance contracts avoids hospital and university research labs in Latin America to have information access and to perform research experiments where CT hardware and software are involved. Despite this, university CT research labs are important to exist in order to create the "know-how" and to preserve the knowledge. This paper addresses important issues to create CT scanner experiments using donated equipment out of commercial companies support that not only take advantage of the hardware-software state of the art but in addition the experiments are used to improve the universal knowledge in the reconstruction algorithms field. One particular example is described where CT raw data is acquired and then parallel programming will be applied to obtain CT images at very low cost, improving qual-

ity and reducing reconstruction time.

3 BIO3 Bioengineering and Medical Electronics

3.1 Design of a Transcutaneous Electrical Stimulator to Avoid the Postoperative Intestinal Effects

Luz Maria Alonso Valerdi, Arturo Minor Martinez, Carlos Escamilla Weimann
Centro de Investigacion y de Estudios Avanzados del IPN

The postoperative intestinal obstruction is an illness characterized by a partial or complete interruption of the intestinal transit, due to adhesions that appear thus a surgical abdominal intervention in 88% of the cases. The 42% of these cases must undergo a surgical experience for the liberation of the adhesions. Unfortunately, whether the adhesions are excised, an inflammatory process will begin; which is the base for the genesis of new adhesions, creating a vicious circle very difficult to interrupt. Therefore, a different treatment for the intestinal postoperative obstruction is proposed by establishing this hypothesis: "After an abdominal intervention; if an electrical stimulation therapy was applied to return the motility of the small bowel, the adhesive growth would be prevented?". Hence, a transcutaneous electrical stimulator was developed for recovering gastrointestinal motor activity; with perspectives to find a new treatment for the prevention of postoperative effects. The constructed electrical stimulator was tested on two male dogs, and the obtained results were successful. The contraction of the small intestine was achieved by the applied electrical stimulation therapy. The outcomes are not completely successful and the transcutaneous electrical stimulator validation has not been accomplished; but

whether this idea was reliable, a new method would be found for the treatment of adhesions small bowel obstruction.

3.2 Electrocardiograph of Twelve Derivations, Low Current Consumption, Powered and Communicated for USB

Juan Yarozvaldi Transito Trujillo, Raul Martinez-Memije, Oscar Infante Vazquez
Superior School of Electric and Mechanical Engineering. Campus Culhuacan IPN

In this work we present the design and construction of a system for electrocardiography of twelve derivations, low power, supplied by Universal Serial Bus (USB) port, at same time the EKG signal is monitored in this port, the system consists on a circuit of three simultaneous channels that register the electric activity of the patient's heart in twelve derivations by a 10 terminals cable. The initial amplification is made using the instrumentation amplifier AD620, continues with a filter of 0.05Hz in low frequencies and 120Hz for high frequencies. Once carried out this process the final amplification is made, the electric isolation is by magnetic type, the USB communications are made using a commercial acquisition data system (ADS) model USB-1208FS that has a resolution of 12 Bits, the program and the control interface for the data acquisition and display of signals coming from the USB port, was developed for the Windows XP operating system, and it was written in DELPHI 7.0 language, the system is powered with 5V, demands 25mA, has a CMRR 97dB, input dynamic range of 4mV $\pm 5\%$ and bandwidth of 0.05Hz at 120Hz, that which make it appropriate to clinical diagnostic.

3.3 On-line Simulation Tool for the Design and Analysis of Lower-limb Prosthetic Devices

Alejandro Melendez Calderon, Hector Caltenco Arciniega, Strahinja Dosen, Jesus Enrique Chong Quero
Aalborg University

This paper presents a new and practical simulation interface to design and analyze lower-limb prosthetic devices. The proposed tool simulates the gait of a lower limb amputee using a desired prosthetic device. It allows the analysis of simple passive devices or the testing of control algorithms for active prostheses. The results presented in this paper correspond to the use of this tool to test a Fuzzy Controller specially designed for an active transfemoral prosthesis. To validate the tool, the simulation results are compared with "real-life" experiments.

4 COM1 Communication Systems

4.1 An Efficient Architecture for Detection of Linear Dispersion Space-Time Codes Based on QR Decomposition

Joaquin Cortez Gonzalez, Miguel Bzdresch, Deni Torres Roman
CINVESTAV-GDL

A new architecture for detection of Linear Dispersion Space-Time Codes (LDSTBC) over Rayleigh fading channels is presented. The LDSTBC scheme consists of one Alamouti space-time block code unit, plus two more antennas operating as two layers of V-BLAST in the transmitter. The LDSTBC receiver can operate with three or more anten-

nas simultaneously. The proposed receiver is based on an Ordered Successive Interference Cancellation (OSIC) scheme and the QR decomposition, which leads to a suitable hardware implementation. It was designed for the Zero-Forcing (ZF) criterion; reduced complexity is achieved by means of an adequate rearrangement of the channel matrix elements. The detection scheme proposed is evaluated and compared with other similar recently reported proposals, assuming a channel without spatial correlation.

4.2 Digital Channel Modeling through Chaotic Generators

Mario Alberto Mijangos Alquisires, Valeri Kontorovich, Mauricio Lara Barrón
CINVESTAV-IPN

Recently, digital channel modeling through chaotic generators has attracted strong interest at literature. Many of them refer to the generation of error detected time series from where we can obtain channel's statistics. In this paper we present a complete modeling of the error-gap distribution (EGD) statistic that helps us to know how the errors are distributed through the channel. Our principal aim was to generate error time series with statistics properties similar to those that we can obtain from a reference model, such as Markov chains based models. Under these considerations, we implemented these algorithms of error time series generation in a Digital Signal Processor (DSP) using as reference three models of real digital channels from literature.

4.3 Distributed Power Control Algorithms in the Uplink of Wireless Systems

Francisco Javier Martinez-Lopez, Daniel U. Campos-Delgado, José Martín Luna-Rivera
UASLP

In this paper, the problem of power control in wireless systems using a distributed approach is analyzed. The uplink of a direct-sequence code-division multiple-access communication (DS-CDMA) system is studied in this work. The power control strategies are derived using classical design approaches (PID and Dead-Beat). It is concluded that the uplink channel variations do not destroy the stability of the feedback structures. However, the delays in the closed-loop paths can severely affect the stability and performance of the resulting feedback schemes. As a result, the control laws have to be selected according with the expected transmission delays in order to maximize the resulting performance. Simulation results are presented to compare the control algorithms using a standard single-step power correction approach.

4.4 Sampling Reconstruction Procedure for a Markovian Gaussian Nonstationary Process in the presence of Jitter

Vladimir Kazakov, José Angel Medina
National Polytechnic Institute of Mexico

The present work provides the conditional mathematic expectation rule in order to analyze the sampling reconstruction procedure of a nonstationary process in the presence of jitter. Beta function is studied as a representation of jitter distribution. The sampled process is Markovian Gaussian. The

error reconstruction function is investigated for nonstationary regime.

4.5 Frequency Offset Estimation and Compensation Using Superimposed Training

Aldo G. Orozco Lugo, Mauricio Lara, Enrique Alameda Hernández, Syed Moosvi, Desmond C. McLernon
CINVESTAV-IPN

We propose in this paper some methods to estimate and compensate for the harmful carrier frequency offset that could be present in pass-band wireless communications. Although there are efficient methods to estimate the frequency offset when training sequences are employed, our method exploits instead the presence of an implicit/superimposed training sequence. Implicit training schemes have been proposed before for the channel estimation task but they all assume a data communication link free of any frequency offset and they all fail in the case when this offset exists. It is therefore mandatory to estimate and compensate for this offset before proceeding to use the channel estimation methods already available in the open literature as a previous step for the ultimate goal of data recovery.

4.6 HAP-Based Monitoring of the Emissions Produced by Terrestrial Microwave Systems

Giselle Monserat Galvan-Tejada, Victor Hugo Correa-Cid
CINVESTAV-IPN

A new alternative in the context of radio monitoring is presented in this paper. The proposed approach is to use high altitude plat-

forms (HAP) as monitoring stations provided their relatively large coverage and moderate path loss. Emissions produced by point-to-point links of terrestrial microwave stations located in Mexico City are simulated in order to illustrate the feasibility of HAP as monitoring station. Both free space and rain conditions are considered. Obtained results show that a mobile HAP represents a very attractive alternative for monitoring purposes, not only due to the acceptable reception levels, but also for its potential implementation in practice.

5 COM2 Communication Systems

5.1 Improved carrier frequency offset estimation using data-dependent superimposed training

Syed Mohsin Abbas Moosvi, D. C. McLernon, A. G. Orozco-Lugo, M. M. Lara, Enrique Alameda-Hernandez
The School of Electronic and Electrical Engineering, The University of Leeds

We address the problem of carrier frequency offset (CFO) estimation within the Data Dependent Superimposed Training (DDST) framework for channel estimation. A CFO estimator was recently developed for DDST, which uses two different data dependent training sequences, one for CFO estimation and other for channel estimation. Here, we propose a CFO estimation scheme which combines the estimates using both the data-dependent training sequences to improve the performance. Finally, simulations are presented that verify the theoretical developments.

5.2 Analysis and Comparison of Optimized Multi-Pump Distributed Raman Amplifier

Mohsen Katebi Jahromi, Farzin Emami Boushehr
Islamic Azad University

In this paper, an optimized distributed multi-pump Raman amplifier is reviewed. Such devices are usually used in a Wavelength Division Multiplexing (WDM) communication system which pumped in bidirectional, co and counter cases and use a Dispersion Compensated Fiber (DCF) as transmitting medium. To describe the structure specifications, the power analysis is applied. We compare the several cases, and it is found that the generated Amplified Spontaneous Emission (ASE) power in co-pumped case is less than the other cases and noise figure is improved for this kind of the structure. System stability is better for backward and bidirectional cases with respect to forward pumping. Indeed, the signal-signal interaction has a very important effect in a Raman amplifier system

5.3 160 Gb/s XOR Gate Using Bulk SOA Turbo-Switched Mach-Zehnder Interferometer

Ramon Gutierrez-Castrejon
Instituto de Ingeniería, Universidad Nacional Autónoma de México, UNAM.

A modified Mach-Zehnder interferometer is proposed to carry out photonic XOR operation between optical data streams. It consists of the synthesis of a differential scheme and the recently demonstrated turbo-switch. Simulations utilizing a sophisticated bulk semiconductor optical amplifier dynamical model indicate practically error-free operation at 160 Gb/s. A comparison of the proposed structure with a state-of-the-art XOR gate

shows outperformance of the former in terms of Q-factor, thus positioning the new device as a very attractive alternative design for logic XOR functionality. Application as ultra-fast processing element on forthcoming optical telecommunication networks is foreseen.

5.4 Distributed Power Control Performance in DS-CDMA Systems with Adaptive Quantization

Francisco Javier Martinez-Lopez, Daniel U. Campos-Delgado, J. Martin Luna-Rivera
UASLP

One practical constraint imposed on closed-loop power control algorithms for a direct-sequence code-division multiple-access communication (DS-CDMA) system is the limited amount of feedback information. This paper proposes a closed-loop power control scheme with adaptive quantization on the basis of the number of power command bits. Adaptive quantization is used on the hypothesis that the quantization sensitivity can be defined as a function of the standard deviation of the power command signal, while maintaining the feedback number of bits constant. Simulation results are presented to illustrate the performance of a distributed power control (DPC) scheme with adaptive quantization, using the classic proportional integral derivative (PID) structure. Moreover, the performance of the DPC algorithm with fixed quantization is also presented and compared with the standard single-step power correction scheme.

5.5 Linear Dispersion Codes Generation from Hybrid STBC-VBLAST Architectures

Omar Humberto Longoria Gándara, Alberto Emmanuel Sánchez Hernández, Joaquín Cortez González, Luis Miguel Bazdresch Sierra, Ramón Parra Michel
CINVESTAV-IPN, Unidad Guadalajara

Hybrid MIMO Systems are defined as a combination of architectures designed to achieve both multiplexing gain (such as VBLAST), and diversity gain, (such as STBC). In these systems the detection can be performed with an Ordered Successive Interference Cancellation (OSIC) based on SQRD algorithm, in which the layers with diversity are decoded first. In this paper we introduce a new way to represent Hybrid Systems, in which the detection process is carried out in a unified manner for both spatial and diversity transmitted symbols, using an OSIC algorithm, but symbol by symbol, just as single VBLAST systems performs. We show that within this approach, a Linear Dispersion (LD) codes has been actually generated, that allows the use of LD theory to settle the capacity achieved by the Hybrid system. Therefore a bridge between Hybrid Systems and LD codes has been established.

6 CS1 Computer Science

6.1 Multi-Class Support Vector Machines for Large Data Sets via Minimum Enclosing Ball Clustering

Jair Cervantes, Xiaou Li, Wen Yu, Javier Bejarano
Cinvestav

Support Vector Machines (SVM) for binary classification have been developed in a broad

field of applications. But normal SVM algorithms are not suitable for classification of large data sets because of high training complexity. This paper introduces a novel two-stage SVM classification approach for large data sets: minimum enclosing ball (MEB) clustering is introduced to select the training data from the original data set for the first stage SVM, and a de-clustering technique is then proposed to recover the training data for the second stage SVM. Then we extend binary SVM classification to case of multi-class. The novel two-stage multi-class SVM has distinctive advantages on dealing with huge data sets. Finally, we apply the proposed method on several benchmark problems, experimental results demonstrate that our approach have good classification accuracy while the training is significantly faster than other SVM classifiers.

6.2 Qubits structure and coherence in a one-way quantum computer

Manuel Avila Aoki

Centro Universitario UAEM Valle de Chalco UAEMex

Present days efforts for building up an operative quantum computer made of silicon soon they will concrete. One of the main challenges to this task is to implement qubit coherence in a practical way. We make emphasis in some physical characteristics (such as the structure) of the basic components (qubits) of a silicon one-way quantum computer which can be exploited in order to implement qubit coherence. Altogether with this, we introduce form factors (accounting for the qubit structure), and calculate times of coherence. It is found that the nuclei states last longer than their electronic counterpart. However, this stability of nuclei qubits limits the speed at which the computer can carry

out instructions and process the information.

6.3 A method for designing CNN templates

José Antonio Medina Hernández, Felipe Gómez Castañeda, José Antonio Moreno Cadenas

CINVESTAV

Cellular neural networks (CNN) are very useful for image processing tasks. One problem with CNN networks is the lack of a programming method to realize a processing task. The cloning templates entirely specifies the programming of a CNN net. There are a lot of cloning templates for several tasks, finded by mathematical analysis or heuristically. However for some specific tasks is very difficult to find the correct templates. In this paper a procedure for finding cloning templates for image processing tasks is described, using a gradient method. A set of CNN templates obtained using the proposed procedure is shown.

7 CS2 Computer Science

7.1 Fragile Watermarking for Color Image Authentication

Mariana Monzoy-Villuendas, Moises Salinas-Rosales, Mariko Nakano-Miyatake, Hector Pérez-Meana
ESIME Culhuacan, Instituto Politécnico Nacional

In this paper, we describe a watermarking system for digital color image authentication. This work is an extension of the Wang's work which is based on a Hash function to construct fragile watermarking system. The system is able to detect any change in the image

even though if it is minimal. Also the system indicates the regions where suffered alterations. In this system, YCrCb color space is used instead of RGB color space. Watermark extraction process can indicate presence of any kind of alteration in the color image, using extracted watermark image. Computer simulation results show authentication capacity of the proposed system, using different image modification, such as JPEG compression, noise contamination, photomontage, etc. Many fragile watermarking system are vulnerable to Vector quantization (VQ) attacks, however the proposed watermarking system also show robustness of the system against VQ attacks.

7.2 The Extreme Vertices Model in the n-Dimensional Space (nD-EVM): A Novel Representation Scheme for Orthogonal Polytopes

*Ricardo Perez-Aguila
Instituto Universitario de Tecnologia y Humanidades (IUTH)*

We will describe the Extreme Vertices Model in the n-Dimensional Space (nD-EVM) and the way it represents nD Orthogonal Pseudo-Polytopes (nD-OPP's) by considering only a subset of their vertices: the Extreme Vertices. In this work we present basic algorithms on the nD-EVM which provide useful information about the polytopes being modeled through the scheme. Time Complexity and practical applications of the nD-EVM are also commented.

7.3 Realtss: a real-time scheduler simulator

Arnoldo Diaz, Ruben Batista, Oskardie Castro

Instituto Tecnológico de Mexicali

Real-time scheduling theory has shown an impressive evolution in the past few years. As a consequence of the intensive research done in this area lot of new scheduling policies had been proposed to date. Nevertheless, just a few of such scheduling policies are available in existing Real-Time Operating Systems (RTOS). In this paper, we describe Realtss, an open source real-time scheduling simulator which is suited to simulate real-time scheduling algorithms without the need of implement them in a RTOS. Realtss is an invaluable teaching and researching tool since existing and new real-time scheduling policies can be easily evaluated.

7.4 Reinforcement Learning and Dynamic Planning Applied to Virtual Humans Animation

Moises Uc Cetina, Angel Rafael Rodriguez Moreno, Felix Francisco Ramos Corchado

Centro de Investigacion y de Estudios Avanzados del I.P.N., Unidad Guadalajara

We present an approach using learning and planning techniques to deal with the problem of animating virtual humans in 3D environments. The main idea is to use learning to guide the initial behavior for animation, then, if an unexpected situation appears use the dynamic planning algorithm to go one step more to finish the animation. The advantage of this strategy is to improve the time required by algorithms to animate virtual creatures. Results obtained show how using this strat-

egy improves the performance regarding just using the planning algorithms.

7.5 A μ -Calculus Approach for the Synthesis of Discrete-Event Supervisors with Safety Specifications

Jose Antonio Lopez Barreto, Arturo Sanchez Carmona, Raul Ernesto Gonzalez Torres

Centro de Investigación y Estudios Avanzados del I.P.N., Unidad Guadalajara

In this paper we present a generalized model-checking-based approach for the synthesis of automata-based supervisors for discrete-event systems (DES). Expressiveness of μ -calculus is exploited to construct fixpoint operators for supervisory synthesis. A novel Kripke structure is proposed that simplifies the synthesis of supervisors as a model checking problem within the same approach. An efficient synthesis algorithm is presented maintaining the same computational complexity of other known methods. A graphical example is employed to show the advantages of the proposed approach.

7.6 An improvement on the Symbolic L* Algorithm

Alejandro Aguilar Cornejo, Raul Ernesto Gonzalez Torres

Centro de Investigacion y Estudios Avanzados del IPN, Unidad Guadalajara

In this paper we present several improvements on the symbolic implementation of Angluin's L* algorithm for regular inference in the context of the compositional verification of reactive systems. We present a new kind of symbolic structures to model such

systems, which we interpret as automata for L* suitability, as well as a more efficient procedure for close the observational table.

8 CS3 Computer Science

8.1 Projection-Based Coordination Control of Automated Manufacturing Systems

Arturo Sanchez Carmona, Liz Erendira Llamas Lopez, Raul Ernesto Gonzalez Torres

Centro de Investigacion y Estudios Avanzados del I.P.N, Unidad Guadalajara

This paper presents the design and implementation of automata-based supervisors of a hierarchical and modular coordination architecture for a prototype automated manufacturing system (AMS). Models for each layer are built using industrial standards. Semantic consistency between adjacent layers is maintained by including in the upper layer transitions modeling the lower layer operational status. These transitions are used as the projection alphabets. The modularity of the architecture is exploited to guarantee global controllability.

8.2 Providing SIP services support on Mobile networks

Javier Alexander Hurtado Guaca, Francisco Orlando Martinez Pabon, Oscar Mauricio Caicedo Rendon, Octavio Ramirez Rojas

Universidad del Cauca

Mobile network operators aims are offering new services to be competitive in the telecommunications area. However, the migration cost towards the 3G network is so

high. This paper presents a proposal to offer a Next Generation Services Platform based on SIP. This solution is easy to implement and its cost is relatively low. Our solution takes into account the IMS service architecture specification proposed by the Third Generation Partnership Project (3GPP) providing ubiquitous characteristics for mobile users. In this way, our proposal becomes as a tool to allow an easy transition from 2.5 to 3rd generation networks.

8.3 Building an infrastructure for DNSSECbis in Mexico

Alberto Francisco Martinez Herrera, Sergio David Villarreal Reyes, Jorge Carlos Mex Perera, Gustavo Lozano Ibarra
Centre for Electronics and Telecommunications, Tecnológico de Monterrey, Campus Monterrey.

This paper describes the architecture developed for DNSSECbis implementation in NIC Mexico. The main goal of this work is to create a secure domain. We propose to build an architecture to manage DNSSECbis private keys securely. The software tools developed allows a zone administrator and the Internet Community to deploy DNSSECbis quickly and efficiently. One such tool checks whether a secure domain is correctly configured. Additional tools to manage private and public keys for DNSSECbis were created. The proposed architecture and tools have been used for DNSSECbis deployment under test.mx. The results of this trial shows that DNSSECbis adoption is feasible.

8.4 From Desktop Applications Towards Ajax Web Applications

J. Sergio Zepeda, Sergio V. Chapa
Department of Computer Science. CINVESTAV

Ajax is a set of different technologies that work together to create new and powerful Web applications. Ajax is demonstrating its usefulness in real world applications. The most important Internet companies as: Google, Yahoo, Amazon, Microsoft, are developing rich Web applications based on Ajax. Many developers do not know how to use these technologies to build Ajax Applications. In this paper, we present an overview about Ajax. Here, we discuss the term Ajax and the technologies used. Also, we show how Ajax is working inside, and how the technologies work together to achieve a rich behavior.

9 EC1 Electronic Circuits

9.1 Improved Direct Interface Circuit for Resistive Full- and Half-Bridge Sensors

Ernesto Sifuentes de la Hoya, Jaime Oscar Casas piedrafita, Ferran Reverter Cubarsi, Ramon Pallás Areny
Universitat Politècnica de Catalunya (UPC)

Resistive bridge sensors can be directly connected to a microcontroller by using time-based measurement circuits that yield a digital output proportional to the fractional resistance change. However, internal resistances (Rini) of microcontroller pins result in systematic errors. We propose an improved measurement circuit and two time-based equations to compensate for Rini. The proposed circuit and equations have been tested on

full- and half-bridge circuits. For both types of bridge, the improved interface circuit and the two novel algorithms reduce the maximal error by a factor greater than two.

9.2 LOCOL: Leakage Reduction Tool Based on Transistor Reordering and Local Stacking

Bassem Elkarablieh, Adrian Nunez-Aldana

University of Texas at Austin

As technology scales down, leakage is becoming the most dominant factor of power consumption in VLSI circuits. Recently, many design strategies targeting leakage reduction have been published by industry and academia groups. However, the timing penalty of leakage reduction techniques is considerable. We present LOCOL, a CAD tool for reducing power while minimizing the large penalties in timing. LOCOL uses transistor reordering in conjunction with local path stacking to reduce the leakage of complex CMOS gates. Experiments show that for various complex gates, leakage was reduced by an average factor of 12X, and the critical path timing increased by an average of 20%, which is feasible compared to 200% overhead imposed by present techniques.

9.3 A Real-time AAC/MP3-type Audio Codec on the 16-bit dsPIC Architecture

Ishaan Dalal

The Cooper Union for the Advancement of Science and Art

This paper presents the design and implementation of a psychoacoustic, MDCT-based

digital audio decoder and associated playback system on Microchip's 16-bit, fixed-point *dsPIC* microcontroller. Unlike common "MP3-player" projects that use dedicated decoder chips, here one microcontroller handles everything from data transfer, signal processing and LCD display. The system can play back encoded 44.1 KHz stereo audio in real-time from a flash card. All code was custom-written in assembly. Additional modifications to the decoder to make it work with standards-compliant MP3 or AAC audio are in progress.

9.4 On the Generalized-Proportional-Integral Sliding mode Control of the "Boost-Boost" Converter

Adrian Franco-González, Richard Marquez, Hebertt Sira-Ramírez
CINVESTAV-IPN

This paper presents a multi-variable DC-to-DC converter of the "Boost-Boost" type constituted by two cascaded "Boost" converters in continuous conduction mode, each feeding an independent resistive load. A sliding mode feedback controller, based on the Generalized Proportional Integral (GPI) approach, is developed for the regulation task. The feedback control scheme uses only output capacitor voltage measurements, as well as input signals represented by the switch positions. In addition robustness of the feedback scheme is tested by non-modelled sudden load resistance variations in the last resistive load. Experimental results verify theoretical predictions.

10 EC2 Electronic Circuits

10.1 Low Cost Ultrasonic Anemometer

Miguel Pérez del Valle, Antonio Urbano Castelán, Yasuhiro Matsumoto
Centro de Investigacion y de Estudios Avanzados del IPN

Low-cost ultrasonic transducers have been employed for wind speed and direction measurements. The system logic was designed based on Freescale's HCS12 microcontroller which delivers data to a personal computer. A LabVIEW virtual instrument software has been used for final data display and logging.

10.2 Design and Characterization of Low Phase Noise C-band SiGe HBT Amplifier

Nicolas Shtin, Ruben Ortiz Loa, Jose Mauricio Lopez Romero, Eugen Prokhorov
CINVESTAV Unidad Queretaro

This paper deals with the design and experimental characterization of C-band microwave amplifier based on commercial SiGe heterojunction bipolar transistor (HBT). In this design an impedance-matching technique that allows realization of the HBT amplifiers having a maximum gain within 4...6 GHz frequency range is developed. As a result of this approach a low phase noise amplifier providing a 13 dB gain at 4.6 GHz and about 1 GHz bandwidth has been designed. In order to characterize a phase noise of the designed amplifier a phase noise measurement setup based on a carrier suppression technique was developed. A measured amplifier's phase noise is proved to be lower than -160 dBc/Hz at 1 kHz Fourier frequency.

10.3 Phase Analysis of a Variable Gain Amplifier Controlled Through Matching Networks

Martin Javier Martinez Silva, María Susana Ruiz Palacios, José Luis Ramos Quirarte
University of Guadalajara, CUCEI

The phase is an important characteristic for the majority of communications circuits. In this paper a study of the effects in the phase of a type of variable gain amplifier (VGA) is presented. The VGA is controlled through the change in the reactance of the elements in impedance matching networks. Two control parameters are defined to change the gain and phase. Expressions are presented to predict such variations. Design examples of variable gain amplifiers are carried out and graphics for the properties of gain and phase are shown. Although control of these characteristics is not independent, the advantage is that it can be done by a single circuit. Its application in beamforming networks for antenna arrays is discussed.

10.4 Graphical Analysis of Transformed Feedback Bilinear Expressions Applied to Differential Active Phase Shifters Design

Javier E Gonzalez Villarruel Javier, Mario Lopez Mario
ITESM- CEM

Graphical analysis has become a powerful tool to design advanced high frequency circuits. By mapping complex expressions on a smith chart, complex functions can visually be designed. This paper presents a graphical method applied to active high frequency phase shifters design. By mapping bilinear expressions resulting from an active

device with a serial or parallel feedback, active phase shifters can be designed. For the method proposed, first the expressions for the bilinear transformed component are obtained from original active device S parameters, then, a computer program performs the mapping process and plots constant amplitude and phase circles on a smith chart representing the feedback component. Finally by selecting the adequate circles the differential phase shifter can be designed.

11 EP Electrical Power

11.1 A New Algorithm for Load Balancing and Power Factor Correction in Multi-phase (Six-phase) Load Circuits

Zakir Husain, R.K. Singh, S.N. Tiwari
National Institute of Technology Hamirpur

Multi-phase loads, with phases more than three, especially in the form of inverter fed induction motor drives suited to high power and specialized applications, are receiving growing attention in the literature. This multi-phase source for such drive application may be derived from transformer connection (3 phase to 6 phase) or by DC link six-phase inverters. These sources will face the problem of unbalance, harmonic distortion and poor power factor operation. In view of these developments, this paper deals with the supply side load balancing and power factor correction in such load circuits. The proposed compensation scheme uses the shunt current source compensation whose instantaneous values are determined by the instantaneous symmetrical component theory. The compensation scheme developed in the paper is tested for its validity on 6-phase (6-wire & 7-wire) circuits through extensive simulations

for unbalanced loading and phase outages. The simulation results of the compensation theory and the ideal compensator verify the compensation method.

11.2 Steady-State Inductance Calculation of a Turbine Generator in the ABC Reference Frame

Rafael Escarela Perez, Eduardo Campero Littlewood, Ana Lilia Laureano Cruces

Universidad Autónoma Metropolitana

The calculation of non-saturated inductances for a solid-rotor generator is performed using analytical formulae and finite-element computations. The inductance profiles are obtained in the ABC frame of reference. It is assumed that the machine is operating in the linear region of the open-circuit characteristic. Finite-element simulations are more accurate than analytical approaches since the electromagnetic phenomena is better represented. On the other, hand, analytical formulae is computationally less expensive but accuracy is questionable since many approximations are considered for their final establishment. Proper combination of both techniques gives a good trade-off between accuracy and computational costs. Steady-state inductances are employed for example in the determination of the machine operation safe regions.

11.3 Estimation of Two-axis Synchronous Machine Parameters using Non-Deterministic Tools

Rafael Escarela Perez, Tadeusz Niewierowicz, Eduardo Campero Littlewood, Jose Luis Hernandez Avila

Universidad Autonoma Metropolitana

Optimization is employed in this work to obtain the two-axis parameters of a typical solid-rotor synchronous machine. SSFR data is used to set-up the identification problem, leading to a fitness function that must be minimized. However, the function is plagued with local minima, making the parameter identification impossible with deterministic methods. Genetic Algorithms have become an important tool to deal with local minima and software codes are readily available. Determination of the global/true minimum is not easy though since big computational resources are required even for relatively small problems. Moreover, the final minimum may not be found in spite of proper tuning of the Genetic Algorithm. Some tuning aspects are addressed in this work.

11.4 Real-Time Outage and Non-Outage Fault Location for Weakly Meshed Distribution Networks Using Directional and Non-Directional Fau

*Izudin Dzafic**Siemens AG, Power Transmission and Distribution, Energy Automation*

Traditional approaches use two different algorithms for outage and non-outage fault locations. Both of them are based on classical radial (tree) distribution networks. This paper describes algorithm that can be applied to any kind of meshed network configurations using any available fault indicator type. The proposed algorithm is very suitable for extensions: including impedance based information or processing trouble calls.

11.5 Observer Based Control for a Single Phase Active Rectifier

*Manuel Israel Flota Bañuelos**Universidad Autónoma de San Luis Potosí*

There are two control objectives in active rectifiers: DC regulation and power factor correction, however it is difficult to reach both objectives simultaneously. In this paper is presented the use of an observer based control for complete both control objectives. A proportional integral (PI) control is applied to regulate DC voltage and a hysteresis based control for improve the power factor. Experimental results on a 1kVA single phase active rectifier prototype are presented to verify the system's behavior.

11.6 Unknown Input Observer for Induction Motors:Experimental Evaluation

*Fabian Romero Torres, Marco Gallegos Lara, Ricardo Alvarez Salas, Edmundo Gabriel Rocha Cozatl**Universidad Autónoma de San Luis Potosí*

Unknown input observers (UIO) are able to estimate perfectly the state of a system, despite of completely unknown input perturbations. In this paper is presented the experimental evaluation of an unknown input observer suitable for flux estimation for induction motors taking the load torque as unknown input. Experimental results on a semi-industrial setup are given.

12 MEC1 Mechatronics and Automatic Control

12.1 On-line Algebraic Identification of Eccentricity in Active Vibration Control of Rotor-bearing Systems

Andrés Blanco Ortega, Francisco Beltrán Carbajal, Gerardo Silva Navarro
ITESM, Campus Guadalajara División de Ingeniería y Arquitectura

This paper leads with the application of on-line algebraic identification for eccentricity estimation in a rotor-bearing system. An important property of this algebraic identification is that the eccentricity identification is not asymptotic but algebraic, in contrast to most of the traditional identification methods, which generally suffer of poor speed performance. The algebraic identification is combined with an adaptive-like active vibration control scheme to reduce the amplitude response of the system while it passes through of its first critical speed. It is considered that one of the bearings can be automatically moved to control the effective rotor length and, as an immediate consequence, the rotor stiffness. Therefore, the rotor stiffness is considered as a control input of the system. Some numerical simulations are included to illustrate the dynamic performance of the algebraic identification and the active vibration control scheme, when the rotor is started and operated over the first critical speed.

12.2 Geometric Design of Lead/Lag Compensators Meeting a Hinf Specification

Salvador Saucedo Flores, Antulio Morgado Valle, Bernardo Altamirano Castillejos

ESIME Zacatenco IPN

The problem of characterizing a class of second-order three-parameter compensators [including lead/lag compensators and proportional-integral-derivative (PID) controllers] satisfying given a closed-loop specification. Design characterizations of similar form as in the recent work on PID control, are derived for a larger class of compensators using simple geometric considerations. The linear fractional transformation is used to give the transfer function the required shape. A generalization of the Hermite-Biehler Theorem is used.

12.3 Decentralized Fuzzy Gain Scheduling Control for an Open Irrigation Canal Prototype

Ofelia Begovich, Evaristo Martinez, Victor Ruiz Carmona

CINVESTAV-IPN, U. Guadalajara

A decentralized fuzzy gain scheduling control is designed and tested in simulation on a multipool open irrigation canal prototype. The main objective of the controller is to regulate the downstream level of each canal's pool in spite of large inflow disturbances. Each local controller, of the decentralized control, is a gain scheduling controller composed by a bank of three Linear Quadratic Gaussian (LQG) regulators switched by fuzzy logic. The adequate closed-loop performance obtained suggests the evaluation of the developed scheme on field applications.

12.4 Nonlinear Uncertain Servomechanism Tracking using an Integral Observer

Rubén Garrido, Ernesto Flores García

CINVESTAV-IPN, Departamento de Control Automático.

The problem of tracking in a second order nonlinear uncertain servo is considered. A Proportional-Derivative (PD) controller with uncertainty and feedforward compensation is proposed. Such a controller employs estimates obtained from an Integral Observer. Stability analysis in a Lyapunov sense for the closed-loop system is performed. Experiments are carried out on a laboratory prototype to validate the proposed approach.

12.5 Dynamical Sliding Mode Control of a MagLev System with 3 DOFs: Experimental Results

Ervin Jesus Alvarez Sanchez, Jaime Alvarez Gallegos, Rafael Castro Linares CINVESTAV

In this paper we present the mathematical model for a MagLev system with 3 DOFs. A dynamical sliding mode controller is proposed to regulate the levitation to a desired position and stabilize the rotational movements. Finally the mathematical model and the controller are validated and evaluated by means of some experimental tests.

12.6 Computed-Torque Control of an Omnidirectional Mobile Robot

José Alejandro Vázquez Santacruz, Martín Velasco Villa

CINVESTAV-IPN Departamento de Ingeniería Eléctrica Sección de Mecatrónica

The path-tracking problem of a wheeled omnidirectional mobile robot is addressed in this work. Instead of the classical kinematics model based control commonly considered, the analysis of the problem is based on

the dynamic model of the vehicle. Borrowed from the rigid robot manipulator literature, the well known computed torque control strategy is applied to the case of a mobile robot of the type (3,0). It is shown that the considered strategy solves the problem assuring the closed loop stability of the system when the state is available for measurement, allowing in this way the convergence of the tracking errors. The performance of the tracking strategy is evaluated by simulation, showing an acceptable performance.

13 MEC2 Mechatronics and Automatic Control

13.1 Modeling and inventory regulation of dynamic supply chains through ordering policies

Alejandro Rodriguez-Angeles, Arturo Sanchez Carmona, Miguel Angel Duarte Lobo

Centro de Investigación y Estudios Avanzados del I.P.N. Cinvestav

A modeling approach based on traffic flow theory, that involves orders and delays in material flows for supply chains is presented. The resulting dynamic model is nonlinear and reflects basic phenomena of supply chains such as bullwhip effect due to delays on delivering materials. For control purposes a bounded PI control for inventory level regulation is considered. A stability analysis of the closed loop system based on linearization is performed. A simulation case study is presented.

13.2 On the Implementation of Control Laws for Finite Spectrum Assignment: the Multiple Delays Case

Daniel Melchor-Aguilar, Beatriz Tristán-Tristán

División de Matemáticas Aplicadas Instituto Potosino de Investigación Científica y Tecnológica

In this note the stability of the internal dynamics of control laws with distributed delays which assign a finite spectrum for delay systems is addressed. These dynamics are described by a special class of integral delay equations. We provide stability conditions for the integral delay equations that could guarantee a safe implementation of the control law by only using numerical quadrature methods.

13.3 On the Output Feedback Control of a Completely Unknown DC-Motor: Fast Algebraic Based Adaptation.

Enrique Barrios Cruz, Hebertt Sira Ramírez, Richard Márquez Contreras
CINVESTAV-Zacatenco

An algebraic parameter identification method, developed for fast, on-line, computation of unknown linear system parameters, is here used for the fast adaptive output feedback control of a completely unknown dc motor, subject to constant perturbation load torques while solving a reference trajectory tracking task. An output feedback controller of the Generalized Proportional Integral (GPI) type, written in classical compensation network form, is proposed for the perturbed output trajectory tracking problem. The fast adaptation of system parameters is carried out, both, on the classical com-

pensating network parameters and on the conformation of the feed-forward control input signal. Experimental results validate the effectiveness of the proposed approach.

13.4 Stable synchronization control for two ball and beam systems

Saul Jimenez, Wen Yu
CINVESTAV-IPN

Ball and beam system is one of the most enduringly popular and important laboratory models for teaching control systems engineering. There are two main problems for ball and beam control: 1) many laboratories use simple controllers such as PD control, but theoretical analysis is based on linear models. 2) nonlinear controllers for ball and beam system have good theory results, but they are seldom used in real applications and almost nobody perform synchronization control for ball and beam systems. In this paper we modify the normal PD control in two ways for each ball and beam system: parallel and serial PD controllers for the regulation case are given then we analyze the stability of these types of controllers for the synchronization of two ball and beam systems. A simulation case is applied to test our theory results.

13.5 Finite Element Analysis and Design of a CubeSat Class Picosatellite Structure

Cuahtémoc Quiroz, Gerardo Silva, Hugo Rodríguez
CINVESTAV

This paper focuses on the mechanical design of a low-cost picosatellite structure which complies with the CubeSat program design

specifications. Being the quasi-static loads bigger than any other expected load, we consider failures due to column bending as a design criteria. The overall design is validated using finite element methods. The satellite structure is treated as a combination of beams and thin plate elements. The mechanical design process leads to three different prototypes which comply with the dimensional and structural requirements of the CubeSat program. The natural frequencies of the prototypes are computed numerically through finite element based methods.

13.6 On the Analysis and Control of a flexible link Robot

Juan Fernando Peza Solis, Gerardo Silva Navarro, Rafael Castro Linares
CINVESTAV, IPN

In this article, a mathematical model for controlling the end tip position of a single flexible link robot arm is presented. The model is derived using a finite modal approximation for the solution of the Euler-Bernoulli beam equation, with the clamped-free boundary conditions. The link is bounded to move on the horizontal plane, so that the gravity effects on the link are neglected. An appropriate output function is chosen for properly controlling the system, called, the negative mode reflected output. Passivity concepts are applied for properly stabilizing the system allowing the application of a simple control approach for controlling the tip position. Simulations of the controlled system show the obtained results.

14 MEC3 Mechatronics and Automatic Control

14.1 Sliding PID Control for Trajectory Tracking of a 2 DOF Robot Manipulator: Simulations and Experiments

David D. Muro-Maldonado, Alejandro A. Rodríguez-Ángeles, Carlos Alberto C.A. Cruz-Villar
CINVESTAV

For a class of robot arms, a proportional derivative (PD) controller plus gravity compensation yields global asymptotic stability for regulation tasks, and some proportional integral derivative (PID) controllers guarantee local convergence without gravity cancellation. However, these controllers cannot render asymptotic stability for tracking tasks. In this paper, a simple sliding PID controller for tracking tasks that yields semiglobal stability of all closed-loop signals with exponential convergence of tracking errors is used. The designing, modeling and construction of a robot manipulator is presented, following a multidisciplinary approach, everything based on CAD/CAE/CAM tools. The prototype is a 3 DOF planar robot manipulator arm pendulum type, totally designed in SolidWorks

14.2 On the GPI balancing control of an uncertain Jeffcot rotor model

Hebertt Sira Ramirez, Gerardo Silva Navarro, Francisco Beltran Carvajal
Cinvestav-IPN

In this article, we present an on-line piecewise perturbation identification approach, based on algebraic parameter identification methods, for the output feedback control of an unbalanced rotor model with unknown eccentricity parameters, unknown angular

velocity and unknown mass. The eccentricity perturbation effects are regarded as unknown perturbations inputs that need to be approximately identified, in a local and on-line fashion, in order to properly compensate, from the available set of external force control inputs, for their periodic influence on the center of mass dynamics. An adaptive output trajectory tracking controller of the GPI type is proposed for actively balancing towards a desired steady state the perturbed rotor dynamics.

14.3 Estimation of the Precursor Power and Internal Reactivity in a Nuclear Reactor by a Neural Observer

J. Humberto Perez-Cruz, Alexander Poznyak
CINVESTAV

This paper presents the design of a nonlinear robust observer for the estimation of the neutron precursor power and internal reactivity in a nuclear research reactor when only the input and the neutron power are available for measurement. The observer is based on a differential neural network with internal and external layers. Besides, this observer has two correction terms: Luenberger one and sliding mode one. This last term is intended to reduce the output external noise effect. The neural network is initially trained off-line using a very simplified third order nonlinear model of the nuclear reactor. The off-line training process is robust with respect to the model employed. Thus, when this preliminary training has finished, the neural observer can work as a completely physical model-free system and can carry out the on-line state estimation within a small margin of error despite uncertainty and noise. The efficiency of this technique with a guaranteed

bound for the averaged estimation error is illustrated by simulation.

14.4 Experimental Results on the Semiactive Sliding-Mode Control of the Unbalance Response in a Rotor-Bearing System Supported on MR

Alvaro Cabrera Amado, Gerardo Silva Navarro
CINVESTAV

This paper deals with the problem of semiactive balancing control of a rotor-bearing system, where one journal bearings is supported on two radial Magneto-Rheological(MR)dampers. The mathematical model of the rotor-bearing system results from a Jeffcott-like model and the dynamics associated to the MR dampers, whose rheological properties depend on the current inputs. For control purposes we use the Choi-Lee-Park polynomial model for the MR dampers, which is quite consistent with the nonlinear and complex hysteresis behavior and also simplifies the physical implementation on an experimental setup. The semiactive control scheme for the unbalance response of the rotor-bearing system is synthesized using sliding-mode control techniques. Some numerical and experimental results are included to illustrate the dynamic performance and robustness of the overall system.

14.5 Fault diagnosis by means of sliding mode techniques

José Juan Rincón Pasaye, Rafael Martínez Guerra
Centro de Investigación y Estudios Avanzados

In this work, the fault diagnosis problem for nonlinear systems is treated, some results based on a differential algebraic approach are used in order to determine fault diagnosability and one nonlinear observer using a sliding mode technique is given for estimating the faults, another nonlinear observer is also treated with the purpose of comparing results. An academic example is presented and faults are estimated by each observer. Some numerical results are shown to illustrate this methodology.

14.6 Basic Small Fixed Wing Aircraft Sizing Optimizing

Ezequiel Reyes Retana, Hugo Rodriguez Cortes

CINVESTAV IPN

In this paper we address the endurance optimization problem for an electric powered fixed wing aircraft. An endurance equation in terms of the aircraft aerodynamics and the electric power plant characteristics is obtained. The equation is optimized as a nonlinear problem and handled using optimization constrained techniques to get the optimal values of the dimensions to build a basic aircraft sizing with maximum endurance.

15 SEM1 Semiconductor Materials

15.1 Chemical composition and resistivity of sprayed CuInS_2 thin films for solar cells

Juan Manuel Peza Tapia, Arturo Morales Acevedo, Mauricio Ortega López
CINVESTAV-IPN México D.F. Depto. de Ingeniería Eléctrica-SEES

CuInS_2 thin films were prepared on glass substrates using the spray pyrolysis technique, using solutions in a wide range going from poor in Cu to rich in Cu compositions. The films were prepared at 390°C . The films have been sprayed using different ratios of $x = [\text{Cu}] / [\text{In}]$ in the precursor solution with the objective of studying their compositional, structural, optical and electrical properties. The value of the Cu/In ratio in the precursor solution has been changed in the range 0.66 – 1.5. SEM photographs show that the surface of films prepared with low values of x were smooth, formed by small crystallites, while the films grown with higher values of x present rough surfaces constituted by larger crystallites. The X-ray diffraction show that films grown with low x values are composed by CuInS_2 , In_6S_7 , In_2S_3 and CuIn_5S_8 phases, while the Cu-rich films present only the CuInS_2 phase with the sphalerite structure. The chemical composition has important influence in the grain size in the films since it is observed that the grain size increases as copper concentration in the films increases. The optical band-gap of the Cu-poor films is larger than for Cu-rich films possibly by quantum confinement of carriers inside the small crystals. The electrical resistivity for the Cu-poor films is high, around $10^6 \Omega\cdot\text{cm}$, while the Cu-rich films present relatively small values, around $0.06 \Omega\cdot\text{cm}$. This result can also be explained as due to the difference in grain size for the different layers grown from different precursor solutions. The above results will allow us to select the most appropriate conditions for preparing CuInS_2 thin films by spray pyrolysis for their use in hetero-junction solar cells.

15.2 Crystallization of SbTe Phase Change Optical Films

Eduardo Morales-Sanchez, Evgene Prokhorov, Jesus González Hernández, Martín Adelaido Hernández Landaverde, Benjamin Chao

CICATA-IPN Unidad Querétaro

The aim of this work was to investigate the crystallization properties and crystallization temperature in SbTe thin films, with different content of Sb, using DSC, optical reflection at 650 nm and XRD measurements. DSC studies showed that crystallization temperature of the films depend on the Sb content. XRD measurements have shown that films with low Sb contents (less than 73 at. %) directly crystallized in orthorhombic $Sb_{2n}Te_3$ and films with higher Sb contents first crystallized in rhombohedral Sb phase and at more high temperature appear $Sb_{2n}Te_3$ stable crystalline phase. Optical measurements showed a gradual increase of reflectivity with the temperature depending on the Sb content. The results of this research show that it is possible to obtain mixtures with different crystallization temperatures, changing the Sb content in the SbTe alloys.

15.3 Origin of Stimulated Emission in Nanostructured Silicon p-n Junction

Oleksandr Malik, Javier De la Hidalga-W., Alfonso Torres-J, Wilfrido Calleja-A National Institute for Astrophysics, Optics, and Electronics (INAOE), Electronics Department

The problem of laser operation based on band-to-band transitions in bulk crystalline silicon is connected with its indirect energy band-gap structure. Nevertheless, Chen et al. [1] demonstrated experimentally for the

first time the presence of stimulated emission from a silicon p-n diode. A peculiarity of those investigated diodes was the use of multiple nanostructured p-n junctions with an area of about 10-11 cm²; they were fabricated on the silicon surface by the decomposition of boron silicate mixed with SiO₂ nanoparticles. The authors [1] suggested that the boron clusters diffuse into the silicon substrate to form p⁺-doped nanostructured p⁺-n junctions after the decomposition of this compound. The aim of this work is to discuss the origin of the stimulated phonon-assisted band-to-band emission from a nanostructured p-n junction. A more realistic model based on the formation of a nanostructured boron-silicon p-n heterojunction is proposed to describe the origin of the stimulated emission. Other important aspects of the stimulated emission such as the formation of a self-compressed electron-hole plasma at the silicon surface, are also discussed.

16 SEM2 Semiconductor Materials

16.1 Study of the Crystallization Process of Cu₂O Samples from Polycrystalline Copper Plates.

Horacio Solache Carranco, Ramón Peñ Sierra, Gabriel Juárez Díaz CINVESTAV IPN

An experimental study of the crystallization process of Cu₂O samples from polycrystalline copper plates is presented. The crystallization process consists of two stages: In the first stage polycrystalline copper plates were wholly oxidized at 1020 ° in air, in the second stage the Cu₂O samples were crystallized through an annealing process at temperatures in the range of 1040-1070 °, by several hours to promote the increase in size

of the crystallites constituting the initial Cu_2O sample. The Cu_2O samples were characterized by X-ray diffraction and photoluminescence measurements. With the processing conditions used in the annealing process, Cu_2O samples with single crystalline areas of more than 2 mm in diameter are observed. On the basis of the experimental results, a model for the crystallization of Cu_2O is presented.

16.2 Cathodoluminescence of Silicon Rich Oxide with nitrogen incorporated

Rosa Elvia Lopez Estopier, Mariano Aceves Mijares, Zhenrui Yu, Ciro Falcony Guajardo

National Institute for Astrophysics, Optics and Electronics

Cathodoluminescence (CL) spectra for Silicon Rich Oxide (SRO) films with different silicon excess and nitrogen content are measured at room temperature. The SRO was deposited by Low Pressure Chemical Vapor Deposition (LPCVD) on Si substrates, and nitrogen was introduced into SRO adding NH_3 to the reactive gases. The samples were divided in two parts, one part was annealed at 1100 °C. The nitrogen incorporation was observed by Fourier Transform Infrared Spectroscopy (FTIR). All samples annealed at 1100 °C show CL, and only SRO with low silicon excess shows emission as deposited. The CL emission shows bands centered at ~460nm, ~530nm and ~720nm. The emission of these bands depends on nitrogen and silicon excess. The peak of the blue CL band (~460nm) is related to twofold coordinated silicon center (=Si:). The band at ~530nm is related with defect due to nitrogen incorporation. The band at ~720nm band is similar to that obtained in PL.

16.3 Field Emission from Palladium Oxide Nanostructures Grown on Si Substrates at Atmospheric Pressure

Roberto Baca Arroyo, Claudia A López Rodríguez, Miguel Galvan Arellano, Ramón Peña Sierra, Gabriel Romero Paredes Rubio
CINVESTAV IPN

In this work the field emission at atmospheric pressure from palladium oxide (PdO) nanostructures grown on Si (111) is demonstrated. The process for the growth of PdO nanostructures with average height between 9-45nm is reported. The structure used for measuring de field emission current posses a diode configuration with a separation between cathode and anode of 5.6um. The current-voltage (I-V) characteristics of the developed structure were observed with voltages between 100V operating at atmospheric pressure conditions. The base current of the developed structures without nanoemitters was of 1-4nA. The maximum current measured for PdO film nanoemitters was of 100nA.

17 SSE1 Solid-State Electronics and VLSI

17.1 Quantum mechanical modeling of charge trapping/detrapping phenomena in CMOS structures with high-k dielectric

K M Farhan Shahil Farhan
Bangladesh University of Engineering and Technology

A quantum mechanical model for the threshold voltage instability induced by charge trapping in the NMOS and PMOS structures with high-k gate dielectric stacks has been developed. The model has been developed introducing a new concept of charge detrapping through both gate-oxide and substrate-oxide interfaces. A predominant role of that effect has been observed with decreasing effective oxide thickness. The proposed model is applicable for samples fabricated with different annealing temperatures

17.2 Thin Film Bulk Acoustic Wave Resonators for their application in Microwave Filters

Gerardo Francisco Perez Sanchez, Arturo Morales-Acevedo, Carlos Saavedra, Brad Jackson
CINVESTAV del IPN

We have made Thin Film Bulk Acoustic Resonators (FBAR) using ZnO as the piezoelectric material grown by sputtering. The performance of the devices was characterized by measuring the frequency response in the range 2-5 GHz, finding the fundamental series resonance frequency at 2.367 GHz. The values for the signal loss of insertion, quality factor (Qs) and the electromechanical coefficient (keff2) were 2.198 dB, 20 y 1.15 %, respectively. In order to model and predict the resonator behavior we have used the modified Butterworth Van-Dyke (MBVD) circuit.

17.3 A Signal Probability Based Self-Controlling Leakage Reduction Technique For CMOS Circuits

Preetham Lakshmikanthan, Adrian Nunez

Syracuse University

Leakage power loss is a major concern in deep-submicron technologies and efficient leakage control mechanisms are necessary to maximize battery life. In this paper, a novel self-controlling leakage reduction technique for CMOS circuits is presented. The disadvantages of having an external controller sequencing the circuit operation like excessive "wakeup" delay and layout routing congestion for different control signals are averted using this self-controlling technique. A combination of high-Vt (high voltage threshold) and standard-Vt control transistors achieves voltage balancing in the Pull-Up Network (PUN) and Pull-Down Network (PDN) paths, thereby cancelling the leakage effect in both the paths. Experimental results on a variety of circuits with 180 nm technology show significant leakage power savings using this technique when compared to the standard circuit implementation, and also when compared to a well established self-controlling leakage reduction technique.

17.4 Verilog-A Implementation of ICS Model for PD SOI Devices

Esteban Contreras, Joaquin Alvarado, Antonio Cerdeira
CINVESTAV

We present a Verilog-A implementation of a Improved Charge Sheet Model (ICSM) for PD SOI MOSFETs. This model is a physical and continuous compact model for deep-submicron transistors focused in an accuracy description of high order derivatives, in order to obtain good approximation of the harmonic distortion behavior. The implementation of the model, using Verilog-A language, allows analog circuit designer simulate their PD SOI design in SPICE circuit simulators, expecting reliable results

17.5 Adaptive Signal Identification Using LMS Filter with an Analog Memory Cell

Jesus de la Cruz, Felipe Felipe, Jose Antonio Moreno, Juan Carlos Juan CINESTAV, D.F.

This paper presents the performance of optimal filtering; LMS with a nonvolatile analog memory cell fabricated through 1.2 μ m CMOS process, for the adaptive identification signal problem, where transfer functions are unknown and changing. The memory stores the weight in the filter as charge on the floating gate of a transistor pMOS. The update is linear, using a pulse density modulation scheme by means of tunneling and injection mechanisms. The LMS algorithm is implemented digitally off chip, and it does not require the signal to be piecewise stationary, and requires no manual operation other than selection of the step-size.

17.6 Lowest Temperature at Thermoelectric Cooling

Yuri Gurevich, Georgiy Logvinov, Oscar Angeles Frago, José Luis del Río Valdés
Departamento de Física, CINESTAV-IPN.

One-dimensional model of thermoelectric module is suggested, and the lowest temperature of thermoelectric cooling is obtained. It is supposed that cooling occurs due to the classic Peltier's effect, and the thermoelectric module operates in the mode when no external thermal load is applied.

18 SSE2 Solid-State Electronics and VLSI

18.1 Comparative analysis between the STRATIX II (Altera) and VIRTEX 4 (Xilinx) for implementing a LVDS bus receiver

Carlos Alberto Lujan Ramirez, Francisco José Mora Mas, Jorge Daniel Martínez Pérez Martínez Pérez
Institute Technologic de Mérida

Technological advances mean that increasingly faster speeds are required for data transmission between devices, and so better tools and resources are required for connecting devices. When various solutions are available for solving data transmission problems, it is necessary to compare solutions to decide which is best for a given system. This paper compares two families of FPGAs both suitable for implementing an LVDS receiver de-serializer. The paper also describes the various tools that are available with each device for improving performance and increasing data transmission rates.

18.2 An Experimental Comparison of Clock Distribution Networks for Systems on Chip

Monico Linares Aranda, Manuel Salim Maza, Daniel Pacheco Bautista
Instituto Nacional de Astrofísica, Óptica y Electrónica

In this paper, an evaluation of experimental results from clock distribution networks fabricated for large systems on chip is presented. Typical 3.3V 0.35 μ m CMOS N-well AMIS process parameters were used for the chip fabrication and analysis. It is shown that local networks represent an appropriate approach when used in system on a chip since these

networks are comparable in performance to global nets but more robust under process variations.

18.3 Analysis of the Threshold Voltage BSIM-Model for a Short Channel PD-SOI DTMOS

*Abimael Jimenez Perez, Francisco Javier De la Hidalgo Wade
Instituto Nacional de Astrofísica Óptica y Electrónica (INAOE)*

The threshold voltage is a fundamental parameter necessary to predict the correct behavior of circuits based on Dynamic Threshold MOSFETs. In this work, we analyzed the short channel effects on this parameter. PISCES simulations of short and long channel MOSFET's based on a 0.2 μm PD-SOI technology were used to investigate the validity of the BSIMSOI model under substrate forward bias. The simulation results showed that the dependence of the threshold voltage on the substrate forward bias can differ importantly from the BSIMSOI model for short channel devices, but it could agree with BSIMSOI model for long channel devices. Under substrate forward bias, an improved definition for the minimum surface potential must be used in order to eliminate the differences between the BSIMSOI model and PISCES simulations for short channel devices.

18.4 Model for a CMOS Bit-Level Product Cell

Yesenia Eleonor González-Navarro, Felipe Gómez-Castañeda, José Antonio Moreno-Cadenas, Luis Martin Flores-Nava, Oliverio Arellano-Cárdenas

CINVESTAV-IPN

An analysis method for a bit-level product cell used for vector-matrix multiplications is presented. The cell is a combination of a charge injection binary multiplier and an analog accumulator. CID/CCD principles help to understand the cell function and MOS structure equations are used to describe the cell operations.

19 SSE3 Solid-State Electronics and VLSI

19.1 Programmable Inverter Based on Neuron MOS Transistor

Alejandro Medina Santiago, Mario Alfredo Reyes Barranca, Rogelio Francisco Antonio

CINVESTAV-IPN

The present work presented the design of programmable inverter used for design of Soft-Hardware-Logic circuit that represents Boolean functions just configuring external signals fabrication in silicon CMOS technology based in floating gate transistor, also present the simulation of SHL and characteristic the programmable inverter. The Simulations were done using PSpice, with level7 model for MOS transistors, using the technological parameters of the 1.2 μm AMIS technology.

19.2 On Force-Free Magnetic Fields with non-constant proportionality factor and their applications to High Temperature Superconductor

Marco Pedro Ramirez Tachiquin, Salvador Cruz Bohorquez, Rodrigo Gómez

Mendoza

Escuela de Ingeniería de la Universidad La Salle

We review the state of the art of quaternionic solutions for the Force-Free Magnetic Field equations: $\text{rot } \vec{B} = \alpha \vec{B}$, $\text{div } \vec{B} = 0$, where α is a non-constant proportionality factor and \vec{B} is the magnetic induction vector, applied to the study of High Temperature Superconductors. We introduce one method for rewriting this system of equations in quaternionic form, and particularly, we review one technic for obtaining new classes of solutions when α is an arbitrary function of one spatial variable and one approach for obtaining solutions for one special case of α depending on three spatial variables.

19.3 Study of the influence of the complex carbon-hydrogen in GaAs films grown by MOCVD

Silvestre. Manrique-Moreno, Gabriel Romero-Paredes, Miguel. Galván-Arellano, Ramon Peña-Sierra
CINVESTAV.IPN

The results of the characterization of GaAs epitaxial films are presented. Emphasis is made in the identification of the residual impurities and the possible existence of C-H complexes. For the growth of the GaAs epilayers trimethylgallium was used as gallium precursor and metallic arsenic was used as the arsenic source. According to the behavior of the carrier concentration and mobility as a function of growth conditions, the GaAs

epilayers result with intermediate values of electrical compensation. As the GaAs epilayers were grown by MOCVD, the presence of C-H complexes in the films is expected and must be considered to explain electrical properties of the GaAs films. The electrical characterization was done by the van der Pauw method. FTIR spectroscopy was used to identify the carbon complex in the GaAs films.

19.4 Voltage Source Circuit Based on CMOS Floating-Gate Memory

Jesus de la Cruz, Victor Ponce, Felipe Gomez Castañeda Gomez, Jose Antonio Moreno Cadenas Moreno
CINVESTAV, D.F.

This paper present a new circuit designed to support high accuracy reference voltages over a nearly full range of the power supply. To achieve this, the circuit is designed to be efficient utilizing a CMOS floating gate memory fabricated in 1.2 μm CMOS process. The memory stores voltages as charge on the floating gate of a pMOS transistor. The output voltages of the circuit are easily programming by simply modifying the value of the floating gate through the tunnelling and injection hot electrons mechanisms. Also, the circuit can drive a resistive load with the advantage of reduced both silicon area and dissipated power on chip.

Autor Index

Aceves Mijares, Mariano	49	Dalal, Ishaan	38
Aguilar Cornejo, Alejandro	36	De la Cruz, Jesus	51,53
Aguilar-Laserre, Alberto Alfonso	27	De la Hidalga Wade, Francisco Javier	48,52
Alameda Hernández, Enrique	31,32	Del Río Valdés, José Luis	51
Alonso Valerdi, Luz Maria	29	Diaz, Arnoldo	35
Alor Hernandez, Giner	27	Dosen, Strahinja	30
Altamirano Castillejos, Bernardo	42	Duarte Lobo, Miguel Angel	43
Alvarado, Joaquin	50	Dzafic, Izudin	41
Alvarado-Serrano, Carlos	27	Elkarablieh, Bassem	38
Alvarez Gallegos, Jaime	43	Emami, Farzin	32
Alvarez Salas, Ricardo	41	Escamilla Weimann, Carlos	29
Alvarez Sanchez, Ervin Jesus	43	Escarela Perez, Rafael	40,40
Angeles Fragoso, Oscar	51	Falcony Guajardo, Ciro	49
Arellano-Cárdenas, Oliverio	52	Farhan Shahil, K. M.	49
Avila Aoki, Manuel	34	Flores Cuautle, Agustín	27
Baca Arroyo, Roberto	49	Flores García, Ernesto	42
Barrios Cruz, Enrique	44	Flores-Nava, Luis Martin	52
Batista, Ruben	35	Flota Bañuelos, Manuel Israel	41
Bazdresch Sierra, Luis Miguel	30,33	Francisco Antonio, Rogelio	52
Begovich, Ofelia	42	Franco-González, Adrian	38
Bejarano, Javier	33	Gallegos Lara, Marco	41
Beltrán Carbajal, Francisco	42,45	Galván-Arellano, Miguel.	53,49
Blanco Ortega, Andrés	42	Galvan-Tejada, Giselle Monserat	31
Cabrera Amado, Alvaro	46	García Ortega, Manuel de Jesús	26
Cadena Méndez, Miguel	28	Garrido, Rubén	42
Caicedo Rendon, Oscar Mauricio	36	Gómez Castañeda, Felipe	34,51,53,52
Calleja-A, Wilfrido	48	Gómez Mendoza, Rodrigo	52
Caltenco Arciniaga, Hector	30	González Hernández, Jesús	48
Campero Littlewood, Eduardo	40,40	González Morín, Carlos Omar	28
Campos-Delgado, Daniel U.	31,28,33	Gonzalez Torres, Raul Ernesto	36,36,36
Casas piedrafita, Jaime Oscar	37	González-Navarro, Yesenia Eleonor	52
Castro Linares, Rafael	43,45	Gonzalez Villarruel, Javier E	39
Castro, Oskardie	35	Guijarro Estelles, Enrique D.	26
Cerdeira, Antonio	50	Gurevich, Yuri	51
Cervantes, Jair	33	Gutierrez-Castrejon, Ramon	32
Chao, Benjamin	48	Guzman De Leon, Alejandro	28
Chapa, Sergio V.	37	Hernandez Avila, Jose Luis	40
Chong Quero, Jesus Enrique	30	Hernández Landaverde, Martin Adelaido	48
Contreras, Esteban	50	Hernández Peralta, José Antonio	28
Correa-Cid, Victor Hugo	31	Hernandez-Ordenez, Martin	28
Cortez González, Joaquín	30,33	Hurtado Guaca, Javier Alexander	36
Cruz Bohorquez, Salvador	52	Husain, Zakir	40
Cruz-Villar, Carlos Alberto	45	Infante Vazquez, Oscar	29

Jackson, Brad	50	Medina, José Angel	31
Jimenez Perez, Abimael	52	Medina Santiago, Alejandro	52
Jimenez, Saul	44	Melchor-Aguilar, Daniel	44
Juan, Juan Carlos	51	Melendez Calderon, Alejandro	30
Juarez Díaz, Gabriel	48	Mex Perera, Jorge Carlos	37
Katebi Jahromi, Mohsen	32	Mijangos Alquisires, Mario Alberto	30
Kazakov, Vladimir	31	Minor Martinez, Arturo	29
Kontorovich, Valeri	30	Montaño, Omar	28
Lakshmikanthan, Preetham	50	Monzoy-Villuendas, Mariana	34
Landeros-Guzman, Ismael Hugo	27	Moosvi, Syed Mohsin Abbas	32,31
Lara Barrón, Mauricio	30,31	Mora Mas, Francisco José	51
Lara, M. M.	32	Morales Acevedo, Arturo	47,50
Laureano Cruces, Ana Lilia	40	Morales-Sanchez, Eduardo	48
Leija-Salas, Lorenzo	27	Moreno Cadenas, José Antonio	34,53,51,52
Li, Xiaou	33	Morgado Valle, Antulio	42
Linares Aranda, Monico	51	Muro-Maldonado, David	45
Llamas Lopez, Liz Erendira	36	Nakano-Miyatake, Mariko	34
Logvinov, Georgiy	51	Nieverowicz, Tadeusz	40
Longoria Gándara, Omar Humberto	33	Nunez-Aldana, Adrian	38,50
Lopez Barreto, Jose Antonio	36	Orozco Lugo, Aldo G.	31,32
Lopez Estopier, Rosa Elvia	49	Ortega López, Mauricio	47
López Rodriguez, Claudia A	49	Ortiz Loa, Ruben	39
Lopez Romero, Jose Mauricio	39	Pacheco Bautista, Daniel	51
Lozano Ibarra, Gustavo	37	Palacios, Elvia	28
Lujan Ramirez, Carlos Alberto	51	Pallás Areny, Ramon	37,27
Luna-Rivera, José Martín	31,33	Paredes Rubio, Gabriel Romero	49
Malik, Oleksandr	48	Parra Michel, Ramón	33
Manrique-Moreno, Silvestre.	53	Peña Sierra, Ramón	48,49,53
Mario, Mario Lopez	39	Perez Sanchez, Gerardo Francisco	50
Márquez Contreras, Richard	44	Pérez del Valle, Miguel	39
Marquez, Richard	38	Perez-Aguila, Ricardo	35
Martinez, Eduardo	28	Perez-Cruz, J. Humberto	46
Martinez, Evaristo	42	Pérez-Meana, Hector	34
Martínez Guerra, Rafael	46	Peza Solis, Juan Fernando	45
Martinez Herrera, Alberto Francisco	37	Peza Tapia, Juan Manuel	47
Martinez Pabon, Francisco Orlando	36	Ponce, Victor	53
Martínez Perez, Jorge Daniel	51	Posada Gomez, Ruben	27
Martinez, Rigoberto	26	Poznyak, Alexander	46
Martinez Silva, Martin Javier	39	Prokhorov, Eugen	39
Martinez-Lopez, Francisco Javier	31,33	Prokhorov, Evgene	48
Martinez-Memije, Raul	29	Quiroz, Cuauhtémoc	44
Martínez-Sibaja, Albino	27	Ramirez Rojas, Octavio	36
Matsumoto, Yasuhiro	39	Ramirez Tachiquin, Marco Pedro	52
McLernon, Desmond C.	31,32	Ramos Corchado, Felix Francisco	35
Medina Hernández, José Antonio	34		

Ramos Quirarte, José Luis	39	Saucedo Flores, Salvador	42
Ramos-Castro, Juan	27	Shtin, Nicolas	39
Reverter Cubarsi, Ferran	37	Sifuentes de la Hoya, Ernesto	37
Reyes Barranca, Mario Alfredo	52	Silva Navarro, Gerardo .	45,44,45,46,42
Reyes Retana, Ezequiel	47	Singh, R.K.	40
Rincón Pasaye, José Juan	46	Sira Ramírez, Hebertt	44,45,38
Rocha Cozatl, Edmundo Gabriel	41	Solache Carranco, Horacio	48
Rodriguez Cortes, Hugo	47	Sotelo Orozco, Arturo	26
Rodriguez, Dolores	26	Suaste Gómez, Ernesto	26,27,28
Rodríguez, Hugo	44	Tiwari, S.N.	40
Rodríguez, Ma. Dolores	28	Torres Roman, Deni	30
Rodriguez Moreno, Angel Rafael	35	Torres-J, Alfonso	48
Rodriguez Ruiz, Roberto	27	Transito Trujillo, Juan Yarozvaldi	29
Rodriguez-Angeles, Alejandro ...	43,45	Tristán-Tristán, Beatriz	44
Rojas Montes de Oca, David	28	Uc Cetina, Moises	35
Romero Torres, Fabian	41	Urbano Castelán, Antonio	39
Romero-Paredes, Gabriel	53	Vázquez López, Carlos E.	26
Ruiz Carmona, Victor	42	Vázquez Santacruz, José Alejandro .	43
Ruiz Palacios, María Susana	39	Vega-Martínez, Gabriel	27
Saavedra, Carlos	50	Velasco Villa, Martin	43
Salim Maza, Manuel	51	Villarreal Reyes, Sergio David	37
Salinas-Rosales, Moises	34	Yu, Wen	33,44
Sanchez Carmona, Arturo	36,43,36	Yu, Zhenrui	49
Sánchez Hernández, Alberto Emmanuel		Zepeda, J. Sergio	37
.....	33		
Sanchez Medel, Luis Humberto	27		