

“For those who want to achieve certainty in their research, it is quite important to know how to doubt just in time” Aristotle (384 BC-322 BC)

First of all, we wish to express our gratitude to ETSII, for being sensitive to our need of additional laboratory space. Research activities at CEI will benefit from this enhancement, and we will devote our best to use it efficiently. We also appreciate ETSII support in the organization of SAAEI, which was successfully organized by CEI at ETSII, as described below. The school was the venue of an interesting conference on Industrial Electronics, where over 100 researchers presented their activities, discussed about the future, and participated in a competition on wireless energy transfer.

Regarding strategy and future directions, our master on Industrial Electronics is key. It is one of the main research gates to enter CEI. Spanish and International students enroll in this research adventure, which is usually extended to pursue the Doctoral degree. The courses and educational program are mainly oriented to fundamental and applied research on Industrial Electronics, and are the basis for the Doctoral program. It is time now to expand the scope of the master, to facilitate the admission of the new graduates under the Bologna declaration. And it is important to offer our master students new opportunities: either continuing the Doctoral Program, or joining Industry. A new structure and contents will be envisaged, clearly connected and committed with Industry research needs.

Francisco Núñez de Celis decided to retire this year. Although not involved in CEI activities, he has been a faculty member in our Department for over 30 years. We recognize his work and dedication, and wish him the very best. Last but not least: we have decided the preliminary dates for our annual event. The Annual Meeting of the Center for Industrial Electronics will be held during March 27th & 28th. Thursday and Friday, as usual, to facilitate traveling. Please take note of the dates!!!

The editorial board

Annual Meeting — MARCH 14th-15th, 2013

On March 14th and 15th, 2013, we celebrated the sixth Annual Meeting of the CEI-UPM at the ETSII-UPM. As in previous editions, the Poster and Technical Sessions showed current research, including: Communications applications, Control Techniques, Modeling, Simulation and Optimization of Power Circuits,

Power Topologies, Re-configurability & Evolvable Hardware, Specific applications and Wireless Sensor Networks.

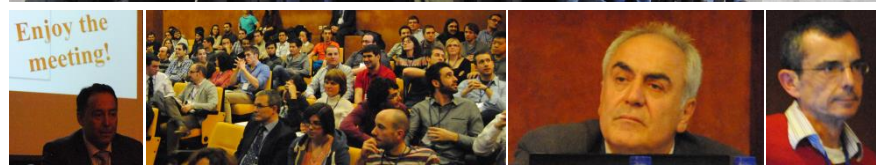
In this Edition, the opening ceremony, March 14th, in the afternoon, was chaired by the UPM VicePresident for research, the Director of the ETSII-UPM and the Director of CEI. An overview of the CEI strategic research lines was given. As usual, it was devoted to show what we do at CEI, and to foster cooperation and research alignment with industry and other universities.

The Plenary talks on “Cutting-edge technologies for the 2020 horizon”, were chaired by Prof. Javier Uceda. The first speaker was Professor Javier de Felipe from the Laboratorio Cajal de Circuitos Corticales (CTB-UPM), who talked to us about “A new strategy to study the brains: The Human Brain project”. Prof. Francisco Guinea from the Instituto de Ciencia de Materiales de Madrid (CSIC) presented “Graphene: challenges and opportunities”. Speakers shared a great and fruitful discussion with the audience.

The traditionally Poster Session was held in our lab. Our young researches had the opportunity to show their research work and to discuss about their latest outcome.

Friday (March 15th) was structured in two oral sessions, chaired by P. Alou, E. de la Torre, F. Moreno and J.A. Oliver, where some selected key contributions from our main research lines were presented. We enjoyed very much presentations from AIRBUS, INDRA, UTRC (Ireland) and FIDELIA GROUP, showing some of their most recent work and even some of the challenges they are facing.

After one day and a half of profound interaction, cocktail was a very nice chance to relax and make plans for the future while enjoying and tasting some appetizers and, surely, to wish a very warm “see you next year” at the 7th CEI Annual Meeting



Specialized Seminars

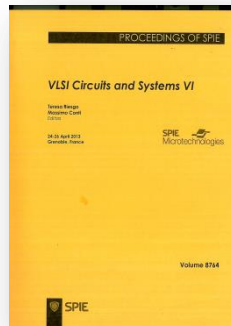
Courses offered in the Master on Industrial Electronics

- Wireless Sensors Networks by **David Boyle** from Tyndall Institute (Ireland), April 10-12
- Converters for Solar Energy by **Miguel Rodríguez** from University of Colorado at Boulder (USA), April & May
- Multiprocessors and models of computation by **Leandro Soares Indrusiak** from University of York (United Kingdom), May 6-8

Monday Seminars

be aware of CEI-UPM results

- April 22** “Multi-objective Planning Tool for Wireless Sensor Networks” by **D. He**
- May 5** “Envelope Amplifier Based on Hybrid series Converter” by **P. Cheng**
- Jun 3** “Freezing without ice by applying electric and magnetic fields” by **C.A. López**
- Jun 17** “Dynamic & Partial Reconfiguration in Space Qualified SRAM-based FPGAs” by **F. Veljković**



Books

- VLSI Circuits and Systems VI, Proceedings of SPIE** Vol. 8764, Editors **T. Riesgo** & M. Conti, SPIE, Bellingham, WA 2013, ISBN 978-0-8194-9561-7.

Master Theses

- Implementation of an online signal processing system for a multidimensional ultrasound Dopplerflow velocimeter by means of FPGAs
Author: Enrique Pérez **Thesis Supervisor:** E. de la Torre **Date:** 8/3/2013
- Integration of wireless sensor networks in the internet of things by using low power WIFI
Author: Manuel Pineda **Thesis Supervisor:** J. Portilla **Date:** 8/3/2013
- Compresión de imágenes optimizada en consumo energético para redes inalámbricas
Author: David Aledo **Thesis Supervisor:** F. Moreno **Date:** 8/3/2013
- Aspectos críticos en el proceso de optimización del convertidor puente completo con fase desplazada para aplicaciones de alta densidad de potencia
Author: Hilario Pisani **Thesis Supervisor:** P. Alou & M. Vasic **Date:** 8/3/2013
- Design of energy control method for three-phase buck-type rectifier with very demanding dynamic loads
Author: Sisi Zhao **Thesis Supervisor:** J.A. Oliver & P. Alou **Date:** 8/3/2013



Top row from left to right, **T. Riesgo, J.A. Cobos & O. García**, and bottom row left to right, **E. Pérez, H. Pisani, S. Zhao, D. Aledo & A. Pineda**

NEWS BRIEFS

Prof. Núñez de Celis has been serving UPM for more than 30 years. His activity has been mainly oriented to education, teaching courses in Electronics to many generations of engineers at the ETS Ingenieros Industriales.

In the picture, some of the current CEI members attending Prof. Núñez de Celis farewell party, where some of the shared experiences along last 30 years were glossed by the participants.

Farewell to FRANCISCO NÚÑEZ DE CELIS



Outgoing visiting researchers during this period

- Sanna Vesti**, doctoral student, doing research stay at **Infineon Technologies** in Villach, Austria (from 1/5/2013 until 31/7/2013)

Congratulations to our colleagues,

- Roberto Prieto** and **Félix Moreno** for their full professor qualification by ANECA.

Farewell... to **Zoran Pavlović**, who joined EADS-CRISA (Spain), now is working at Tyndall (Ireland), and **Hilario Pisani**, who finalized his Master Thesis.

Welcome... to **Luis Flores** (Universidad Autónoma de Aguascalientes (Mexico), who came for a 2 months stay as researcher (from 21/5/2013 until 21/7/2013).



Conferences

EWSN

Ghent (Belgium), February 2013

European Conference on Wireless Sensor Networks

- G. Mujica, J. Portilla, T. Riesgo, *A Reliable Support Tool for Monitoring, Testing and Debugging Wireless Sensor Cookie Nodes*
- V. Roselló, J. Portilla, T. Riesgo, *Route-back delivery protocol for Collection Tree Protocol-based applications*

SPIE

Grenoble (France), April 2013

SPIE Microtechnologies - VLSI Circuits and Systems

- A. Otero, A. Gallego, E. de la Torre, T. Riesgo, *Architectural evaluation of dynamic and partial reconfigurable systems designed with DREAMS tool*, Vol. 8764, 87640H.
- A. Vaskova, M. Portela, M. Garcia, C. López, J. Portilla, J. Valverde, E. de la Torre, T. Riesgo, *Hardening digital systems with distributed functionality: robust networks*, Vol. 8764, 87640L.
- G. Liang, J. Portilla, T. Riesgo, *High speed Radix-4 soft-decision Viterbi decoder for MB-OFDM UWB system*, in Vol. 8764, 87640F

continued...

Journals

- S.C. Huerta, A. Soto, P. Alou, J.A. Oliver, O. García, J.A. Cobos, *Advanced Control for Very Fast DC-DC Converters Based on Hysteresis of the C_{out} Current*, **IEEE Transactions on Circuits and Systems I: Regular Papers**, pp. 1052 - 1061, vol. 60, nº 4, April, 2013
- O. García, P. Alou, J.A. Oliver, D. Díaz, D. Meneses, J.A. Cobos, A. Soto, E. Lapeña, J. Ranaño, *Comparison of boost-based MPPT topologies for sapce applications*, **IEEE Transactions on Aerospace and Electronic Systems**, pp. 1091-1107, vol. 49, nº 2, April, 2013
- S. Vesti, T. Suntio, J. A. Oliver, R. Prieto, J. A. Cobos, *Impedance Based Stability and Transient-Performance Assessment Applying Maximum Peak Criteria*, **IEEE Transactions on Power Electronics**, pp. 2099-2104, vol. 28, nº 5, May, 2013
- M.C. González, M. Vasic, P. Alou, O. Garcia, J.A. Oliver, J.A. Cobos, *Transformer-Coupled Converter for Voltage Modulation Techniques*, **IEEE Transactions on Power Electronics**, pp. 2330 - 2342, vol. 28, nº 5, May, 2013
- D. Meneses, F. Blaabjerg, O. García, J.A. Cobos, *Review and Comparison of Step-Up Transformerless Topologies for Photovoltaic AC-Module Application*, **IEEE Transactions on Power Electronics**, pp. 2649 - 2663, vol. 28, nº 5, June, 2013



by F. MORENO

Embedded Intelligence on chip, a research challenge

Nowadays, hardware embedded systems must perform progressively more complex functions, which requires a high level of embedded intelligence in hardware. This rise in intelligence forces a rise in the level of information processing that the hardware embedded systems carry out. This, in turn, gives rise to a significant increase in complexity of the hardware and the software. Due to this, the conception and design of those systems has to face two major points, in many cases opposed to each other. On one side, a higher level of intelligence is demanded day by day to the systems, and, on the other side, those systems have requirements of real-time operation and reliability difficult to meet in complex systems. Facing that research challenge, CEI-UPM is getting on its own research lines related to.

The use of reconfigurable hardware is one of the most popular approaches for tackling that motivating challenge. Although reconfigurable hardware based on FPGA reconfigurable architecture is a little bit limited in terms of algorithm complexity, it is one of the most promising research lines at CEI. Other possible solution is to design and to implement evolvable hardware architectures which is also an interesting research approach, even though they are highly hardware resources demanding as their main drawback; we envisage those architectures as a valuable alternative.

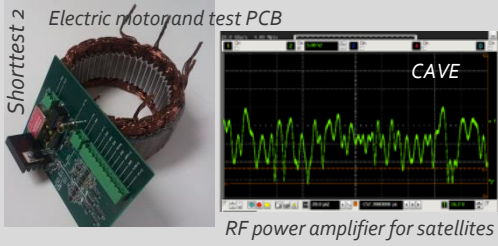
Cognitive architectures capable of operating with abstract variables, reacting to multiple kinds of perturbations and to the uncertainty of the environment which may reach very high levels of complexity are being a very promising approach to be implemented on FPGAs. However, the limited resources available in hardware embedded systems and the standards of reliability required, make that these types of architectures were intelligence limited; although some qualities of complex cognitive architectures in terms of intelligence could be grounded in embedded systems, in spite of resource limitations. Today at CEI-UPM, that is one of our most motivating challenges for the near future

Conferences

Long Beach (California, USA), March 2013	APEC
IEEE Applied Power Electronics Conference and Exposition	
<ul style="list-style-type: none">M. Silva, N. Hensgens, J.M. Molina, M. Vasic, J.A. Oliver, P. Alou, O. Garcia, J.A. Cobos, <i>Interleaved multi-cell isolated three-phase PWM rectifier system for aircraft applications</i>Z. Pavlovic, J.A. Oliver, P. Alou, O. Garcia, J.A. Cobos, <i>Bidirectional multiple port dc/dc transformer based on a series resonant converter</i>J. Cortés, V. Svikovic, P. Alou, J.A. Oliver, J.A. Cobos, R. Wisniewski, <i>Limits of the frequency response for the analysis of ripple-based controllers</i>V. Šviković, J.A. Oliver, P. Alou, O. García, J.A. Cobos, <i>Multiphase Current Controlled Buck Converter with energy recycling Output Impedance Correction Circuit (OICC)</i>N. Hensgens, J.A. Oliver, J.A. Cobos, <i>Design and multi-objective optimization of EMI input filters</i>S. Vesti, J.A. Oliver, R. Prieto, J.A. Cobos, T. Suntio, <i>Simplified small-signal stability analysis for optimized power system architecture</i>D. Díaz, O. García, J.A. Oliver, P. Alou, J.A. Cobos, <i>Ripple cancellation technique applied to a synchronous buck converter to achieve very high bandwidth and very high efficiency envelope amplifier</i>D. Cucak, M. Vasic, O. García, J.A. Oliver, P. Alou, J.A. Cobos, <i>Application of GaN FET in 1MHz large signal bandwidth power supply for radio frequency power amplifier</i>	

Other
<ul style="list-style-type: none">A. Gallego, J. Mora, A. Otero, R. Salvador, E. de la Torre, T. Riesgo, <i>A Novel FPGA-based Evolvable Hardware System based on Multiple Processing Arrays, IEEE International Symposium on Parallel & Distributed Processing Workshops and PhD Forum</i>, Boston (MA, USA), May 2013J. Cortés, V. Šviković, P. Alou, J.A. Oliver, J.A. Cobos, <i>Design and analysis of ripple-based controls based on the discrete modeling and Floquet theory, IEEE International Workshop on Control and Modeling for Power Electronics (COMPEL)</i>, Salt Lake City (Utah, USA), June 2013

new research projects



- BOSCH** *Shorttest 2: Development of a PCB for the turn-to-turn short-circuit test of electric motor windings* funded by **BOSCH**, 22/4/2013 to 20/10/2013
The test system designed in project Shorttest to detect turn-to-turn short-circuits is modified to include electrical isolation between power and I/O signals to improve the EMC and the electrical security. A PCB ready to be included in the production line of the client is designed and some units are built

Research Projects

- INDRA** *Modelado y optimización del rectificador para la cadena de alimentación del radar electrónico, (MORE-CARE)*, funded by **INDRA**, 1/1/2013 to 31/7/2013
- CLASS MANUFACTURING S.A.** *Desarrollo de controlador para recuperación de Calor, (DCRC)*, funded by **CLASS MANUFACTURING S.A.**, 1/6/2013 to 31/12/2013

current research projects

Modeling & Simulation of power architectures, circuits and components

- ANSYS** *PExprt and SMPS Library (PExprt-SMPS)* funded by **ANSYS**, 1/5/2007 to 1/5/2017
- ANSYS** *Consulting services for developing IC power module components for Simplorer* funded by **ANSYS**, 1/1/2011 to 30/6/2013
- Mº Ciencia e Innovación** *Modelos rápidos equivalentes para gestión de redes electrónicas de energía (MORE_GREEN)* funded by **Mº Ciencia e Innovación**, 1/1/2011 to 31/12/2013

Power Quality

- REE** *Modelos avanzados para el estudio de la calidad de onda de enlaces en corriente continua con convertidores en fuente de tensión*, funded by **REE**, 1/10/2011 to 1/4/2013

Optimization of Power Architectures

- Mº Ciencia e Innovación** *Fuentes de alimentación para los imanes superconductores del XFEL europeo (XFEL)* funded by **Mº Ciencia e Innovación**, 1/12/2010 to 30/11/2013
- ABB** *PhD work in virtual optimized EMC filter design for power electronic converters under consideration of real components and interconnects (ABB-MEC)* funded by **ABB Switzerland Ltd.**, 1/3/2010 to 28/2/2013

Integrated DC/DC Converters

- Mº Ciencia e Innovación** *Fuentes de alimentación con rápida respuesta dinámica para gestión de la energía (FAST)* funded by **Mº Ciencia e Innovación**, 1/1/2011 to 31/12/2013
- European Comission Frame Program 7** *POWER SoC With Integrated PassivEs (PowerSwipe)* funded by **European Comission Frame Program 7**, 01/10/2012 to 30/9/2015

Wide Band-gap devices

- Mº Ciencia e Innovación** *Advanced Wide band gap semiconductor devices for rational use of energy (RUE)* funded by **Mº Ciencia e Innovación**, 1/11/2009 to 31/10/2014

Reconfigurable Embedded Systems

- Mº Ciencia e Innovación** *Dynamically Reconfigurable Embedded Platforms for Networked Context-Aware Multimedia Systems (DREAMS)* funded by **Mº Ciencia e Innovación**, 1/1/2012 to 31/12/2013
- European Commission FP7-SME-2011 (Capacities)** *Source FPGA Accelerator & Hardware-Software Codesign Toolset for CUDA Kernels (FASTCUDA)* funded by **European Commission FP7-SME-2011 (Capacities)**, 1/11/2011 to 31/10/2013
- Comisión Europea / CDTI / ISIS** *Reconfigurable Ultra-Autonomous Novel Robots (RUNNER)* funded by **Comisión Europea / CDTI / ISIS**, 1/12/2010 to 30/11/2013

Emerging Applications

- Fidelia Group** *Starting Cryogenic Analysis (CRYOSTART)* funded by **Fidelia Group**, 1/6/2012 to 31/5/2013

Sensor Networks

- TECALUM** *Sistema de Iluminación Inteligente LUIX (TECALUM)* funded by **INNFACTO. Mº Ciencia e Innovación**, 1/11/2011 to 30/11/2014
- European Commission CIP ECO INNOVATION** *ICT tools greening food processing businesses (GIST)* funded by **European Commission CIP ECO INNOVATION** 12/9/2011 to 11/9/2014
- Artemis/MICyT** *WSN Development, Planning and Commissioning & Maintenance ToolSet (WSN DPCM)* funded by **Artemis/MICyT**, 1/10/2011 to 30/9/2014

Telecommunications consulting

- Mº de Economía y Competitividad** *NetAdvanced: Despliegue de Red de Comunicaciones Avanzadas en Entornos Desfavorables* funded by **Mº de Industria (Program AVANZA) and Mº de Economía y Competitividad**
- Mº Ciencia e Innovación** *LAMP: Plataforma de Distribución y Asignación de Anuncios en nuevos Paradigmas de Acceso a TIC basada en Perfilado Anónimo de Usuarios.*, funded by **Mº Ciencia e Innovación** (Plan Innovación 2010. Program INNFACTO)
- Satlink** *ECOLOG. Nueva solución de pesca integral, responsable y sostenible para la mejora de la productividad y el aprovechamiento en el sector pesquero*, funded by **Satlink** and **Mº de Economía y Competitividad**

Latest news from current semester

MONDAY SEMINARS More information: www.cei.upm.es/

July 22	"An Evolutionary Approach to Particle Filtering" by A. Rodríguez
Sept 9	"Modelling, analysis and optimization of analog controls for Buck converters" by J. Cortés
Sept 23	"Design and Development of an Assistant Tool for Deploying, Debugging and Maintaining Wireless Sensor Networks: The DPCM Project" by G. Mujica
Oct 7	"Physical modeling and application of GaN HEMTs in Envelope Amplifier for highly efficient Radio Frequency Power Amplifier" by D. Čučak



(SAAEI'13) at the Escuela Técnica Superior de Ingenieros Industriales of the UPM, organized by the Centro de Electrónica Industrial (CEI-UPM).

There were 130 papers, two invited speakers, Dr. Paolo Mattavelli (Universidad de Padova, Italy) and Dr. José Ramón García (Vice President Research & Development Dishwashers BSH Bosch and Siemens Hausgeräte GmbH), plus demos and presentations by the exhibitors. Taking advantage of the Seminar, several meetings of IEEE committees were celebrated. As a novelty, it was celebrated a contest for students about the topic "Wireless Energy Transfer". This contest was a success since 7 groups participated in it. The students explained the basic ideas of their prototypes and made live demos. It was pleasant to see so young students presenting their very diverse technical solutions.

Finally, it should be highlighted the good atmosphere along the conference and social events, that facilitated to foster the relationships among research groups. The web page of the conference (www.saaei.org/edicion13/) has been updated recently with information on the seminar (presentations, photos, awards, etc).

- Two of our students, **Iván Flores** and **Ángel Gallego**, received the Final Project Degree Award by the F2I2 Foundation, Academic year 2012-2013
- Guixuan Liang** (July) and **Zoran Pavlović** (September) defended their PhD Thesis.
- David P. Daza** was honored with the Best Student's Record Award (IAEI Grade) by the ETSII-UPM, Academic year 2012-2013, on September
- Javier Uceda** received the Medal of Honor from the Architecture School of UPM.

Next appointment

- VII CEI Annual Meeting** will be held in CEI-UPM on **March 27th & 28th, 2014**
- Design of Circuits and Integrated Systems (DCIS'2014)* will be hosted by CEI-UPM. The conference will be held in Madrid on **November 26th-28th, 2014.**

