

# 2013 Fourth Argentine Symposium and Conference on Embedded Systems (SASE/CASE)

## Regular Papers

August 14<sup>th</sup>-16<sup>th</sup>, 2013  
School of Engineering - University of Buenos Aires  
Buenos Aires, Argentina



## 2013 Fourth Argentine Symposium and Conference on Embedded Systems (SASE/CASE)

### Regular Papers

Printed Book ISBN 978-1-4799-1098-4

CD-ROM ISBN 978-1-4799-1099-1

E-Book ISBN 978-1-4799-1101-1

Printed Book IEEE CATALOG CFP1346V-PRT

CD-ROM IEEE CATALOG CFP1346V-CDR

E-Book IEEE CATALOG CFP1346V-ART

### Editors:

Diego Brengi, INTI/UNLaM

Luciana De Micco, UNMDP/CONICET

José Lipovetzky, UBA/CONICET

Ariel Lutenberg, UBA/CONICET/UTN-FRBA

Copyright and Reprint Permission: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923. For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Operations Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved. Copyright 2013 by IEEE.

## Preface

The development of Embedded Systems is crucial for the development of industry, technology and science; and it is an area which has grown in the past years in Argentina and South America.

The SASE and CASE are intended to promote the development of embedded systems in the country and the region with the following activities:

- Presentation of scientific and technological works at the conference.
- Hands-on Workshops.
- Technical Lectures (Tutorials).
- Plenary sessions.
- Contest for students projects
- A program to assign electronic equipment to Universities.
- Travel and lodging grants for graduate and postgraduate students, professors and researchers of Argentina.

The objectives of the SASE are:

- To allow a more fluid exchange between academia and industry.
- To promote the exchange between researchers and students from different universities from Argentina and other countries.
- To allow the diffusion of scientific and technological development done in the region and worldwide.
- To encourage students from the country to get interested in the development of Embedded Systems.
- To coordinate and promote the actualization of curriculum contents related to Embedded Systems in undergraduate and graduate programs at the universities of Argentina.

This year different topic areas were included at CASE: Architecture of Microprocessors, ASICs, DSPs, FPGA and HDLs, Implementation of Embedded Systems, Embedded Systems Linux, Communications and Protocols, Embedded Software, Robotics, RTOS, Bioengineering. Scientific works were accepted in three categories, Regular Papers, Technical Forum, and Poster. This book contains the works accepted as Regular Papers. Twenty nine manuscripts were submitted as Regular Papers at SASE2013, but after an exhaustive peer review process only eight of them were accepted in that distinguished category and published here. Some of the other ones were moved to the categories of technological forum or poster.

We hope you enjoy the following papers, and the conference.

**CASE 2013 Organizing Committee**



# Sponsors

## Diamond Sponsors

- ARM Ltd.
- ARROW Argentina
- CIKA S.R.L.
- CORADIR S.A.
- ELECTROCOMPONENTES S.A.
- Electrónica ELEMÓN S.A.

## Platinum Sponsors

- Atmel Corp.
- Emtech
- Freescale Semiconductor
- NXP Semiconductors
- Qeuctel
- Synopsys
- Telit Wireless Solutions
- Texas Instruments Inc.
- Vicda Argentina S.R.L.

## Gold Sponsors

- Dai Ichi Circuitos S.A.
- Digi International
- Edasim
- Ernesto Mayer S.A.
- INVAP S.E.
- INTEL
- Macon Máquinarias y consumibles S.R.L.
- Microchip Technology Inc.
- Orbcomm
- Probattery
- Sur Emprendimientos Tecnológicos
- Unitec Blue

## Silver Sponsors

- ARSAT
- Asissi
- Clariphy Argentina S.A.
- Globallogic
- Renesas
- Revista Mercado Electrónico
- Saber Electrónica
- SMT Solutions

- ST Microelectronics Inc.

### **Institutions which support SASE**

- Agencia Nacional de Promoción de la Ciencia y la Tecnología (ANCPyT)
- Asociación Argentina de Control Automático (AADECA)
- Cámara Argentina de Industrias Electrónicas, Electromecánicas y Luminotécnicas (CADIEEL)
- Centro de Investigaciones Tecnológicas para la Defensa (CITEDEF)
- Centro Argentino de Ingenieros (CAI)
- Comisión Nacional de Actividades Espaciales (CoNAE)
- Comisión Nacional de Energía Atómica (CNEA)
- Consejo Federal de Decanos de Ingeniería (CONFEDI)
- IEEE Argentina
- IEEE Circuits and Systems Society (CASS)
- Institute of Electrical and Electronics Engineers (IEEE)
- Instituto Nacional de Tecnología Industrial (INTI)
- Instituto ORT Argentina
- Ministerio de Ciencia, Tecnología e Innovación Productiva (MinCyT)
- Ministerio de Industria
- Secretaría de Políticas Universitarias (SPU)

### **Universities which support SASE**

- UBA: Universidad de Buenos Aires
- UNC: Universidad Nacional de Córdoba
- UNCA: Universidad Nacional de Catamarca
- UNCOMA: Universidad Nacional del Comahue
- UNCUYO: Universidad Nacional de Cuyo
- UNER: Universidad Nacional de Entre Ríos
- UNJ: Universidad Nacional Arturo Jauretche
- UNICEN: Universidad Nacional del Centro de la Provincia de Buenos Aires
- UNLAM: Universidad Nacional de La Matanza
- UNLP: Universidad Nacional de La Plata
- UNLu: Universidad Nacional de Luján
- UNM: Universidad Nacional de Misiones
- UNMDP: Universidad Nacional de Mar del Plata
- UNPA: Universidad Nacional de La Patagonia Austral
- UNPSJB: Universidad Nacional de la Patagonia San Juan Bosco
- UNQ: Universidad Nacional de Quilmes
- UNR: Universidad Nacional de Rosario
- UNRC: Universidad Nacional de Río Cuarto
- UNS: Universidad Nacional del Sur
- UNSA: Universidad Nacional de Salta
- UNSJ: Universidad Nacional de San Juan
- UNSL: Universidad Nacional de San Luis
- UNSM: Universidad Nacional de San Martín
- UNT: Universidad Nacional de Tucumán

- UNTF: Universidad Nacional de Tres de Febrero
- UTN-FRA: Universidad Tecnológica Nacional - Facultad Regional Avellaneda
- UTN-FRBA: Universidad Tecnológica Nacional - Facultad Regional Buenos Aires
- UTN-FRBB: Universidad Tecnológica Nacional - Facultad Regional Bahía Blanca
- UTN-FRD: Universidad Tecnológica Nacional - Facultad Regional Delta
- UTN-FRH: Universidad Tecnológica Nacional - Facultad Regional Haedo
- UTN-FRLR: Universidad Tecnológica Nacional - Facultad Regional La Rioja
- UTN-FRM: Universidad Tecnológica Nacional - Facultad Regional Mendoza
- UTN-FRN: Universidad Tecnológica Nacional - Facultad Regional Neuquén
- UTN-FRRG: Universidad Tecnológica Nacional - Facultad Regional Rio Grande
- UTN-FRSF: Universidad Tecnológica Nacional - Facultad Regional San Francisco
- UTN-FRSN: Universidad Tecnológica Nacional - Facultad Regional San Nicolás
- UTN-FRVT: Universidad Tecnológica Nacional - Facultad Regional Venado Tuerto
- UTN-FRVM: Universidad Tecnológica Nacional - Facultad Regional Villa Mercedes
- UTN-FRT: Universidad Tecnológica Nacional - Facultad Regional Tucumán
- UADE: Universidad Argentina de la Empresa
- CAECE: Universidad CAECE
- ITBA: Instituto Tecnológico de Buenos Aires
- IUA: Instituto Universitario Aeronáutico
- UBP: Universidad Blas Pascal
- UCC: Universidad Católica de Córdoba
- UCU: Universidad Católica de Uruguay
- UCSE: Universidad Católica de Santiago del Estero
- UM: Universidad de Mendoza
- UREP: Universidad de la República del Uruguay





# Technical Program Committee

## SASE 2013 General Chair

- Dr. Ariel Lutenberg (FIUBA/UTN-FRBA/CONICET)

## CASE 2013 Technical Program Chair:

- Msc. Diego Brengi (INTI/UNLaM)

## CASE 2013 Publication Chairs:

- Dr. Luciana De Micco (UNMDP/CONICET)
- Dr. José Lipovetzky (FIUBA/CONICET)

## CASE 2013 Topic Chairs:

- Architecture of Processors: Eng. Alejandro Furfaro (UTN-FRBA)
- ASICs: Dr. Martín Di Federico (FIUBA)
- Bioengineering: Eng. Juan Manuel Reta (UNER)
- DSPs: Dra. María Liz Crespo (ICTP)
- FPGAs and HDLs: Eng. Salvador Tropea (INTI/UTN-FRBA)
- Embedded Linux: Eng. Lucas Chiesa (FIUBA)
- Protocols and communications: Eng. Gustavo Mercado (UTN-FRM)
- Robotics: Dr. Luis Canali (UTN-FRC)
- RTOS: Dr. Ricardo Cayssials (UNS)
- Embedded Systems: Msc. Cristian Sisterna (UNSJ)
- Embedded Software: Dr. Ricardo Medel (INTEL)

## Reviewers.

Abraham, Jorge	Larrondo, Hilda Angela
Aldonate, Julio	Leiva, Lucas
Alessandrini, Gustavo	Lipovetzky, Jose
Alpago, Octavio	Lozano, Clevis
Antonelli, Maximiliano	Lutenberg, Ariel
Arias, Ricardo	Marchi, Edgardo
Arias-Garcia, Janier	Martos, Pedro
Brenji, Diego	Masrur, Alejandro
Briff, Pablo	Mata, Walter A.
Canali, Luis Rafael	Medel, Ricardo
Carbajales, Rodrigo	Melo, Rodrigo
Carbonetto, Sebastián	Mercado, Gustavo
Cayssials, Ricardo	Meza-Benavides, Carlos
Chiesa, Lucas	Monte, Gustavo
Crespo, Maria Liz	Oliva, Rafael
De Marziani, Carlos	Orallo, Carlos
De Micco, Luciana	Perez, Jorge
Dellavale, Damian	Perez, Santiago
Di Federico, Martin	Petrashin, Pablo
Escudero, Gustavo	Pucheta, Julián
Ferrao, Hilda	Reta, Juan
Ferreira, Fabiana	Ridolfi, Pablo
Ferreira, Pablo Alejandro	Risco Castillo, Miguel Alberto
Ferro, Edgardo	Rocha, Fábio
Filomena, Eduardo	Rodriguez Rivero, Cristian
Franco, Leonardo	Sager, Gerardo Enrique
Furfaro, Alejandro	Sambuco, Lucas
Garcia, Javier	Santos, Rodrigo
Garcia Inza, Mariano	Sistema, Cristian
Gayoso, Carlos Arturo	Tacca, Hernán
Giribet, Juan Ignacio	Taffernaberry, Carlos
Gonzalez, Apolinar	Toccaceli, Graciela
González, Rodrigo	Todorovich, Elías
Grimblatt, Victor	Tropea, Salvador
Gutierrez Andrade, Jose Antonio	Weizs, Maria
Gwirc, Sergio N.	Zabaleta, Omar Gustavo
Hernandez Tabares, Lorenzo	Zacchigna, Federico G.
Juarez, Gustavo Eduardo	Zaradnik, Ignacio

## Subreviewers

Alejandro Pasciaroni	Martin Villemur
Andrés P. Djordjalian	Niria Osterman
Angel Jose Soto	Omar Lifschitz
Diego Beltramone	Aciti, Claudio
Marcelo L. Moreyra	Friedrich, Guillermo

# Table of Contents

Preface	iii
Sponsors	v
Technical Program Committee.	ix
Portable wireless device for biopotential recording. <i>Eduardo Filomena and Julio Alberto Aldonate</i>	1
Hardware Implementation of Maximum Lyapunov Exponent <i>Luciana De Micco, Maximiliano Antonelli, Claudio Gonzalez and Hilda Angela Larrondo</i>	6
Wireless Biological Signals Acquisition System. <i>Esteban Cilleruelo, Andrés Nacelle, Gerardo Robert, Julián Oreggioni, Fernando Silveira and Ángel Caputi</i>	10
Characterization of LQI behavior in WSN for glacier area in Patagonia Argentina <i>Ana Laura Diedrichs, Maria Ines Robles, Diego Dujovne, Facundo Bromberg and Gustavo Mercado</i>	15
Design of an Extensible, Portable and POSIX Compliant Protocol <i>Agustin Alba Chicar, J. Ezequiel Esposito and Ariel Lutenberg</i>	21
Hybrid method uses RSS and AoA to establish a low-cost localization system. <i>Bruno De S. Muswieck, Jumar L. Russi and Marcos V.T. Heckler</i>	27
Proximate Time Optimal Control of an XY Positioning <b>Table</b> . <i>Leandro Lisboa, Nelso Bedin, Henrique Lasevitch, Aurelio Salton and Jeferson Flores</i>	33
Indoor Navigation using WiFi signals. <i>David Ivan Vilaseca and Juan Ignacio Giribet</i>	38
Author index	45

