SIGNAL
Bulletin mensuel des microsystèmes
Microsystems Monthly Newsletter
RESMIQ
Regroupement Stratégique en Microsystèmes du Québec

FROM THE EXECUTIVE COMMITTEE

It is with great pride that we ended the 10th edition of the NEWCAS international conference, which took place from June 17 to 20 in Montréal at the Sheraton center. We have met with unprecedented success with more than 180 participants from 43 countries. Note that the acceptance rate of 41%, the lowest in the history of the conference, allowed the conference to achieve a remarkable level of quality. It was also a pleasure and an honor to welcome world renowned speakers who came to share their knowledge and expertise with the participants. We also want to congratulate all the members of the organizing committee for this success and take this opportunity to thank all the sponsors for their support. We took the opportunity to highlight the major milestone that is the 10th edition and wish for an equal success for the next ten. It is with this goal in mind that we look forward to seeing you next year in Paris for the 11th edition of NEWCAS from June 16 to 19, 2013. We also celebrated the 25th anniversary of ReSMiQ and, on this occasion, highlighted the outstanding contributions by the founding members. We recognize that ReSMiQ could not be where it is today without their involvement and contribution at its beginning. Note that on this occasion we had the pleasure to welcome all former directors of our center and we take this opportunity to thank the representatives of FRQNT, CMC and Prompt for participating in this celebration. As for our priorities, we are now actively preparing ourselves for the launch of the first ReSMiQ Innovation Day, a competition in which undergraduate and graduate students will demonstrate their scientific and technical expertise where each presenter will display their project via a technical demonstration and awards will be offered to the best presentations. Finally, the management team of ReSMiQ wish you a pleasant summer.

Best regards,
M. Sawan, director

From left to right: Maryse Lassonde from FRQNT, Peter Stokes from CMC, Mohamad Sawan and Mounir Boukadoum, NEWCAS General Co-chairs.

From left to right: Patricia Desgreys, Technical Program Co-chair, Peter Wu, Yvon Savaria and Majid Ahmadi, keynote speakers.

NEWS FROM OUR MEMBERS

EXPOSURE

Dr. Savaria of *Polytechnique* gave a keynote speech at the 10th IEEE NEWCAS conference.
More details

Dr. Sawan of *Polytechnique* gave a keynote speech at the FTFC conference in Paris.
More details

INVOLVEMENT

Dr. Abdi from Concordia is Technical program Chair of the IEEE HLDVT conference to be held in Nov. 2012 in California.
More details

ACHIEVEMENT

Drs. Domingue and Adel Dahmane of UQTR saw one of their students awarded the prize for best student paper at the CCECE2012 conference.

Dr. Savaria of Polytechnique saw one of his students co supervised with Dr. J.-J. Brault awarded the 2nd prize for best student paper at the NEWCAS'12 conference.

Dr. Deslandes of UQAM saw one of his students awarded the 3rd prize for best student paper at the NEWCAS'12 conference.

Drs. Fontaine and Pratte of Sherbrooke University and Dr. Lakhssassi of UQO received a CRD grant from NSERC of 1,39M$.

ReSMiQ Innovation Day

More than 4000$ in awards for undergraduate and graduate students
September 20, 2012, Montréal.
More details

Message to members: we will be pleased to publish your news in forthcoming issues, let us know.

SPOTLIGHT ON OTHER CONFERENCES

55th IEEE International Midwest Symposium on Circuits and Systems (MWSCAS), August 5 - 8, 2012, Boise, USA.
More details

IEEE International Conference on Computer Design (ICCD 2012), Sept. 30 - Oct. 3, 2012, Montréal, Canada.
More details

IEEE Biomedical Circuits and System Conference (BIOCAS 2011), November 28 - 30, 2012, Hsinchu, Taiwan.
More details

The **SIGNAL** newsletter is published by ReSMiQ. For information or to contact the management team : 514-340-4711 ext. 3612, email : marie-yannick.laplante@polymtl.ca

Visit our web site: www.resmiq.org

RESEARCH CONTRIBUTIONS

Some of the research achievements of our members.
This month, three major contributions and the recipient of the ReSMiQ award are presented.

1. MT. Salam, **M. Sawan**, Implantable Closed-Loop Epilepsy Prosthesis: Modeling, Implementation and Validation, ACM Journal on Emerging Technologies in Computing Systems, Vol. 8, No. 2, 2012.

In this article, authors present an implantable closed-loop epilepsy prosthesis, which is dedicated to automatically detect seizure onsets based on intracerebral electroencephalographic (icEEG) recordings from intracranial electrode contacts and provide an electrical stimulation feedback to the same contacts in order to disrupt these seizures. A novel epileptic seizure detector and a dedicated electrical stimulator were assembled together with common recording electrodes to complete the proposed prosthesis. The seizure detector was implemented in CMOS 0.18-µm by incorporating a new seizure detection algorithm that models timeamplitude and -frequency relationship in icEEG. The detector was validated offline on ten patients with refractory epilepsy and showed excellent performance for early detection of seizures. The electrical stimulator, used for suppressing the developing seizure, is composed of two biphasic channels and was assembled with embedded FPGA in a miniature PCB. The stimulator efficiency was evaluated on cadaveric animal brain tissue in an in vitro morphologic electrical model. Spatial characteristics of the voltage distribution in cortex were assessed in an attempt to identify optimal stimulation parameters required to affect the suspected epileptic focus. The experimental results suggest that lower frequency stimulation parameters cause significant amount of shunting of current through the cerebrospinal fluid; however higher frequency.

2. A. Cyr, **M. Boukadoum**, Classical conditioning in different temporal constraints: an STDP learning rule for robots controlled by spiking neural networks, Adaptive Behaviour, Online, June 11, 2012.

This work investigates adaptive behaviours for an intelligent robotic agent when subjected to temporal stimuli consisting of associations of contextual cues and simple reflexes. This is made possible thanks to a novel learning rule based on spike-timing-dependent plasticity and embedded in an artificial spiking neural network serving as a brain-like controller. The subsequent bio-inspired cognitive system carries out different classical conditioning tasks in a controlled virtual 3D-world while the timing and frequency of unconditioned and conditioned parameters are varied. The results of this simulated robotic environment are analysed at different stages from stimuli capture to neural spike generation and show extended behavioural capabilities by the robot in the temporal domain.

ReSMiQ Highlights in NEWCAS 2012

2nd Place of Best Student Paper Award, Jean-François Pons, Jean-Jules Brault and **Yvon Savaria**, An FPGA Compatible Asynchronous Wake-Up Receiver for Wireless Sensor Networks.

This paper explores design methods applicable to Wireless Sensors Networks, where low power consumption and energy efficiency are a must. A key component that modulates the power consumption is the main radio. Controlling its use through suitable sleep modes and wake up mechanisms is a significant issue and can be done with a wake-up receiver. But many applications are associated with low fabrication volume where custom integrated circuits are not economical and where FPGAs are the best available solution. In this paper, we explore an asynchronous solution, which permits to decrease the internal activity, thus reducing the power consumption, including that required for clock distribution. We also propose an FPGA implementation of such a wake-up receiver using the NULL Convention Logic™. The overall power consumption of the reported implementation is as low as 5µW at 250 kbps.

3rd Place of Best Student Paper Award, Alexandre Robichaud, Martin Boudreault and **Dominic Deslandes**, Parametric Analysis of Helical Resonators for Resonant Wireless Power Transmission Links

This paper presents a parametric study of wireless power transmission links composed of two identical helical resonators. The effect of the helix radius, the pitch and the number of turns are studied in order to find the optimal geometry that maximizes the transmission efficiency. The product of the coupling coefficient and the quality factor is used as a figure of merit to compare the different structures. A practical validation is presented and it shows that the simulations predict accurately the frequency response of the link. Authors demonstrate that the best performance is achieved when the radius is equivalent to approximately 75% of the transmission distance.

The **SIGNAL** newsletter is published by ReSMiQ. For information or to contact the management team : 514-340-4711 ext. 3612, email : marie-yannick.laplante@polymtl.ca

Visit our web site: www.resmiq.org