Guest Editorial—Special Issue on Selected Papers From ISCAS 2009

THIS special issue of the IEEE TRANSACTIONS ON BIOMEDICAL CIRCUITS AND SYSTEMS is devoted to topics from the 2009 IEEE International Symposium on Circuits and Systems (ISCAS 2009), held on May 24–27, 2009, at the Taipei International Convention Centre in Taipei, Taiwan.

The IEEE ISCAS conference is the world's premier networking forum of leading researchers in the highly active fields of theory, design, and implementation of circuits and systems. The conference received 1650 submissions from academic and industry authors. The final conference program accepted 809 papers from 5 continents and 40 different nations spanning 3 full days, with 102 lecture and 48 poster sessions covering 17 tracks represented by CAS Society technical committees, as well as the special session track and the track for live demonstrations.

Topics presented at the conference span a wide range of exciting, state-of-the-art fields, and papers related to biomedical circuits and systems can be found in several different technical tracks, including analog signal processing, biomedical circuits and systems, cellular neural networks and array computing, circuits and systems for communications, digital signal processing, life-science systems and applications, nanoelectronics and gigascale systems, neural systems and applications, sensory systems, visual signal processing and communications, and the live demonstrations track.

The contributions presented in this Special Issue cover a variety of modern and timely topics in the biomedical circuits and systems community. Beginning with a list of 63 papers that were highly rated by ISCAS 2008 reviewers, we distilled this to a small selection of journal-ready articles that showcase the state of the art within the BioCAS field. After a thorough peer-review process, it is our pleasure to present you with the final set of papers for this Special Issue on ISCAS 2009, which focuses on circuits and systems for neural and implantable technology. The selected contributions include papers in four areas:

A. Neural Modelling

- Theodore Yu and Gert Cauwenberghs, “Analog VLSI biophysical neurons and synapses with programmable membrane channel kinetics”

B. Neural Interfacing

- Farzaneh Shahrokhi, Karim Abdelhalim, Roman Genov, “128-channel fully differential digital integrated neural recording and stimulation interface”

- Kriangkrai Sooksood, Thomas Stieglitz and Maurits Ortmanns, “An active approach for charge balancing in functional electrical stimulation”

C. Neural Signal Processing

- Benoit Gosselin, Adeline Zbrzeski, Mohamad Sawan, and Eric Kerherv, “Linear-phase delay filters for ultra-low-power signal processing in neural recording implants”

D. Wireless Biomedical Implants and Devices

- Henrique Miranda, Vikash Gilja, Cindy Chestek, Krishna V. Shenoy and Teresa H. Meng, “HermesD: A high-rate long-range wireless transmission system for simultaneous multichannel neural recording applications”
- Guillaume Simard, Mohamad Sawan, Daniel Massicotte, “High speed OQPSK and efficient power transfer through inductive link for biomedical implants”

The Technical Program of ISCAS 2009 is the result of a truly international cooperation of experts. We feel very much indebted to the Technical Program Committee for their invaluable efforts to keep ISCAS at the high level of standards our scientific community has come to expect from it. The guest editors would like to thank our colleagues from all around the world for choosing to submit their work to ISCAS for review. Due to their many and important contributions, we managed to create a Technical Program of high scientific quality. In fact, it has been gratifying to learn more about the advances first described at ISCAS 2009. We would like to thank the numerous volunteers that helped to review the submitted papers. We wish to thank Professor and IEEE Fellow Tor Sverre Lande (Bassen), Editor-In-Chief of the IEEE TRANSACTIONS ON BIOMEDICAL CIRCUITS AND SYSTEMS and a former chair elect (2003–2005) of the IEEE Biomedical Circuits and Systems technical committee (BioCAS), for giving us the opportunity to organize this prestigious Special Issue. We also wish to express our deepest gratitude for the efforts of the IEEE supporting personnel; this Special Issue is only possible with their expert help.

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Philipp Häfliger received the M.Sc. degree in computer science with astronomy as a second subject from the Swiss Federal Institute of Technology (ETH), Zürich, Switzerland, in 1995, and the Ph.D. degree from the Institute of Neuroinformatics (INI), ETH Zürich, Zürich, in 2000.

At INI, where biologists, psychologists, neurologists, engineers, mathematicians, physicists, and computer scientists join forces to explore the working principles of the brain, he started in earnest to design bioinspired analog and hybrid integrated circuits. Many of these circuits operate on sub-threshold currents (i.e., currents that traditional digital electronics considered entirely negligible until recently) trying to approach the energy efficacy of biological organisms. His special focus was on on-chip learning algorithms. He then moved to a postdoctoral position at the Institute of Informatics, University of Oslo, Norway, where he currently is an Associate Professor. Between 2002 and 2006, he participated in the European Union funded project CAVIAR and from 2006 to 2009, he has worked on the GlucoSense project sponsored by the Norwegian research council, developing ultra-low power electronics for a pill-sized wireless implant.

Dr. Häfliger is Vice Chair of the IEEE Circuits and Systems (CAS) Society's Biomedical CAS Technical Committee, Track Chair for the IEEE International Symposium on Circuits and Systems live demonstrations track 2009, and Technical Program Committee Member of the IEEE Conference on Biomedical CAS (2007 and 2008). He serves as reviewer for a number of journals (recently the IEEE TRANSACTIONS ON NEURAL NETWORKS and the IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS I: REGULAR PAPERS) and conferences (recently the IEEE International Symposium on Circuits and Systems and Neural Information Processing Systems).

Timothy G. Constandinou (S'98-M'01) received the B.Eng. degree in electrical and electronic engineering (Hons.) and the Ph.D. degree in electronic engineering from Imperial College London, London, U.K., in 2001 and 2005, respectively.

Currently, he is based at the Institute of Biomedical Engineering at Imperial College London, where he is the Assistant Research Director and Research Officer in Bio-Inspired Technology. His research is in the novel application of integrated microelectronics in biomedical and biologically inspired systems with an emphasis on innovating circuits, devices, and technology.

Dr. Constandinou serves on the Sensory Systems and Biomedical Circuits and Systems Technical Committees of the IEEE Circuits and Systems Society and continues to serve on the technical and review committees for several IEEE conferences. He is currently the Technical Program Co-Chair and Publications Chair for the 2010 IEEE Biomedical Circuits and Systems Conference (BioCAS 2010). He is a member of the IET and a registered chartered engineer. In 2009, he has received the IET Mike Sargeant Achievement Award in recognition for significant career progression over a number of years.