The Institute of Electrical and Electronics Engineers
Hungary Section - Circuits, Systems and Computer Joint Chapter
Chapter chair: Prof. Géza Kolumbán, FIEEE
e-mail:kolumban@itk.ppke.hu

Activity report of 2013
IEEE Hungary Section
Circuits, Systems and Computer Joint Chapter

1. Highlights from the past - Events organized by or related to IEEE HS-CS&C JC during 2013

1. Meeting

   - Title: IRUN Winter School on Nonlinear Dynamics in Cellular Wave Computing
   - Event Category: Professional
   - Description:
     Two and a half a day winter school devoted to the nonlinear dynamics observed in cellular wave computing and non-boolean nanoscale architectures and algorithms. Many related topics were also discussed such as stability, synchronization, bio-related and mission-critical applications. Three universities participated in the organization of IRUN Winter School: Pazmany Peter Catholic University, Budapest, Hungary, Jagellonian University, Krakow, Poland and University of Siena, Siena, Italy.
   - Keywords: nonlinear dynamics, cellular wave computing, nanoscale architectures and algorithms
   - Guest Attendance: 23
   - IEEE Member Attendance: 12
   - Date and location: Jan 28, 2013 - Jan 30, 2013; Region 8, Budapest HUNGARY (CAS04/C16)

2. Meeting

   - Title: R&D activities at the Photonics Research Centre of the Hong Kong Polytechnic University
   - Event Category: Professional
   - Description:
     Profs. H.Y. Tam and C. Lu presented an overview on the research activity of the Photonics Research Centre established at The Hong Kong Polytechnic University. The Photonics Research Centre performs research on both optical fibre sensors and optical communication systems. After the introduction, a detailed discussion on an ongoing research topic was given, namely, a project devoted to coherent high-capacity optical communications system was discussed. Then the results achieved in the areas of optical 16 QAM and 64 QAM signal generation, carrier phase estimation for polarization multiplexed 16 QAM coherent detection system and high speed parameter estimation were discussed. Last but not least some recent experimental results on a 400Gbit/s WDM optical transmission system was presented.
   - Keywords: optical sensors, coherent optical communications systems, photonic research
   - Guest Attendance: 13
   - IEEE Member Attendance: 16
   - Date and location: Jun 10, 2013; Region 8, Budapest HUNGARY (CAS04/C16)

3. Meeting

   - Title: Software Defined Electronics: Introduction to the SDE-VI Lab of Pazmany Peter Catholic University
   - Event Category: Professional
   - Description:
     RF/microwave/optical analog signal processing is substituted in Software Defined Electronics (SDE) by its digital counterpart operating in the low-frequency region referred to as BaseBand (BB). Every application is implemented in SW and the transformation between the BB data streams and real high-frequency analog signals is performed by a universal HW device. The SW implementation offers reconfigurability, high accuracy and flexibility, features that are required in cognitive radio, reconfigurable automated test beds, etc. The most important feature of SDE approach is that the HW and SW components are completely separated, and the same universal HW is used to implement every desired application. Although digital signal processing has been around everywhere in the low-frequency applications for many years, until this time it could not satisfy the strict requirements of RF, microwave and optical applications where the (i) ultra-wide dynamic range and (ii) high sampling rate are a must. In our days the situation has been changing rapidly, for example, Software Defined Radio (SDR), Universal Software Radio Peripheral (USRP) and Virtual Instrumentation (VI) all mean that a universal HW device is used to extract the complex envelope of a high-frequency bandpass signal to be demodulated or analyzed, and the radio receiver or signal analyzer is implemented in baseband, entirely in SW. The complex envelope used in BB features two essential properties: it (i) carries all information available in the original RF bandpass signal and (ii) assures the theoretically attainable minimum sampling rate. The Software Defined Electronics and Virtual Instrumentation (SDE-VI) Lab has been established at the Faculty of Information Technology and Bionics, Pazmany Peter Catholic University, Budapest, to provide the laboratory background for the scientific research, prototyping and teaching of the SDE- and VI-concepts. The SDE-VI lab is equipped with PXI- and USRP-based HW devices and the desired applications can be implemented either in MATLAB or LabVIEW. The short course was organize to introduce the lab to the students who are interested in the SDE-VI topic.
   - Keywords: software defined electronics, virtual instrumentation, automated calibration ans test beds
   - Guest Attendance: 9
   - IEEE Member Attendance: 2
   - Date and location: Oct 24, 2013; Region 8, Budapest HUNGARY (CAS04/C16)

4. DLP lectures delivered in 2013:

   - G. Kolumbán, *Software Defined Electronics (SDE): A New Research Field for the IEEE CAS Society*, Guangdong University of Technology, April 09, 2013, Guangzhou, P.R. China.
   - G. Kolumbán, *Software Defined Electronics: A Revolutionary Paradigm for RF Radio and Measurement Systems*, A day-long short course organized by IEEE UK&RI Solid State Circuits Chapter, Tyndall National Institute, May 09, 2013, Cork, Ireland.
   - G. Kolumbán, *Software Defined Electronics (SDE): A Revolutionary Design Paradigm for Automated Calibration and Test Systems*, Beijing Jiaotong University, May 12, 2013, Beijing, P.R. China.
   - G. Kolumbán, *Software Defined Electronics: A New Approach for Design and Implementation of Future Communications Systems*, Short course at EAMTA, Facultad Regional Buenos Aires - Universidad Tecnológica Nacional, August 12 and 14, 2013, Buenos Aires, Argentina.
   - G. Kolumbán, *Implementation of SDE-Based Universal RF Testbed and Derivation of Baseband Equivalents*, CAMTA Day, Facultad Regional Buenos Aires - Universidad Tecnológica Nacional, Buenos Aires, August 15, 2013 Buenos Aires, Argentina.
   - G. Kolumbán, *Software Defined Electronics (SDE): A New Research Field for CAS Society*, Tokushima University, December 04, 2013, Tokushima, Japan.
   - G. Kolumbán, *Software Defined Electronics (SDE): A New Research Field for CAS Society*, Meiji University, December 11, 2013, Tokyo, Japan.
   - G. Kolumbán, *New Approach for Design and Implementation of Future Communications Systems*, Tokyo University of Science, December 13, 2013, Tokyo, Japan.

2. Future activities closely related to the work of IEEE HS-CS&C JC

Further IEEE DLP lectures will be organized locally and internationally in the topic of Software Defined Electronics.

3. Best practices

Best practice in the topic of Software Defined Electronics for digital communications:

Book chapter in Electrical Eng. & Applied Signal Processing Series by CRC Press appeared October, 2013.:
Géza Kolumbán, Tamás Krébesz, Chi K. Tse, and Francis C.M. Lau
Basics of Communications Using Chaos
Chaotic Signals in Digital Communications
October 25, 2013 by CRC Press

4. Points of concern / Topics for future discussion

Highlighting the relevance and importance of the topic of Software Defined Electronics for the Society

5. Miscellaneous

Prof. Yejun He, professor of information and communication engineering at Shenzhen University (Shenzen, P.R. China), visited the Department of Measurement and Information Systems at the Budapest University of Technology and Economics and the Faculty of Information Technology and Bionics at the Pázmány Péter Catholic University in Jun, 2013. Prof. He and the local researchers from both universities shared their experience and exchanged their new scientific achievements.