Selected papers from the IEEE Dallas circuits and systems conference 2016

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The IEEE Dallas Circuits and Systems Conference 2016 was held in the University of Texas at Arlington on Oct. 9–10, 2016. The conference was a forum for new circuits and systems concepts. The 2-day program included 21 full presentations, and 9 poster papers, relating to concepts in analog, power, RF, sensing and digital circuit techniques.

This special issue consists of 6 peer-reviewed full-length papers that are based on papers presented at the conference. These were invited on the recommendation of the technical program committee. Three of these papers relate to RF and analog circuit techniques, one paper describes an SOC for a sensing application, and two papers describe circuit and system concepts for emerging health applications.

The first paper by Chang et al., entitled “Design Techniques for Mitigation of Intermodulation Distortion Components in CMOS RF Receiver Front-End Circuits with Subthreshold Operation,” describes circuit techniques for enhancing the linearity of a sub-threshold MOS RF amplifier and mixer. An approach to enhance the third-order intercept-point performance of the front-end circuits is described and measurement results in a 110-nm process are presented. In “Design Considerations of CMOS Active Inductor for Low Power Applications,” Ou et al., present an approach for sizing devices in an active CMOS inductor for maximizing device speed and minimizing power dissipation.

Time-domain techniques have received significant interest in deep submicron CMOS technologies in recent years. In “Design and Analysis of a Feedback Time

Difference Amplifier with Linear and Programmable Gain,” Wu et al., describe the design of a feedback-based time difference amplifier with a linear, controllable gain and an input range that can be changed based on the time-difference gain. The design approach is demonstrated in a 130-nm process.

Light-based detection and ranging systems have become increasingly important in recent years, especially with the rapidly expanding application space of autonomous vehicles and robotics. In “A LIDAR Sensor Prototype with Embedded 14-bit 52 ps Resolution ILO-TDC Array,” Chen et al., describe a sensor SOC with a 31×2 pixel channel array and a 32×1 time-to-digital converter. The characterization results of a prototype implemented in a 65-nm CMOS process are described in the paper.

The last two papers address the use of circuits and systems concepts for emerging health applications. In “Neural Network Based Real-time Heart Sound Monitor Using a Wireless Wearable Wrist Sensor,” Shi et al., describe a neural-network method to estimate parameters of heart sounds derived from a wearable wrist sensor. The final paper “Contactless Hand Tremor Detector based on an Inductive Sensor,” also by Shi et al., describes a contactless detector for sensing and evaluating hand tremors that result from exercise-induced fatigue and early Parkinson’s disease. A prototype based on inductive sensing is demonstrated, as part of this work.

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Sid Balasubramanian received the M.S. and Ph.D. degrees in electrical engineering from The Ohio State University (OSU) in 2009 and 2013, respectively. From 2005 to 2008, he was a member of the onboard electronics team for India's first student-built microsatellite, the ANUSAT, focusing on the design and integration of RF subsystems that were deployed in space in April 2009. From 2008 to 2009, he was affiliated with the Analog VLSI Lab, and

the ElectroScience Laboratory Complex at OSU, working on high-speed data conversion, mm-wave and beamforming systems, and many more. In the Fall of 2010, he was with Xtendwave, a Dallas-based startup, to develop a backward-compatible modulation scheme for WWVB systems, which is currently the broadcast standard for time in the United States of America. From 2013 to 2016, he was with Texas Instruments, developing high-speed RF data converters for the wireless infrastructure and industrial space markets. Since 2016, he has been at Phazr developing mm-wave solutions for the fixed-wireless markets. Balasubramanian has several patents pending and has authored several publications, including a book chapter on the advances in digital-to-analog converters. Notable awards received are The Ohio State University Fellowship (2008), TSMC Outstanding Student Research Award (2010), National Science Foundation MIPR Fellowship (2011), and the Wireless Innovation Forum Best Paper Award (2013).

Ranjit Gharpurey (M'95, SM'10) received the B.Tech. degree from the Indian Institute of Technology, Kharagpur, in 1990, and the M.S. and Ph.D. degrees from the University of California at Berkeley in 1992 and 1995, respectively. He is currently a Professor in the Department of Electrical and Computer Engineering, University of Texas at Austin. His research interests are in analog circuit design, with emphasis on RF and wireless communication

applications, low-power design techniques, and techniques for improving efficiency and dynamic range in analog circuits.

Rama Venkatasubramanian received the B.E. degree in electrical and electronics engineering from Regional Engineering College, Tiruchirappalli, India, in 2001. He received the M.S. and Ph.D. degrees in electrical engineering from the University of Texas at Dallas, Dallas, USA, in 2005 and 2012, respectively. Since 2005, he has been associated with the DSP Systems group, Texas Instruments, Dallas where he currently leads the DSP Core Development Team and is a Senior Member of Technical Staff. His research interests include DSP processor design, cache architectures and energy efficient circuit design using emerging technologies, NEMS and hybrid NEMS-CMOS based analog and mixed mode circuits. He served as the chair for IEEE Dallas CAS Chapter in 2014 and 2015. He has authored or coauthored two book chapters, 18 journal and conference papers, and holds twelve issued and eleven pending U.S. patents.