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BIO

Michael P. Flynn received the Ph.D. degree from Carnegie Mellon University in 1995. From 1995 to 1997, he was a Member of Technical Staff with Texas Instruments, Dallas, TX. During the four years from 1997 to 2001, he was with Parthus Technologies, Cork, Ireland. Dr. Flynn joined the University of Michigan in 2001 and is currently Professor. His technical interests are in RF circuits, data conversion, serial transceivers, and biomedical systems.

Michael Flynn is a 2008 Guggenheim Fellow. He received the 2016 University of Michigan Faculty Achievement Award. He received the 2011 Education Excellence Award and the 2010 College of Engineering Ted Kennedy Family Team Excellence Award from the College from Engineering at the University of Michigan. He received the 2005-2006 Outstanding Achievement Award from the Department of Electrical Engineering and Computer Science at the University of Michigan. He received the NSF Early Career Award in 2004.

Dr. Flynn was Editor-in-Chief of the IEEE Journal of Solid-State Circuits from 2013 to 2016. He is a former Distinguished Lecturer of the IEEE Solid-State Circuits Society. He served as Associate Editor of the IEEE Journal of Solid-State Circuits (JSSC) and of the IEEE Transactions on Circuits and Systems. He is chair of the Data Conversion Committee of the International Solid-State Circuits Conference. He formerly served on the Technical Program Committees of ESSCIRC, A-SSCC, and the Symposium on VLSI Circuits.

The evolution of NS SAR : A 100MHz-BW 68dB-SNDR Tuning-Free Hybrid-Loop DSM with an Interleaved Bandpass Noise-Shaping SAR Quantizer

ABSTRACT

The noise-shaping SAR (NS-SAR) ADC architecture has become a dominant emerging ADC technique in a short time. NS-SAR combines the advantages of SAR and noise-shaping and NS-SAR ADCs very efficiently cover a wide range of specifications and are beginning to displace conventional ADCs in industry. This talk describes a new architecture that further improves both improves the performance and usability of NS-SAR.

Communication and radar applications place enormous demands on ADC performance by requiring wide BW (100MHz) and high DR (70dB). Continuous-time delta-sigma modulators (CT-DSM) are a mainstream solution as they deliver high amplifier efficiency, are easy to drive, and provide innate anti-aliasing. However, CT-DSMs have some inherent drawbacks: 1) the loop filter is typically based on RC time-constants which are poorly defined and require digital tuning; 2) they do not scale with sampling frequency; 3) they are very sensitive to DAC ISI and jitter. Discrete-time (DT) DSMs, such as the emerging noise-shaping (NS) SAR architecture, avoid these problems, but cannot provide the essential benefits of CT-DSMs. We propose the new Hybrid-Loop (HL) DSM architecture, which combines the advantages of both CT and DT DSMs and eliminates the drawbacks. Moreover, a bandpass, time-interleaved noise-shaping (TINS) SAR quantizer further boosts the new architecture's performance. The prototype HL-DSM provides 68dB SNDR over a 100MHz BW for a quadrature input, without any calibration or tuning, while occupying only 0.09mm² and consuming 13mW at 1.6GS/s. The resulting 166dB FoMs shows the potential of HL-DSM as a more robust and practical alternative to CT-DSM.