SEMINAR
Room 223B ZEC

Thursday, February 3, 2010  3:55 - 5:10 P.M.

Time-Mode Analog Circuit Design for Nanometric Technologies

by

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Abstract: Rapid scaling in technology has introduced new challenges in the realm of traditional analog design. Scaling of supply voltage directly impacts the available voltage-dynamic-range. On the other hand, nanometric technologies with fT in hundreds of GHz range open opportunities for time-resolution-based signal processing. With reduced available voltage-dynamic-range and improved timing resolution, it is more convenient to device analog circuits whose performance depends on edge-timing precision rather than voltage levels. Thus, instead of representing the data/information in the voltage-mode, as a difference between two node voltages, it should be represented in time-mode as a time-difference between two rising and/or falling edges. A major advantage of processing signals encoded in the time-mode is the digital-friendly nature of the system, which scales down with the technology. In addition, migrating to smaller technologies is expected to improve the performance of the same design as timing resolution is improved. This dissertation addresses the feasibility of employing time-mode analog circuit design in different applications. Specifically:
1) Time-mode-based quantizer and feedback DAC of ΣΔ ADC.
2) Time-mode-based low-THD 10MHz oscillator,
3) A Spur-Frequency Boosting PLL with -74dBc Reference-Spur Rejection in 90nm Digital CMOS.

Mohamed Mostafa Elsayed received the B.Sc. and M.Sc. degrees in electrical engineering from Cairo University, Cairo, Egypt in 2002 and 2005 respectively. Since 2005 he is pursuing Ph.D. degree at the Analog and Mixed Signal Center (AMSC) in Texas A&M University. During summer 2001 he was interning in Saarland University, Saarbrucken, Germany where he worked on multi-threshold and dynamic-threshold digital circuits. He was a teaching and research assistant in Cairo University from 2002 to 2005. In summer and fall 2009 he joined Texas Instruments Inc, Dallas, TX as a design intern where he designed low power DAC. His research interest include Time-to-Digital converters, Phase-Locked-Loops and digitally-enhanced analog circuits.