

Title: Classical Mathematics Leads to Smart Analog-Digital Circuits

Abstract:

This lecture introduces some research results in analog-digital circuit design area, which are based on classical mathematics, such as number theory, coding theory and signal processing theory, including Chinese mathematics. You can enjoy the following topics:

- (i) Fibonacci Sequence Weighted SAR ADC
- (ii) Golden Ratio Sampling for Waveform
- (iii) Residue Sampling based on Chinese Remainder Theorem
- (iv) DAC Design based on Magic Square
- (v) DAC Architectures with Gray-code Input
- (vi) Complex Signal Processing and Analog Hilbert Filter
- (vii) Floating-Point Digital Arithmetic Circuits based on Taylor-Series Expansion

ADC: Analog-to-Digital Converter

DAC: Digital-to-Analog Converter

SAR: Successive Approximation Register



Haruo KOBAYASHI received the B.S. and M.S. degrees in information physics from the University of Tokyo in 1980 and 1982 respectively, the M.S. degree in electrical engineering from the University of California, Los Angeles (UCLA) in 1989, and the Ph. D. degree in electrical engineering from Waseda University in 1995. He joined Yokogawa Electric Corp. Tokyo, Japan in 1982, and was engaged in research and development related to measuring instruments and mini-supercomputer. He joined Gunma University in electronic engineering department as Associated Professor in 1997, and promoted to Professor in 2002. His research interests include mixed-signal integrated circuit design & testing, and signal processing algorithms. He has published more than 170 journal papers and 560 international conference papers. Also, he has supervised 20 Ph. D. students and 160 M. S. Students. Currently, he is Professor Emeritus of Gunma University. He has served as committee member as well as general chair and program committee chair of many international conferences. He received the Yokoyama Award in Science and Technology in 2003. He is a Senior Member of IEEE, IEICE, and IEEJ.



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学者论坛



讲座主题 数学理论引领智能模拟数字电路的发展

主讲专家 日本群馬大学 小林春夫 教授

讲座时间 2023年11月1日（星期三）10:20

讲座地点 清水河校区成电国际创新中心B504报告厅



内容简介：

本报告介绍模拟数字电路设计领域基于数论、编码和信号处理以及算术的研究成果，内容包含（1）基于斐波那契序列加权的 SAR ADC；（2）信号波形的黄金比例采样；（3）基于余数定理的残差采样方法；（4）基于魔方理论的 DAC 设计；（5）灰码输入的 DAC 架构实现；（6）复杂信号处理和模拟希尔伯特滤波器；（7）基于泰勒级数展开的浮点型数字运算电路。

专家简介：

小林春夫，群馬大学名誉教授，IEEE、IEICE 和 IEEJ 高级会员。曾担任多个国际会议的委员会成员、总主席和程序委员会主席，并于 2003 年获得横山科学技术奖。分别于 1980 年和 1982 年获得东京大学信息物理学学士和硕士学位，1989 年获得加州大学洛杉矶分校（UCLA）电气工程硕士学位，1995 年获得早稻田大学电气工程博士学位。于 1982 年加入日本东京横河电机公司，从事与测量仪器和微型超级计算机有关的研究和开发工作。1997 年加入群馬大学电子工程系任副教授，2002 年晋升为教授。研究包括混合信号集成电路设计与测试以及信号处理算法，发表了 170 多篇期刊论文和 560 多篇国际会议论文，指导了 20 名博士生和 160 名硕士生。

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