Professor Akira Matsuzawa

Prof. Matsuzawa received B.S., M.S., and Ph. D. degrees in electronics engineering from Tohoku University, Sendai, Japan, in 1976, 1978, and 1997 respectively. In 1978, he joined Matsushita Electric Industrial Co. Ltd. Since then, he has been working on research and development of analog and Mixed Signal LSI technologies; ultra-high speed ADCs, intelligent CMOS sensors, RF CMOS circuits, digital read-channel technologies for DVD systems, ultra-high speed interface technologies for metal and optical fibers, a boundary scan technology, and CAD technology. He was also responsible for the development of low power LSI technology, ASIC libraries, analog CMOS devices, SOI devices. From 1997 to 2003, he was a general manager in advanced LSI technology development center. On April 2003, he joined Tokyo Institute of Technology and he is a professor on physical electronics. Currently he is researching in mixed signal technologies; CMOS wireless transceiver, RF CMOS circuit design, data converters, and organic EL drivers. He served the guest editor in chief for special issue on analog LSI technology of IEICE transactions on electronics in 1992, 1997, and 2003, the vice-program chairman for International Conference on Solid State Devices and Materials (SSDM) in 1999 and 2000, the Co-Chairman for Low Power Electronics Workshop in 1995, a member of program committee for analog technology in ISSCC and the guest editor for special issues of IEEE Transactions on Electron Devices. He has published 26 technical journal papers and 46 international conference papers. He is co-author of 8 books. He holds 34 registered Japan patents and 65 US and EPC patents. He is an IEEE Fellow since 2002. In April 2003 he joined, as a Professor, the Department of Physical electronics at Titech.

Awards

- 1983 IR100 Award (USA)
- 1994 Remarkable Invention Award (JP)
- 1994 R&D100 Award (USA)
- 2002 IEEE Fellow Award
- 2003 ISSCC2002 The Evening Panel Award
- 2005 ISSCC2004 The Evening-Panel Award

Research

Our Aims and Perspectives

It evolved to the digital technique now though the basis of electronic equipment was an analog technology before. As a result, not only personal computers but also "Digital consumer electronics" for example DVD, digital TV, digital still camera, flat panel display and so on dominated in the world. Furthermore, a digital network, for example Internet, Wireless LAN, and the cellular phone and so on will be expected to spread. Aggravated problems of the signal integrity, the noise radiation, and power consumption, etc. are at these equipment. It is necessary to use a sophisticated analog technology, even if the digital techniques are used for these. Therefore, the technology that mixes the digital technique with the analog technique is desired currently. Namely, the "mixed signal system LSI" is the most

important key technology in electronics. Our researches focus on the high performance mixed signal system LSI design.

Research Topics

"The Implementation of Multi-bands Multi-standards Wireless Systems LSI."

Multi-bands multi-standards wireless systems that based on software defined radio techniques are demanded more and more in the future. To meet such requirements, the high performance A/D converters and digital RF techniques are receiving much attention as important elements. These techniques are expected to become key technology at not only wireless systems but also wireless sensor networks, high performance digital networks and Digital Recording Systems etc. Furthermore, these techniques assure to provide some unexpected evolution in the world. To implement these concepts, our laboratory develops following elements.

The Development of High-performance CMOS Analog to Digital Converters

A recent trend toward a large system integration on a LSI. The biggest problems associated with the high density integration is higher speed operation, power dissipation and low voltage circuit design. To meet such requirements as the wide bandwidth operations under the low supply voltage, A/D converters are receiving much attention as important elements.

Digital RF Techniques for Wireless Systems

Multi-bands multi-standards wireless systems should be based on software defined radio techniques. Meanwhile, the analog technology has been still used in a lot of wireless RF circuits that operate over GHz. Herein key features of digital RF techniques that we propose are able to reduce analog counterparts, and to have the excellent interface with software. However, the design techniques of digital RF are not yet established. Therefore, to exploit such potential of digital RF techniques, the diagram shown in Fig. 3 is investigated in our laboratory. We especially take up the elements as follows. The sampling mixer that has filter function. The digital synthesizer that can adjust to multi-band, and achieves high-speed frequency change. By combining with high-performance CMOS A/D converter techniques that can adjust characteristics, it is possible to produce that wireless system LSI and wireless sensor network LSI that responds to multi-band multi-standard.

Contact

Prof. Akira Matsuzawa
matsu@ssc.pe.titech.ac.jp
Office: S3 Building, 3F 312
TEL/FAX: +81-3-5734-2508
2-12-1 S3-27, Ookayama, Meguro-ku, Tokyo 152-8552 Japan
Department of Physical Electronics, Tokyo Institute of Technology
Matsuzawa and Okada Lab.

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