Electrical/Computer Engineering Design Project Proposal

Title: *Circuit Design and Design Automation for Analog and Mixed-Signal VLSI Systems*

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Description

System-on-chip (SoC) applications accelerate the growth of mixed-signal integrated circuits. The analog portion in the mixed-signal design is inevitable due to the nature of continuous signals in the external environment. However, up to now, analog and mixed-signal circuit designers still have to spend an extremely large amount of time in conducting simulations and nontrivial layout design due to insufficient support from CAD tools. This manual scheme is both tedious and error-prone.

This project is to investigate both circuit design techniques and design automation methodologies for analog and mixed-signal Very Large Scale Integration (VLSI) systems and circuits. In terms of circuit design aspects, the students are expected to work on the design of integrated circuits for communication or bio-medical applications, for instance, operational amplifiers using bulk-driven MOSFETs, low-noise pico ammeter chips, Micro-Electro-Mechanical Systems (MEMS), etc. The second stream of this project is design automation for analog and mixed-signal VLSI circuits. The students are expected to work on circuit sizing optimization, placement, or routing problems. As a project team, ideally the students working on circuit design will use the methodology developed by the second group of students (i.e., who are working on design automation), while the second group of students will use the circuits developed by the first group for benchmark test.

Roles

Up to five students are needed for this project. Two students (Group-A) will be working on circuit design and three students (Group-B) will be focusing on design automation.

The primary role of the Group-A students is to develop analog and mixed-signal integrated circuits, e.g., operational amplifiers using bulk-driven MOSFETs, low-noise pico ammeter chips, Micro-Electro-Mechanical Systems (MEMS), etc. The students should understand MOSFET working principle and learn how to run simulations for integrated circuits. They may be from either Electrical Engineering or Computer Engineering discipline.

The primary role of the Group-B students is to develop algorithms and implement design automation program. The students should know basics of algorithms and object-oriented programming. These students should have Computer Engineering background.