Joint CQSE and CASTS Seminar

2020
December 18, Friday

TIME Dec. 18, 2020, 2:30~3:30pm
TITLE Bit-Slicing the Hilbert Space: Scaling Up Accurate Quantum Circuit Simulation to a New Level
SPEAKER Prof. Jie-Hong Roland Jiang
Department of Electrical Engineering, NTU
PLACE Rm104, Chin-Pao Yang Lecture Hall,
CCMS & New Physics Building, NTU

Abstract:

Quantum computing is greatly advanced in recent years and is expected to transform the computation paradigm in the near future. Quantum circuit simulation plays a key role in the toolchain for the development of quantum hardware and software systems. However, due to the enormous Hilbert space of quantum states, simulating quantum circuits with classical computers is extremely challenging despite notable efforts have been made. In this work, we enhance quantum circuit simulation in two dimensions: accuracy and scalability. The former is achieved by using an algebraic representation of complex numbers; the latter is achieved by bit-slicing the number representation and replacing matrix-vector multiplication with symbolic Boolean function manipulation. Experimental results demonstrate that our method can be superior to the state-of-the-art for various quantum circuits and can simulate certain benchmark families with up to ten thousands of qubits.

(Joint work with Yuan-Hung Tsai and Chiao-Shan Jhang; Reference https://arxiv.org/abs/2007.09304)

Biography Brief:

Professor Jie-Hong R. Jiang received the B.S. and M.S. degrees in Electronics Engineering from National Chiao Tung University, Hsinchu, Taiwan, in 1996 and 1998, respectively. In 2004, he received the Ph.D. degree in Electrical Engineering and Computer Sciences from the University of California, Berkeley. He is a Professor in the Department of Electrical Engineering and the Graduate Institute of Electronics Engineering at National Taiwan University (NTU). His research interests include logic synthesis, formal verification, electronic design automation, and computation models of biological and physical systems.

- N O T I C E -
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