香港城市大學
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電腦科學系
Department of
Computer Science

COMPUTER SCIENCE COLLOQUIUM

Realizing Closed-loop, Online Tuning and Control for Configurable-Cache Embedded Systems: Progress and Challenges

SPEAKER **Dr Ann GORDEN-ROSS**

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TIME 10:00 am - 10:30 am
VENUE CS Seminar Room, Y6405
6th Floor, Yellow Zone
Yeung Kin Man Academic Building
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ABSTRACT

The cache subsystem is a major contributor to energy consumption in commercial microprocessors used in embedded systems. To reduce energy, designers can perform design space exploration (DSE) to determine a suitable cache configuration that matches system constraints and goals while minimizing energy consumption. Traditionally, this cache tuning step has been a static process where heuristics or analytical models are used to determine an optimal or near-optimal cache configuration prior to runtime given a known application, application set, or application domain. Even though the configuration may change during runtime for different phases of execution, the specific configuration for each phase remains fixed. This static nature is too restrictive for modern, complex embedded systems that are expected to operate under diverse, unknown operating environments, run unknown applications, and with vastly different user quality of experience (QoE) expectations (e.g., smart phones). Therefore, cache tuning must change from a static optimization process to a dynamic optimization process that adapts online during runtime transparently to the user/system needs. The key challenge is determining the configuration that adheres to QoE expectations while minimizing energy consumption without degrading the user experience during DSE. Despite the wealth of progress that has been made, the realization of a closed-loop, fully adaptive, online-tunable cache subsystem still faces many challenges. In this talk, we review the progress made in the area of static and dynamic cache tuning, discuss the challenges that still exist in this area, and propose a prediction-assisted control-theoretic framework to address these challenges.

BIOGRAPHY

A. Gordon-Ross (M'00) received her B.S and Ph.D. degrees in Computer Science and Engineering from the University of California, Riverside (USA) in 2000 and 2007, respectively. She is currently an Associate Professor of Electrical and Computer Engineering at the University of Florida (USA) and is a member of the NSF Center for Space, High-Performance, and Resilient Computing (SHREC) at the University of Florida. She is also the faculty advisor for the Women in Electrical and Computer Engineering (WECE) and the Phi Sigma Rho National Society for Women in Engineering and Engineering Technology, and is an active member of the Women in Engineering ProActive Network (WEPAN). She received her CAREER award from the National Science Foundation in 2010 and Best Paper awards at the Great Lakes Symposium on VLSI (GLSVLSI) in 2010 and the IARIA International Conference on Mobile Ubiquitous Computing, Systems, Services and Technologies (UBICOMM) in 2010, and a best Ph.D. forum award at the IEEE Computer Society Annual Symposium on VLSI (ISLVSI) in 2014. Her research interests include embedded systems, computer architecture, low-power design, reconfigurable computing, dynamic optimizations, hardware design, real-time systems, aerospace systems, and multi-core platforms. She is also very active in promoting diversity in STEM fields. She has been a guest speaker at and has organized several international workshops/conferences on this topic, and participates in outreach programs at local K-12 schools.

All are welcome!

In case of questions, please contact Dr XUE Chun Jason at Tel: 3442 9815, E-mail: jasonxue@cityu.edu.hk, or visit the CS Departmental Seminar Web at http://www.cs.cityu.edu.hk/.