ST. FRANCIS XAVIER UNIVERSITY

Department of Mathematics, Statistics and Computer Science
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presents

Learning Based Power Management for Periodic Real-time Systems

by

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M.Sc. Thesis Proposal Presentation

Monday, December 8th @ 1:30pm in Annex 23A

With the wide use of portable battery powered devices in the new computing era, the power consumption problem of embedded devices has received a lot of attention in order to gain long battery life for enormous prospective. In any computational devices, the processor is one of the major power consumers. In modern processors, dynamic voltage and frequency scaling (DVFS) has been commonly used for energy reduction and temperature control. But with the variation of processor architecture and application behavior, a DVFS arrangement that is energy efficient for one processor might not be efficient for others. Furthermore, different DVFS algorithms work with different strategies and a single policy is not optimal for all operating conditions. One algorithm may outperform another under different workloads, dynamic slacks and power settings. In this thesis proposal, we propose two reinforcement-learning based DVFS controlling mechanisms for real-time systems to minimize energy consumption. The first one is application-and-device-aware DVFS that dynamically adjusts voltage and frequency with the variation of hardware configuration and application behavior. The second one is a hybrid DVFS approach which takes a set of well-known existing DVFS techniques, specialized to handle different conditions, and switches to the most suitable one in various situations. Computationally these algorithms are lightweight. Preliminary experimental results show that these techniques are effective in terms of energy saving.