Department of Computer Science
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Presents

Extension of Energy-Efficient DVFS Techniques with Reinforcement Learning to Handle Mixed Tasksets in Real-Time Embedded Systems

by
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Energy consumption is the most significant challenge in real-time embedded systems. With the increased use of portable devices like mobiles, laptops, and smartwatches, battery life has become the central focus in research and innovation. The modern processor employs a DVFS (Dynamic Voltage Frequency Scaling) for energy reduction and temperature control. In a real-time embedded system, periodic tasks have regular arrival times and rigid deadlines, while aperiodic tasks have irregular arrival times and soft deadlines. A real-time system is invariably required to respond to external events (aperiodic tasks) for which the release times are not known a priori. It is always essential to ensure that we also consider aperiodic tasks along with the periodic tasks. This is referred to as a mixed taskset. The previous experiment shows that DVFS techniques along with reinforcement learning save energy while handling periodic tasksets. However, energy-efficient DVFS techniques for mixed tasksets are hardly investigated. In this thesis proposal, we extend the hybrid DVFS approach using reinforcement learning to handle a mixed taskset on multiple embedded platforms and evaluate these algorithms on real-time devices. Preliminary results show that we can successfully apply the extended hybrid DVFS technique to handle aperiodic requests while meeting the deadlines of the periodic tasks, in the simulator. We also plan to implement our proposed approach on embedded platforms, like Beagle Bone and Raspberry pi on the Linux operating system, as well as extending on the FreeRTOS framework, all while focusing on energy saving.