Stony Brook University
The Graduate School

Doctoral Defense Announcement

Title

A Control Framework for Continuous Time Adaptation in Modern Day Embedded Systems

By

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Abstract: Modern day embedded systems require frequent changes in their architecture due to the variations in the market requirements and the environment the embedded system is placed. The variations impose constraints that cant be efficiently obtained by a static architecture and redesigning would severely affect time to market and cost due to over designed solutions. The systems tend to be over designed to handle varied scenarios and the full capabilities of the system would rarely be used. Substantial work done in power conservation with the help of various control methods. We would like to extend some of these control methods to the problem of controlling reconfigurable architectures in a dynamically varying environment.

The control framework we use is based on CTMDP (Continuous Time Markov Decision Processes). These are a class of Dynamic Programming methods which implement stochastic control policies. The method has been used for dynamic scheduling, load sharing and inventory control among other engineering and econometric problems. The beauty of the method is that a queueing model of an architecture can be easily mapped to CTMDP framework. With appropriate rewards and constraints incorporated from the specifications of the application these methods throw the design problem as Linear programming problem.

The stochastic arbitration policies were tested with other heuristics in a queueing model based simulation of the embedded architecture. They were compared on the basis on several performance metrics like buffer size, data loss, power conservation and delay. A design environment was developed in which the policies were sequentially used on a queueing model of the architecture and systematic data collection has been done analysed for performance trade offs.

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