Energy-Efficient Scheduling for Fault-Tolerant Real-Time Control Systems Using Standby-Sparing

Linwei Niu
Howard University, Washington, United States

Abstract:

For real-time control systems, energy efficiency, Quality of Service (QoS), and fault tolerance are among the major design concerns. In this work, we study the problem of energyefficient scheduling for fault-tolerant real-time control systems with QoS constraint scheduled under Earliest Deadline First (EDF) scheme using standby-sparing. The standby-sparing systems adopt a primary processor and a spare processor to provide fault tolerance for both permanent and transient faults. In order to reduce energy consumption for such kind of systems, we proposed two scheduling schemes, i.e., a greedy one and a selective one, under the QoS constraint of (m,k)-deadlines. The preliminary experimental results demonstrated that our proposed techniques are very promising in energy conservation while assuring QoS constraint in terms of (m,k)- deadlines as well as fault tolerance for real-time control systems scheduled under EDF scheme.

Keywords:

Energy efficiency, Earliest Deadline First scheduling, (m,k)-constraint, fault tolerance, standby sparing.