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Energy Efficient Fault Tolerant Online Scheduling

Abstract:
System reliability and power management have surfaced as principle design considerations in real-time system designs. There is a tradeoff between system reliability and power management. This study attempts to find close to optimal solution to address fault tolerant energy efficient scheduling of RTS application. In this context we address two challenging problems: (1) the problem of identifying the optimal number of checkpoint to provide fault tolerance. (2) the problem of providing energy efficient schedule which is dynamically adaptive to the runtime behavior using two different approaches. (3) Comparing the performance of the implemented approaches. To solve this problem, first a fault tolerant schedulability analysis for periodic tasks is done to obtain the optimal number of checkpoints. The optimal number of checkpoints can facilitate the task to guarantee the timing constraints and minimize the worst case execution time (WCET) in the presence of faults. Then a scheduling scheme is recommended which carries out dynamic voltage and frequency scaling (DVFS) on the basis of the schedulability analysis for the problem of static task scheduling and voltage allocation. Also the problem is solved in two phases; first pessimistic offline scheduling is done for worst case scenarios. Then it develops efficient adaptive online scheduling scheme in order to maximize energy conservation in case faults do not occur or the tasks take less than WCET. The problem is then solved using static scheduling and ultimately the performance of both the approaches is compared to find the better solution.