ABSTRACT

The Real-Time system is the system in which the accuracy of system is defined by the logical accuracy and the time it takes to produce the result. Real-Time systems have decisive, unchanging time restrictions, i.e., the task must be completed within the specified duration; otherwise, the system fails. Scheduling a task in Real-Time System is always a challenging problem. The Scheduling algorithm for Soft Real-Time Single Processor systems have been targeted in this thesis.

The scheduling algorithms are divided based on static and dynamic scheduling algorithm, which depend on the priority they follow. The static algorithm uses a unique priority to each task during the scheduling activity, whereas dynamic algorithm priority changes during the scheduling process. In this thesis, critical analysis of many Static and Dynamic scheduling algorithms have been done and represented. The static scheduling algorithm does not ensure scheduling all tasks during the underload scenario, whereas the dynamic scheduling algorithm performs poorly during an overload scenario. Based on critical analysis, the hybrid scheduling algorithm call S_LST has been proposed in this thesis. This scheduling algorithm overcomes the drawback of Static and Dynamic scheduling algorithms.

In the recent past, different research papers have been proposed a Swarm Intelligence-based scheduling algorithm. In this thesis detailed study of ACO-based scheduling algorithm has been given and also proposed the mathematical proof for ACO-based scheduling algorithm. Detailed study has been done on different Swarm Intelligence Technics and identified that Particle Swarm

Optimization could provide an effective solution for Scheduling in Soft Real-Time systems. In this thesis, the PSO-based scheduling algorithm for Soft Real-Time Single Processor System has been designed and developed.

The proposed algorithm has been compared with the existing EDF and ACO-based scheduling algorithm concerning Effective CPU Utilization (ECU) and Success Ratio (SR) parameters. It has been found that the proposed PSO-based scheduling algorithm performs more effectively than EDF and ACO-based scheduling algorithms. To validate the correctness of this algorithm, a large dataset of the periodic task has been considered. Research has considered 6800 tasks set, which vary in CPU load and the number of tasks within the task set. CPU load ranges from 0.5 to 5.0, and the number of task sets varies from 1 to 9. It has been observed that during the underload scenario, the proposed algorithm performs equally to EDF and ACO-based algorithms. The SR% values for the EDF, ACO and PSO based scheduling algorithm remains nearly 100%. During overload and highly overload situations, the proposed algorithm performs better compared to EDF and ACO-based algorithms. In overload situation SR% values for the EDF are vary between 18.27% to 1.71%, whereas for the ACO based scheduling algorithm it varies between 67.01% to 27.91%. PSO based scheduling algorithm give batter performance compare to both of these and its SR% value varies between 78.24% to 73.35% based on different task set. During highly overload situation SR% values for the EDF degrades between 1.61% to 0.31% which is very low, whereas for the ACO based scheduling algorithm it varies between 37.25% to 2.41%. PSO based scheduling algorithm still able to meet specific task's deadline and its SR% value varies between 71.25% to 32.15% which is much batter than EDF and ACO based scheduling algorithm.