Proposed Fuzzy CPU Scheduling Algorithm (PFCS) for Real Time Operating Systems

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Abstract - ***In the era of supercomputers multiprogramming operating system has emerged. Multiprogramming operating system allows more than one ready to execute processes to be loaded into memory. CPU scheduling is the process of selecting from among the processes in memory that are ready to execute and allocate the processor time (CPU) to it. Many conventional algorithms have been proposed for scheduling CPU such as FCFS, shortest job first (SJF), priority scheduling etc. But no algorithm is absolutely ideal in terms of increased throughput, decreased waiting time, decreased turnaround time etc. In this paper, a new fuzzy logic based CPU scheduling algorithm has been proposed to overcome the drawbacks of conventional algorithms for efficient utilization of CPU.***

Index Terms - CPU scheduling, fuzzy logic, Multiprogramming Operating System, process, turnaround time, and throughput.

1. INTRODUCTION

With the advancement in operating system, multiprogramming operating systems has evolved. In a multiprogramming environment, many processes are loaded into memory that competes for CPU time. CPU scheduling algorithms determines which process will be given processor time and which will wait. Some of the objectives that scheduling function should satisfy in order to be effective include fairness, efficient use of processor time, response time, turnaround and throughput [11].There are many scheduling algorithms such as FCFS, SJF, PRIORITY Scheduling etc., but none is efficient for real time tasks.

1. **FCFS**: - In FCFS algorithm the process is allotted processor time on First Come, First Serve basis. It is a non-preemptive scheduling in which the processes are being given CPU in the order of their arrival in ready queue. Advantage of FCFS is less context switching overhead. But the limitations are: - (i) Throughput can be low, since long processes can hold the CPU. (ii)Turnaround time, waiting time and response time can be high for the same reason. (iii)No prioritization occurs, thus this system has trouble to meet deadlines of the processes. (iv)Convoy Effect: - All the processes wait for one long process to get off CPU [11].
2. **SJF: -** To overcome the limitations of FCFS, Shortest Job First (SJF) algorithm was proposed. This algorithm selects the process with smallest burst time to execute next. The limitation of algorithm is: - it is very difficult to know the burst time of next CPU request. Although this algorithm is optimal but it cannot be implemented at the level of short-term CPU scheduling[11].
3. **SRTF:-**Shortest-Remaining-Time-First(SRTF) scheduling algorithm is preemptive version of SJF. This algorithm allows the next process with shorter burst to preempt the process already executing, if the burst of new arrived process is shorter than the remaining time for the running process.
4. **Priority Scheduling Algorithm (Pri):-**In this algorithm the process with highest priority is assigned CPU first and so on. The priorities are assigned to process by operating system. Low priority process gets interrupted by the incoming of higher priority process. The limitation of algorithm is indefinite blocking or starvation of lower priority process if there is large number of high priority process. Also, waiting time and response time depends on priority of process. To overcome the limitation of indefinite blocking aging technique was proposed which gradually increases the priority of processes waiting from long time.

None of the algorithms stated above is ideal with respect to scheduling objectives. Therefore, in this paper we proposed a t new algorithm which uses fuzzy logic to find the dynamic priority of the process.

2. RELATED WORK

Terry Regner & Craig Lacey[8] introduced the concepts and fundamentals of the structure and functionality of operating systems. The purpose of this article was to analyze different scheduling algorithms in a simulated system. This article has the implementation of three different scheduling algorithms: shortest process first, round robin, and priority sequence. Comparing the three algorithms, they find that the CPU utilization values indicate that the shortest process first has the highest throughput values with CPU utilization times comparable to those of the round robin. Ajit Singh[9] developed a new approach for round robin scheduling which helps to improve the CPU efficiency in real time and time sharing operating system. Alexander[10] stated that Multimedia applications have unique requirements that must be met by network and operating system components. In any multimedia application, we may have several processes running dependently on one another. Multimedia is a real-time

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