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RESEARCH ARTICLE

Analysis of Priority Scheduling Algorithm on the Basis of FCFS & SJF for Similar Priority Jobs

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Abstract— Scheduling is one of the most important activity of the process manager which take decision to choose which of the process in the ready queue will be assigned to the CPU. There are different types of scheduling algorithms available for taking decision. One of them is Priority Scheduling Algorithm, which is based on the priority assigned to each process. In priority scheduling the Processes are executed on the basis of priority, the process having highest priority is executed first. In case of similar priority FCFS is used. In this paper, the priority scheduling algorithm is used in such a way that, in case of similar priority SJF algorithm is used instead of FCFS and average waiting time and average turnaround time is calculated. The comparative analysis is performed on the SJF based priority scheduling and FCFS based priority scheduling to compare the average waiting time and average turnaround time.

Keywords— SJF, FCFS, Scheduling, Priority Scheduling, Similar Priority jobs

I. INTRODUCTION

For the system of single processor, when multiple process comes, then one process can be execute at a time and other process remain in waiting state until the CPU becomes ideal or can be schedule again. To expand the CPU usage, the goal of multiprogramming is to have some procedure running at all times. CPU scheduling manages the issue of choosing which of the procedures in the ready queue is to be assigned the CPU. Operating System usually performs scheduling of processes which is major task of a system [1].

Different number of algorithms is used to schedule processes such as First Come First Serve (FCFS), Shortest Job First (SJF), round robin and priority scheduling algorithm. In FCFS, the process that arrives first is executed first. The SJF works on shortest burst time it means the job that has lowest burst time is executed first and then another process and so on. In the round robin scheduling, processes are executed in First In First Out (FIFO) manner but are given a small amount of CPU time called a time-slice or a quantum. The CPU is preempted, if a process does not complete before its CPU-time expires and given to the next process waiting in a queue [2].

In priority Scheduling algorithm, a priority is assigned to each process, and priority is allowed to run. Each process have their different priorities, according to the priority the processes are executed. Higher priority process will executed first and then the lower priority and so on. Generally, we use the lowest integer as highest priority. If the two or more process has equal priorities then they executed in FCFS manner such that the process which enters first will executed first. The decision of priority can be internally or externally. Internal priority uses some factors these are available to calculate the priority of a process. External priorities are set by criteria outside the operating system. [3].

II. LITERATURE SURVEY

The general need of CPU usage builds the interest to enhance the CPU time. An overview has been made to analyze the different scheduling algorithm and to enhance them.

*E.O. Oyetunji and A. E. Oluleye, "*Performance Assessment of Some CPU Scheduling Algorithms*"*, 2009 [4], attempted to compare different scheduling algorithms on the basis of waiting time and turnaround time. This paper gives a brief overview to the problem of scheduling jobs/processes on the central processing unit (CPU) of the computer system.

Jyotirmay Patel1 and A.K. Solanki, "CPU Scheduling: A Comparative Study", 2011 [5], discuss about scheduling policies of Central processing unit (CPU) for computer System. A number of problems were solved to find the appropriate among them. Therefore, based on performance, the shortest job first (SJF) algorithm is suggested for the CPU scheduling problems to decrease either the average waiting time or average turnaround time. Also, the first come first serve (FCFS) algorithm is suggested for the CPU scheduling problems to reduce either the average CPU utilization or average throughput.

Mehdi Neshat, Mehdi Sargolzaei, Adel Najaran, Ali Adeli, "The New Method Of Adaptive CPU Scheduling Using Fonseca And Fleming's Genetic Algorithm", 2012 [6], proposed a new CPU scheduling . This algorithm based on the three parameters of CPU burst time, I/O service time, and priority of processes. The proposed FFGA multi objective optimization algorithm is used. It selects and runs the desired processes through adaptation. In this algorithm, the priority of processes increases with time. The proposed algorithm is analyzed with the other methods showed that the average waiting time and average response time are reduced.

Taqwa Flayyih Hasan, "CPU Scheduling Visualization", 2014 [7], evaluated different number of algorithm to analyze the average waiting time and average turnaround time. The result shows that, in FCFS recommended for the CPU scheduling problems of minimizing either the average CPU utilization or average throughput. In RR algorithm, selection of time quantum is the major problem. In round robin scheduling algorithm average waiting time is often quite long.

III. EXISTING FCFS BASED PRIORITY SCHEDULING ALGORITHM

In the existing algorithm the processes are executed according to priority, such that the process having highest priority will execute first. On the basis of execution of each process, the waiting time and turnaround time is calculated but in the case of similar priority FCFS i.e. first Come First Serve is used. In which, if the two or more process have similar priority then the process which comes first is executed first, algorithm for priority Scheduling [8] are as follows:

Existing Algorithm:

Step 1: Assign the process to ready queue.

Step 2: Assign the process to the CPU according to the priority, higher priority process will get the CPU first than lower priority process.

Step 3: If two processes have similar priority then FCFS is used to break the tie.

Step 4: Repeat the step 1 to 3 until ready queue is empty.

Step 5: Calculate Waiting time and Turnaround time of individual Process.

Step 6: Calculate Average waiting time and Average Turnaround time.

IV. PROBLEM STATEMENT

One of the most important problems in operating systems designing is CPU Scheduling and challenge in this field is to build a program to achieve proper scheduling. In case of priority scheduling algorithm when similar priority jobs arrive than FCFS is used and the average waiting and turnaround time relatively higher. The process that arrives first is executed first, no matter how long it takes the CPU. So in this case if long burst time processes execute earlier then other process will remain in waiting queue for a long time. This type of arrangement of processes in the ready queue results in the higher average waiting and turnaround time.

V. OBJECTIVE

The objective of this paper is:

- To Analysis of SJF priority based and FCFS priority based scheduling algorithm.
- To reduce the Average waiting time and Average Turnaround time of CPU.

VI. PROPOSED SJF BASED PRIORITY SCHEDULING ALGORITHM

In proposed algorithm, SJF based Priority Scheduling Algorithm is used. In which each process that have similar priority is executed on the basis of burst time, i.e. the process which have least burst time will execute first. The SJF based priority algorithm results in reduced average waiting time and turnaround time.

Proposed Algorithm:

Step 1: Assign the process to ready queue.

Step 2: Assign the process to the CPU according to the priority, higher priority process will get the CPU first than lower priority process.

Step 3: If two processes have similar priority then SJF is used to break the tie.

Step 4: Repeat the step 1 to 3 until ready queue is empty.

Step 5: Calculate Waiting time and Turnaround time of individual Process.

Step 6: Calculate Average waiting time and Average Turnaround time.

VII. IMPLEMENTATION

The proposed algorithm has been implemented on Windows XP Operating System by using Turbo C++ editor. Different cases are used to implement the algorithm. The cases have number of processes along with the burst time and priority.

To calculate the waiting time and turnaround time we use the following formula [9]:

Turnaround Time= Process completion time - Arrival time.

Waiting time =Turnaround Time - Burst Time

Case 1: For 10 processes.

TABLE I
INPUT VALUE

Process	Burst Time	Priorities
P1	183	4
P2	112	2
P3	190	5
P4	84	1
P5	245	6
P6	26	1
P7	123	3
P8	132	4
P9	197	6
P10	256	7

A. Expected outcome on the basis of existing FCFS based priority scheduling algorithm.

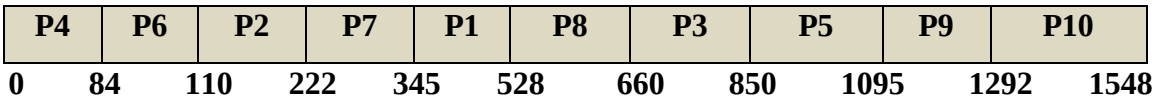

Figure 1: Expected Gantt chart for the above processes (For Similar Priorities)

B. Expected outcome on the basis of proposed SJF based priority scheduling algorithm.

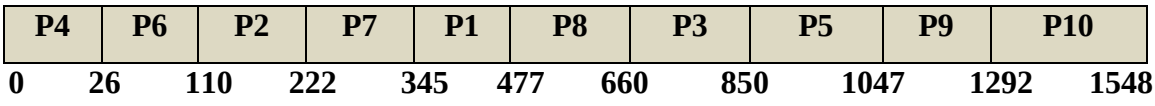

Figure 2: Expected Gantt chart for the above processes (For Similar Priorities)

VIII. RESULT AND ANALYSIS

In this paper an algorithm is proposed in which SJF is used to schedule the similar priority jobs. For this different test cases were used through which we can easily compare the result of FCFS based Priority Scheduling Algorithm and SJF based Priority Scheduling Algorithm.

A. Result

The results are shown with the help of snapshot according to the case.

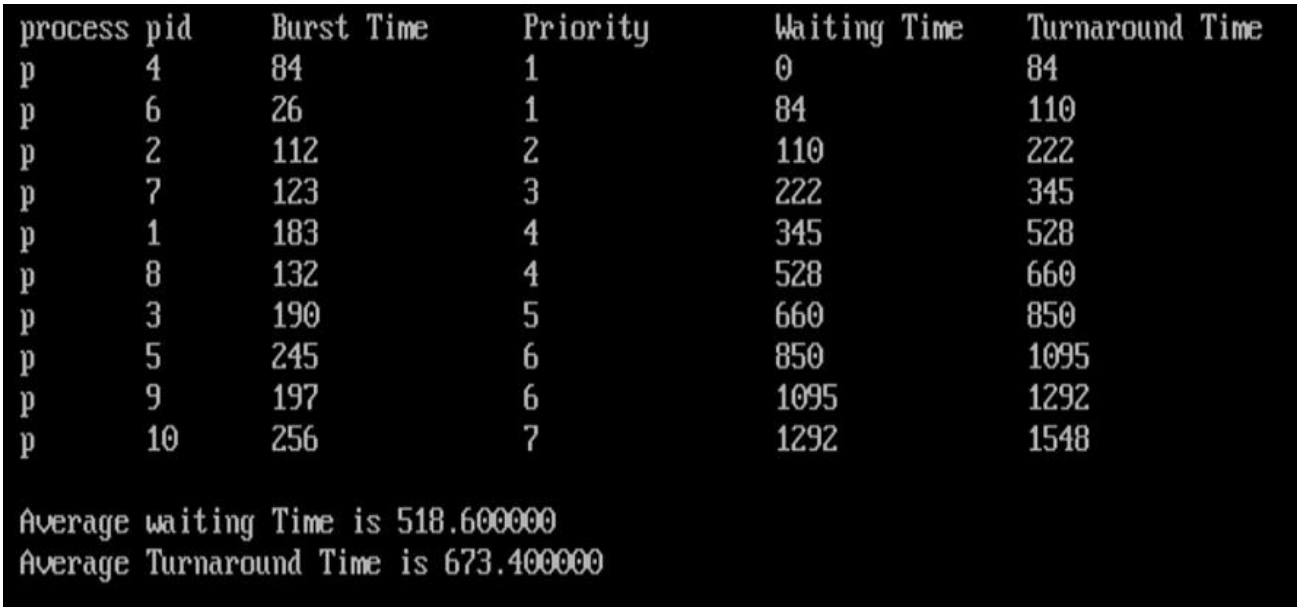

Figure 3 Case 1 FCFS based priority scheduling for 10 processes.

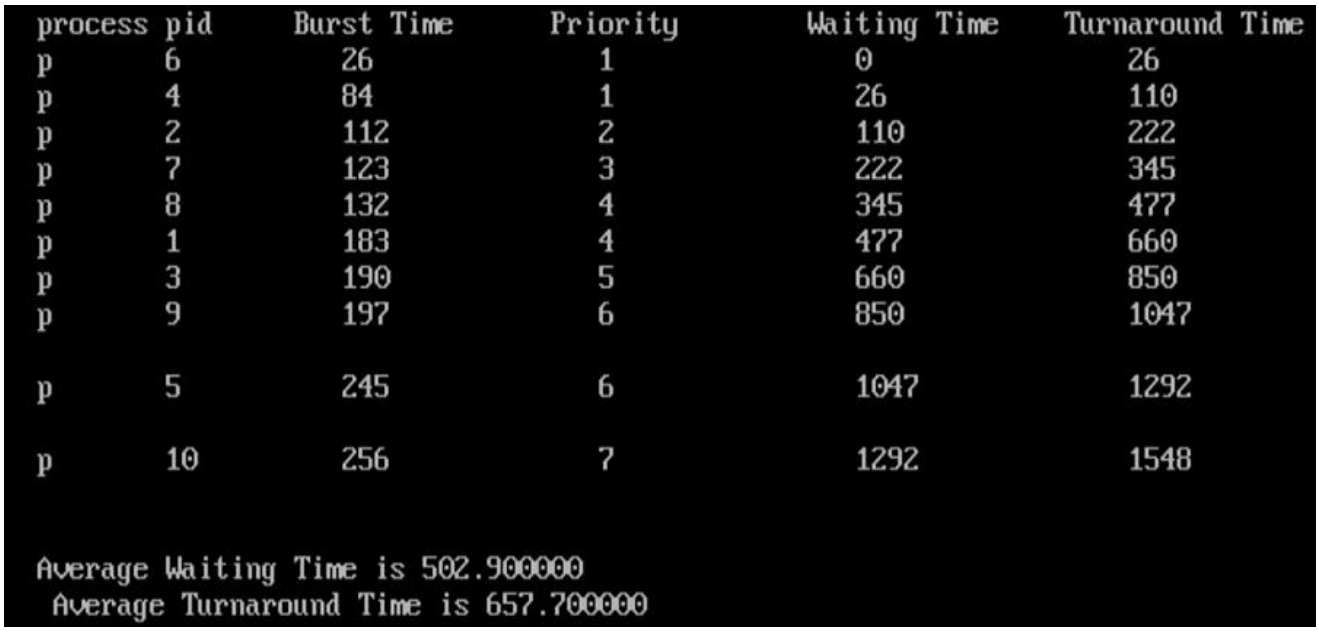

Figure 4 Case 1 SJF based priority scheduling for 10 processes.

TABLE II

COMPARISION OF WAITING TIME AND TURNAROUND TIME FOR 10 PROCESSES

Process	Waiting Time (ms)		Turnaround Time (ms)	
	FCFS based Priority Scheduling Algorithm	SJF based Priority Scheduling Algorithm	FCFS based Priority Scheduling Algorithm	SJF based Priority Scheduling Algorithm
P1	345	477	528	660
P2	110	110	222	222
P3	660	660	850	850
P4	0	26	84	110
P5	850	1047	1095	1292
P6	84	0	110	26
P7	222	222	345	345
P8	528	345	660	477
P9	1095	850	1292	1047
P10	1292	1292	1548	1548
Average	518.60	502.90	673.40	657.70

B. Analysis

On the basis of the above outcome for FCFS and SJF based priority scheduling algorithm, the average waiting and average turnaround time is calculated which is shown in graph.

- Comparison of average waiting time and turnaround time for 10 processes.

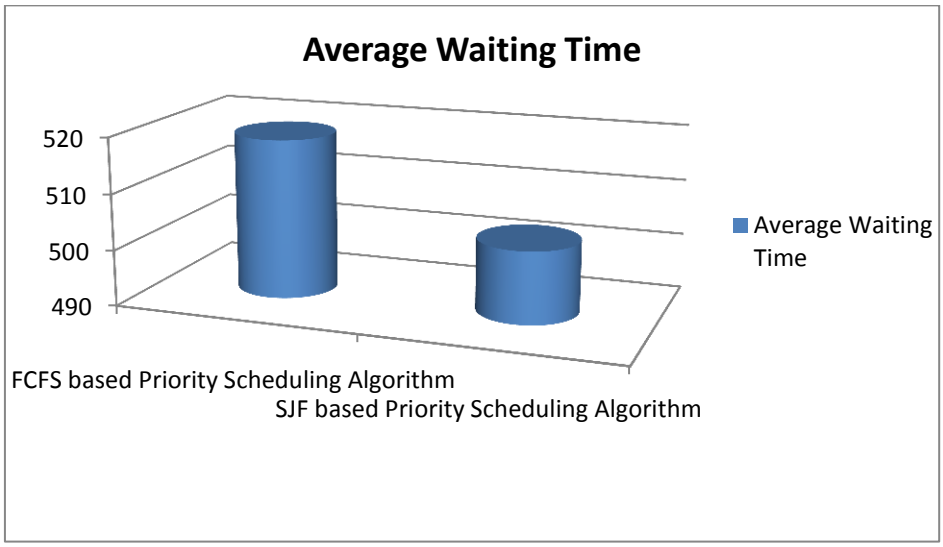

Figure 5: Average Waiting Time of FCFS based Vs SJF based Priority Scheduling Algorithm.

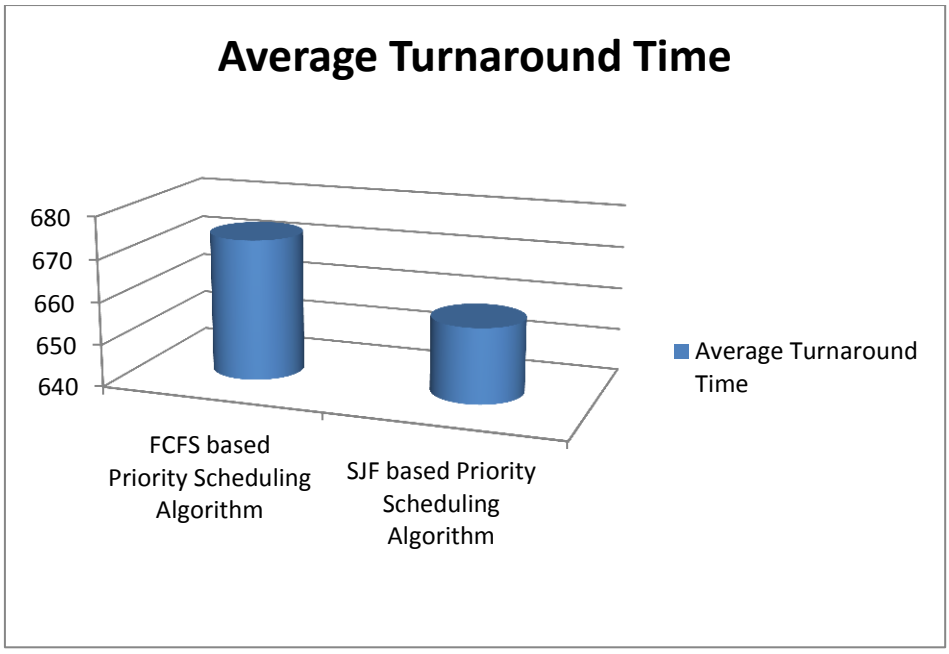

Figure 6: Average Turnaround Time of FCFS based Vs SJF based Priority Scheduling Algorithm

CONCLUSION

There are many scheduling algorithms having their own benefits and drawbacks. Scheduling can also be done on the basis of priority. Each process assigned a priority and the process which has highest priority will execute first. In case of similar priority generally FCFS is used to select the next process. If SJF based priority scheduling algorithm is used when two or more process having similar priority, instead of FCFS, then the average waiting time and average turnaround time is reduced. We proposed SJF based priority scheduling algorithm in which, the process that having lowest burst time will execute first. The existing FCFS based priority scheduling algorithm and proposed SJF based priority scheduling algorithm is analyzed and the result shows that the average waiting time and average turnaround time is reduced.

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