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Determining a Finest Time Quantum to Improve the Performance of Roundrobin Scheduling Algorithm

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ABSTRACT: In Multiprogrammed Operating System, process scheduling is one of the important task to decide which of the processes in the ready queue is to be allocated to cpu . There are different Cpu scheduling algorithms like FCFS, Shortest Job First (SJF), Round Robin(RR),priority scheduling algorithms etc. All these scheduling algorithms has drawbacks in reducing waiting time, turnaround time ,context switch .The main objective of the proposed work is to compute time quantum for Round Robin scheduling algorithm to maximize cpu utilization and throughput in terms of reducing average waiting time(AWT), average turnaround time (TAT)and total number of context switches(CS) . The paper also presents the analysis of proposed algorithm with existing RoundRobin scheduling algorithm in terms of reducing average waiting time, average turnaround time and in reducing the number of context switches.

KEYWORDS: Round Robin scheduling,average turnaround time,average waiting time, context switch, time quantum.

1.INTRODUCTION

Multiprogramming Is One Of The Important Aspect In Operating System. The Main Objective Of The Multiprogramming Is To Have Process Simultaneously In Memory Running At All Times [1], Thereby Maximize The Cpu Utilization And Use Time Productively. If There Are Several Processes Are In The Memory To Run At The Same Time, Then Operating System Must Choose Which One Among Them To Run First . Scheduling[2] [5] Deals With The Problem Of Deciding Which Of The Process In The Ready Queue Is To Be Allocated To Cpu. There Are Various Algorithms Like First Come First Serve ,Shortest Job First, Shortest Remaining Time First, Priority Scheduling , Round Robin Scheduling Algorithm. But Due To Various Disadvantages These Are Rately Used In Realtime Sharing Operating System , Except Round Robin Scheduling Which Is Simple Amd Fairest.

II.SCHEDULING CRITERIA

Many criteria have been suggested for comparing cpu scheduling algorithms in the determination of best algorithm. The criteria include the following [3]:

- Context Switch: This is the process of storing and restoring context (state) of a preempted process, so that execution can be resumed from same point at a later time.
- Throughput: The number of processes that are completed per unit time.
- CPU Utilization: keep the cpu as busy as possible.
- Turnaround Time: The interval from the time of submission of a process to the time of completion.
- Waiting Time: Amount of time a process spends waiting in ready queue.
- Response Time: amount of time it takes to start responding but not the time it takes to output that response.

Therefore a good scheduling algorithm for real time and time sharing system must possess following characteristics:

- ❖ Minimum context switches.
- ❖ Maximum CPU utilization.
- ❖ Maximum throughput.
- ❖ Minimum turnaround time
- ❖ Minimum waiting time

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❖ Minimum response time

III.ROUND ROBIN SCHEDULING ALGORITHM

Round Robin Algorithm is designed for time sharing systems .It is similar to FCFS [1,5,], but pre-emption is added to switch between the process. It assigns a small unit of time called time quantum or time slice where the performance of the system will depend on size of the time Quantum. The process are kept in ready queue .when new processes enters it is added to the tail of the ready Queue. The scheduler goes around this queue, allocating the CPU to each process for a time interval of assigned quantum [4] . The time Quantum because, if the value of time quantum is small there will be more number of context switches thereby increasing the overhead of the system[10][11] which leads to degradation of system performance . on the other hand, if the time quantum is very high than maximum burst time of the ready process then it will downgrade to FCFS scheduling algorithm. Therefore the Actual value of the time quantum is to be from 10 to 100 milliseconds[1].

IV.LITERATURE REVIEW

To increase the performance of Round robin scheduling algorithm different approaches are used to find the time Quantum like Multidynamic time quantum Round robin[8], Min Max Round robin Algorithm[7], A finest time quantum for improving shortest remaining burst round robin (SRBRR) algorithm[9], Improved Round Robin[RR][10]. Therefore various techniques were used to minimize the waiting time, turnaround time and context switches .

V.PROPOSED ALGORITHM

Hardware system is uni-processor.
Burst time of each process are known prior to submission of process.
All process are Cpu bound. All processes are independent of each other.

VI.ILLUSTRATION AND RESULTS

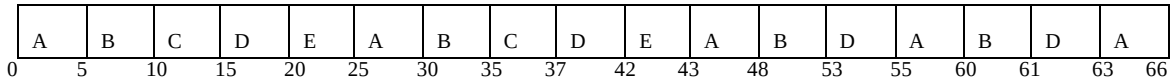
Case1: Let us assume 5 process with given CPU burst time as shown in Table 1.

Table1:

PROCESS	BURST TIME
A	24
B	16
C	7
D	12
E	6

Calculating according to simple Round Robin Algorithm with Time Quantum(TQ=5ms):

Gantt chart:



Now total number of Context switches=17
Average waiting time=42.8ms
Average Turn Around Time=54

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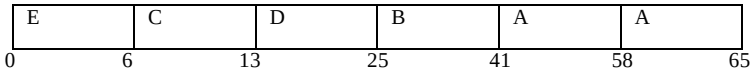
Vol. 3, Issue 7, July 2015

Case ii.: Assuming five process arriving at time 0 with increasing burst time as shown in table2.

Table2.

PROCESS	BURST TIME
E	6
C	7
D	12
B	16
A	24

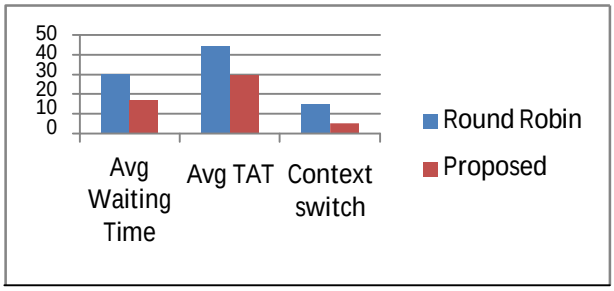
Now TQ is calculated as follows:
TQ= ((max value of burst time-min value of burst time) *median) / Average of the Burst time.
TQ = ((24-6)*12)/13=>16.6 i.e 17.
Gantt chart:



Total number of Context switches=5
Average waiting time=(0+6+13+25+41)= 17ms
Turn Around Time=(65+41+13+25+6)/5= 30ms

Table3: Comparison between RoundRobin and proposed algorithm

Algorithm	Time Quantum	AvgWT	Avg. TAT	CS
Round Robin	5	30.2	44	15
FRR(Proposed)	17	17	30	5



Graph1:Comparison Graph Of AWT, ATTand CS with increasing burst time

Graph1 shows that when time quantum increases then the performances increases in proposed algorithm when compared to Round Robin Scheduling algorithms in terms of Average Turnaround Time, Average Waiting Time and number of context switching.

Case iii: Assuming five process arriving at time 0 with decreasing burst time as shown in Table 4.

Table 4.

PROCESS	BURST TIME
A	24
B	16
D	12
C	7
E	6

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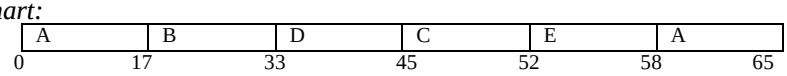
Vol. 3, Issue 7, July 2015

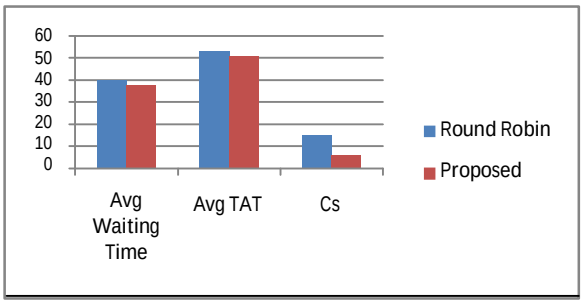
Gantt chart:



Total number of Context switches=6
Average waitingtime=(0+(58- 17)+17+33+45+52=188/5=37.6
Average Turn Around Time=65+33+52+45+58=212/5=50.6

Table5: Comparison between RoundRobin and proposed algorithm

Algorithm	Time Quantum	AvgWT	Avg. TAT	CS
Round Robin	5	40.2	53	15
FRR (Proposed)	17	37.6	50.6	6



Graph2 :Comparison Graph Of AWT, ATTand CS with decreasing burst time

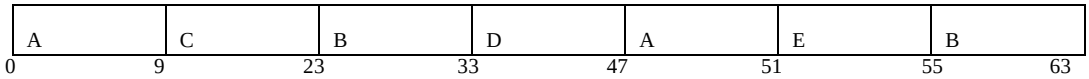
Graph2 shows the comparison of average waiting time. average turnaround time and context switching. It shows that proposed algorithm has less average waiting time, average turnaround time and less number of context switches when compared to round robin scheduling algorithm.

Case iv: Priority based Round Robin Scheduling algorithm as shown in Table6

Table6:

Process	Burst time	Priority
A	24	4
B	16	2
C	7	1
D	12	3
E	6	5

Ganttchart:



Total number of Context switches=7
Average waiting time:=(0+7+23+35+(58-52)+52)=123/5=24.6
Average Turnaround Time:=63+55+9+33+51=42.2

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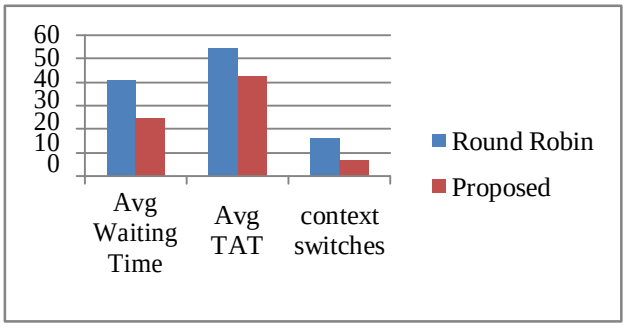
Table7: Comparison between RoundRobin and proposed algorithm

Algorithm	Time Quantum	AvgWT	Avg. TAT	CS
Round Robin	5	41	54.2	16
proposed	17	24.6	42.2	7



Graph3 :Comparison Graph Of AWT, ATTand CS for proposed scheduling algorithm

Graph3 illustrates that for priority based scheduling the proposed FRR scheduling algorithm gives better performance than Round Robin Scheduling in terms of average waiting time.average turnaround time and context switching.

VI. CONCLUSION

The proposed work focuses on the drawbacks of simple round robin architecture which gives equal priority to all the processes due to these drawbacks Round Robin architecture is not efficient for processes with smaller CPU burst. This results in increasing waiting time and response time of processes .In this paper, finest time quantum is calculated in Round Robin Scheduling algorithm. From the above analysis it is observed that it gives better result than the simple Round Robin algorithm in terms of reducing the average waiting time, average turnaround time and total number of context switches., Therefore it is concluded that finest time quantum will increase the performance of cpu in real time operating system.

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BIOGRAPHY

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