Round Robin Algorithm with Optimized Time Quantum for Soft Real Time Systems

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***Abstract*: The new introduced round robin (RR) algorithm implemented for minimizing context switching and solution of sizeable time slice. Round robin algorithm is not well suitable for real time operating system because more context switching and time quantum is dynamic .Basically my implemented algorithm is well suited for a soft real time operating system. The existing round robin scheduling is not well suitable for soft real time operating system because latency time is very large. Our implemented algorithm delivers better result in terms of less latency time as compared to the existing round robin algorithm,**

***Keywords*: Real time system, CPU scheduling.**

INTRODUCTION

Operating system is an interface between computer user and system hardware [10]. Real time system is usually used to execute all assigned task within specified time. A real time system can be divided into three types; hard based, firm based and soft based real time system [10]. A hard based real time system is very stringent to deadline & failure leads to serious breakdown in system performance or latency time constraint comes to system related failure. In case of firm based real time system, if deadline could not meet, it can be endured. In case of soft real time system, failed to endure deadline, it can be tolerated but only performance may be adversely affected [2]. In case of CPU scheduling, mainly scheduler schedules all process from ready queue to CPU & response time, throughput, waiting can be evaluated based on various algorithm such as FIFO,SJF etc [10].

1).CPU Utilization: keeping central processing unit (CPU) busy as much as possible [10].

2). Throughput: The no of process executed per unit of time is known as throughput [10].

3) Turnaround time: The difference between submission time &completion time of a process [10].

4).Waiting time: The total amount of time spent by a process in ready queue is known as waiting time [10].

5). Response time: Time periods taken to respond a process is known as response time or reaction time [10]

6). Context switching: Context switching is a mechanism in which, a process is preempted during execution from high burst time to less burst time. In CPU scheduling algorithm, context switching must be less [4].

There are following well established CPU scheduling algorithms-

First Come First Serve scheduling: First come first served is a first proposed scheduling algorithm. It is based on non- preemptive techniques in which, a process is executed on first come first served basis. It is CPU scheduling algorithm in which if a process enters running state, it cannot be prevented until process completes its execution [10]. In first come first served algorithm, Average waiting time high as compared to other CPU scheduling algorithm and performance is poor [1].

Shortest-Job-First scheduling (SJF): Shortest job first (SJF) algorithm is based on both preemptive and non-preemptive CPU scheduling algorithm. In case of preemptive shortest job first (SJF), shortest job is assigned first to CPU and during execution, any process can be preempted based on burst time [6]. In case of non-preemptive shortest job first (SJF), shortest task is assigned first to CPU but any process cannot be preempted during execution [1].

Priority based CPU Scheduling: In this scheduling algorithm, job is assigned to CPU on the basis of priority. Highest priority job is assigned first to CPU In priority based CPU algorithm, undefined blocking is a problem. This algorithm is not applicable for time sharing operating system because response time is large [5].

Round Robin scheduling (RR): Round robin CPU scheduling algorithm is better than other scheduling algorithm for time sharing operating system because of finer response time but waiting time(WT) and turnaround time(TT) is large as compared to other CPU scheduling algorithm. In round robin (RR) scheduling, time quantum is taken for scheduling. Time quantum is not fixed in round robin algorithm. So, if time slice is minor then context switching is large and if time slice is vast then round robin works like FCFS scheduling [8].

Multilevel Queue Scheduling: Multilevel Queue scheduling is not an autonomic scheduling algorithm. It uses other existing

algorithm to schedule job in ready queue. In multilevel queue scheduling, a ready queue is partitioned into deferral ready queue. Each ready queue assigns a separate scheduling algorithm such as process priority [10].

OUR PROPOSED ALGORITHM

In round robin scheduling, high context switching and vast time quantum is main problem. In my proposed algorithm context switching is not so high also time quantum is dynamic and it is not so larger than average CPU execution time of process present in ready queue. In our proposed algorithm, context switching has been reduced as compared to round robin algorithm its reflect in comparison part in this research paper. In my proposed algorithm, taking some variable like OTS means optimize time quantum, BT means CPU burst time of process present in ready queue, FIFO means first in first out.

ALGORITHM:-

1). First, inspect ready queue is null.

2). If ready queue containing nothing then assign task into ready queue.

3). While (ready queue != null)

4). Calculate optimize time quantum (OTS):-

X1=Addition of lowest CPU burst time and second lowest CPU burst time in ready queue.
Y1= Assign average CPU burst time (Process) in ready queue.

If (X1 ≤ *Y*1) OTS=X1;
Else OTS=Y1;

5). Assign optimize time quantum (OTS) to arrival process(First in first out)based for CPU

6). If (BT(Pi)≤ OTS(P*i*))

[i=1 to n]
Total task should be complete Goto step(2)
Else
Finish task within assigned OTS (P) Goto step (2)

7). If new job is coming then goto step (2).

8). End while loop.

9). Calculation of context switching, reaction time waiting time/period.

10). End while loop.

PERFORMANCE EVALUTION &VALIDATION

Take an assumption five processes containing burst time for following process respectively mentioned in table p1=10, p2=2, p3=3, p4=2, p5=1

Processes	Burst time
P1	10
P2	2
P3	3
P4	2
P5	1

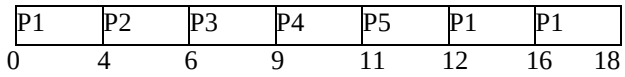
Table.1 Representation of burst time of each process

Gantt chart by proposed algorithm:-

P1	P2	P3	P4	P5	P1	
0	3	5	8	10	11	18

Gantt chart by existing round robin algorithm:-

Taking time quantum=4



Comparison:-

Context switching:- In my proposed algorithm total number of context switching is 5. In existing algorithm number of context switching is 6.So proposed algorithm is giving less context switching.

Response time:-comparison of response time of individual processes.

Turnaround time:-Compare turnaround time of each process.
Waiting time:-Compare waiting time of individual process.

Processes	Response time by new algorithm	Response time by existing RR algorithm
P1	0	0
P2	3	4
P3	5	6
P4	8	9
P5	10	11

Table.2 Representation of response time of each process

Processes	Turnaround time by proposed algorithm	Turnaround time by existing algorithm
P1	18	18
P2	5	6
P3	8	9
P4	10	11
P5	11	12

Table.3 Representation of turnaround time of each process

Average turnaround time (ATAT):- Average turnaround time computed by applying new introduced algorithm is 10.4 and existing round robin algorithm is 11.2 So in above given example, turnaround time better than existing Round Robin algorithm excepting only exception cases. Only our main goal is to reduce context switching and response time using new algorithm

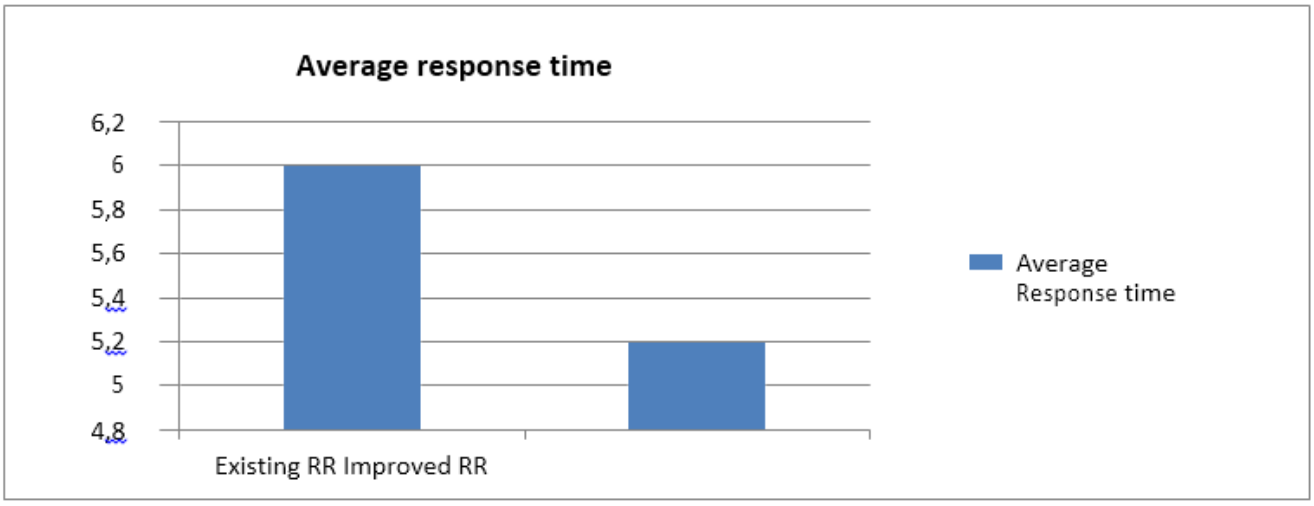


Figure-1 Comparison of waiting time of Round Robin (RR) and improved Round Robin (RR) algorithm

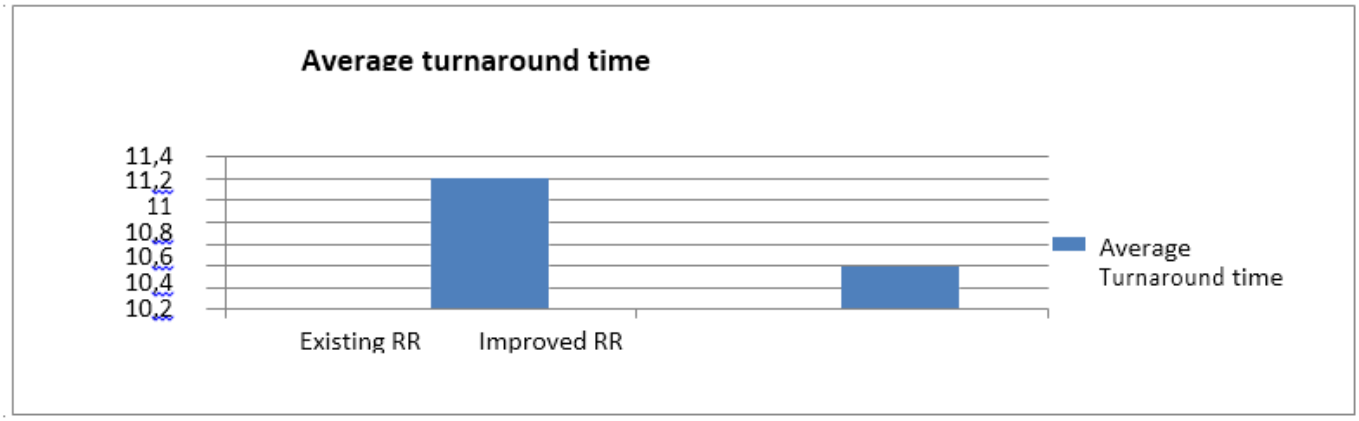


Figure-2 Comparison of turnaround time of Round Robin (RR) and improved Round Robin (RR) algorithms

Processes	Waiting time by new improved algorithm	Waiting time by existing algorithm
P1	8	8
P2	3	4
P3	5	6
P4	8	9
P5	10	11

Table.4 Representation of waiting time of each process

Average waiting time:-Average waiting time computed by applying new introduced algorithm is 6.8 and existing round robin algorithm is 7.6. So in above given example, average waiting time of new introduced algorithm is better than the existing round robin algorithm. The most significant things of new proposed algorithm is better response time. If supposing time quantum is less for better response time in existing algorithm then context switching is large

CONCLUSION:

From the above compared illustration reveal that proposed algorithm is giving improved response time and less context switching than existing algorithm as well as in this implementation turnaround time (TAT) and waiting time (WT) is better than existing algorithm. Our propose algorithm, basically for better response time and less context switching. Also time slice/quantum is not too large in this proposed algorithm. In proposed algorithm time quantum is no static and it is not vaster than average waiting time of execution time of process in ready queue.

FUTURE WORK:

The new introduced algorithm is basically implemented for a soft based real time system so new proposed algorithm can be

improvised, specifying a deadline. Also turnaround time and waiting time can be reduced by making some changes based on deadline.

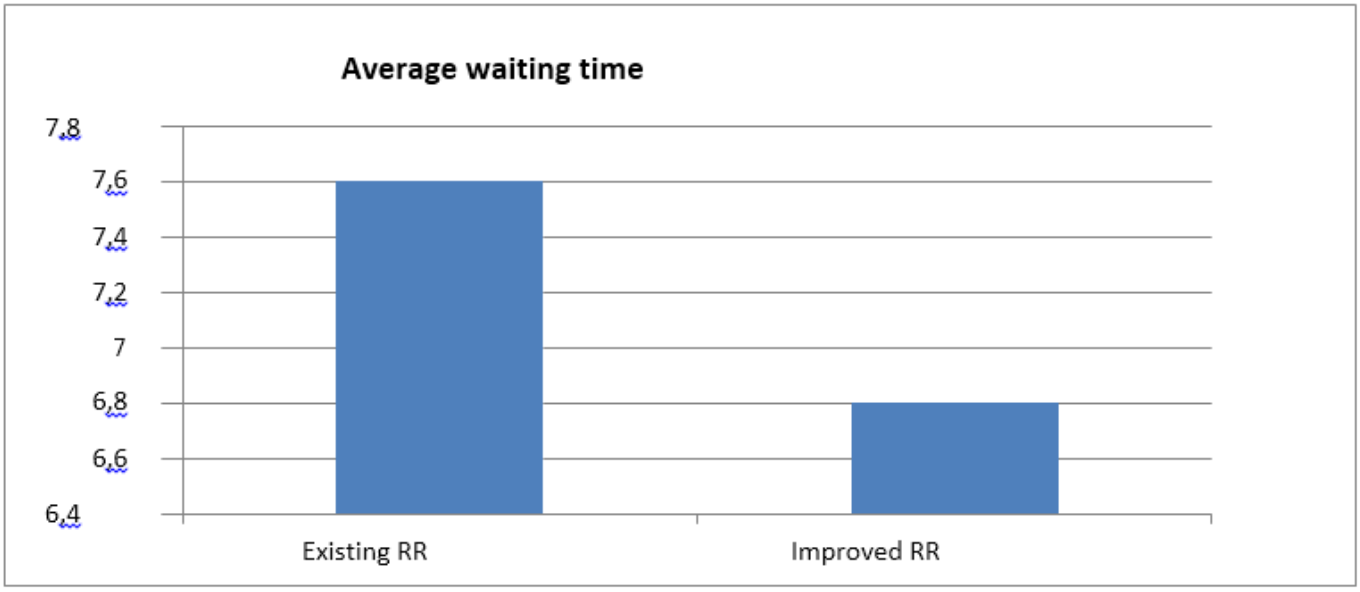


Figure-3 Comparison of waiting time of Round Robin (RR) and improved Round Robin (RR) algorithm

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