International Journal of Engineering Science Invention
ISSN (Online): 2319 – 6734, ISSN (Print): 2319 – 6726
www.ijesi.org ||Volume 6 Issue 8|| August 2017 || PP. 68-72

Review of Round Robin (RR) CPU Scheduling Algorithm on Varying Time Quantum

Amit Kumar Gupta[1]Dr. Narendra Singh Yadav[2]Dr. Dinesh Goyal[3]
Suresh Gyan Vihar University, Jaipur[1] JECRC University Jaipur[2] Suresh Gyan Vihar University,Jaipur[3]

Abstract: *Round Robin scheduling is mostly used CPU scheduling algorithm; it gives better result in comparison to other scheduling algorithm. But this algorithm may lead many problems directly related to time quantum. If selected time quantum is large, then the response time of the processes may be too high. On the other hand, if time quantum is short, it increases the number of context switch which may lead overhead of the CPU. In this paper, the researcher has analyzed the Round Robin CPU scheduling algorithm on varying time quantum. It is founded that selection of time quantum has crucial role for finding the optimal solution in Round Robin scheduling algorithm.*

Keywords: *Operating Systems, Waiting Time, Turnaround Time, Context Switching, Scheduling Algorithm, Time Quantum, Round Robin.*

Date of Submission: 08-08-2017 Date of acceptance: 19-08-2017

I. Introduction

Round Robin (RR) algorithm which is the main concern of this research is one of the oldest, simplest, and most widely used scheduling algorithms. This algorithm works on time sharing phenomenon. A time slice is given to every process and every process will executed for particular defined time slice. New processes are added to at the last of ready queue. The scheduler pick the process from the starting point of the ready queue and set the timer to a defined time slice and also set an interrupt. If the process still not completed its complete execution within a time slice it will be preempted after a time slice and added at the end of ready queue. The round robin scheduling give the better response time, minimize waiting time and turnaround time, maximize throughput and CPU utilization [1, 2].There are some scheduling criteria, on the basis of these criteria we analysis and determine which scheduling algorithm is best.

II. Scheduling criteria

There are many CPU scheduling algorithms having different properties, and the selection of a particular algorithm may favour one class of processes over another. The algorithm is selected for a particular state; we must judge properties of a verity of algorithms. The criteria contain the following: [1, 2, 3, 4]

- **Context Switch**: A context switch occur when a process interrupt the normal execution sequence of another process. The CPU stores all relevant information of interrupted process in Task Control Box (TCB). The context switch includes wastage of time, memory and scheduling overhead. So scheduling algorithm is designed in such way that it can minimize the number of context switches.
- **Throughput**: This term is defined as number of process completed per unit time. So scheduling algorithm is designed in such way that it can maximise the throughput.
- **CPU Utilization**: From the performance wise concern the CPU cannot be sit ideal. So scheduling algorithm is designed in such way that it cans maximum use of CPU as possible.
- **Turnaround Time**: It is the difference in the time of process when a process is ready to execute and when it complete its execution. So scheduling algorithm is designed in such way that it can minimize the turnaround time.
- **Waiting Time** it is the sum of all waiting done by a process in ready queue for execution. So scheduling algorithm is designed in such way that it can minimize the waiting time.
- **Response Time**: Response time is the time it takes to start its execution not the time it takes to output the response.

III. Scheduling Algorithm

There exist different Scheduling algorithms, each of them has advantages and disadvantages and as follows:
First-Come-First-Served (FCFS) FCFS is simple scheduling algorithm in which process are executed on the basis of their arrival time in ready queue. This scheduling algorithm is non preemptive in nature. The disadvantages of this algorithm is long waiting time, response time for high priority process.

Shortest-Job-First (SJF) In this algorithm the process which have minimum CPU burst time will schedule first. This algorithm can be implemented in two way on is preemptive and another one is non preemptive. This is also known as Shortest Remaining Time first (SRTF). This algorithm may lead a problem that we cannot predict how long a job will executed.

Priority Scheduling In This algorithm the process which has priority among the processes will schedule first. This algorithm may lead a problem of starvation which is defined as if high priority processes are regularly available in ready queue then waiting time for low priority may become infinite.

Round Robin (RR) algorithm which is the main concern of this research is one of the oldest, simplest, and most widely used scheduling algorithms. This algorithm works on time sharing phenomenon. A time slice is given to every process and every process will executed for particular defined time slice. New processes are added to at the last of ready queue. The scheduler pick the process from the starting point of the ready queue and set the timer to a defined time slice and also set an interrupt. If the process still not completed its complete execution within a time slice it will be preempted after a time slice and added at the end of ready queue. The round robin scheduling give the better response time, minimize waiting time and turnaround time, maximize throughput and CPU utilization [1, 2].

IV. Round robin scheduling

The simple RR scheduling algorithm is defined by following steps [1, 2]:-

1. The scheduler contains a queue of ready processes and a list of blocked and swapped out Processes.
2. The Task Control Box (TCB) of newly created process is added to end of ready queue.
3. When executing process finishes its slice, it is moved to end of ready queue.
4. Define the Time quantum for which the processes will be allocated to the CPU

In this Researcher has to consider the processes only with CPU burst time and also let round robin quantum =5

Table 1 Process With Cpu Burst Time

Process Id	CPU Burst Time(ms)
P1	22
P2	18
P3	9
P4	10
P5	5

RR quantum=5

Gantt chart:

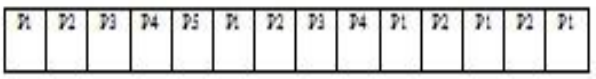

Figure 1 Gantt chart for Round Robin Scheduling

No of context switches=13
Average waiting Time=34 ms
Average turnaround Time=46.8ms
There are many researcher give many improved round robin algorithm. So the literature survey is presented

V. Analysis of rr on varying time quantum

Consider there are five processes P1, P2, P3, P4 and P5 with their arrival time and execution time as shown in table 2. The Figure 2, 3, 4, 5, 6 and 7 shows Gantt chart for scheduling of process in Round Robin with time quantum=1, 2, 3, 4, 5 and 6 respectively.

Table 2 Processes With Burst Time, Arrival Time And Priority

Process	Arrival Time	Burst Time (ms)	Priority
P1	0	10	5
P2	2	4	2
P3	3	2	1
P4	4	6	3
P5	5	8	4

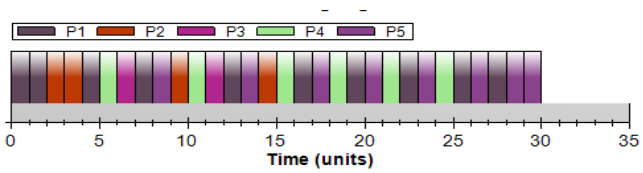

Figure 2 Simple RR Scheduling with Time Quantum=1

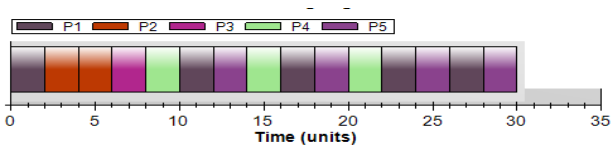

Figure 3 Simple RR Scheduling with Time Quantum=2

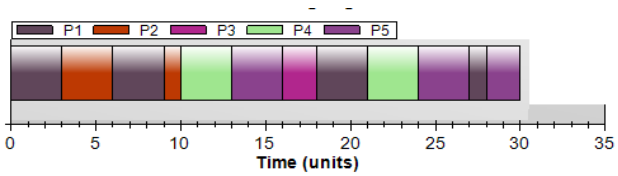

Figure 4 Simple RR Scheduling with Time Quantum=3

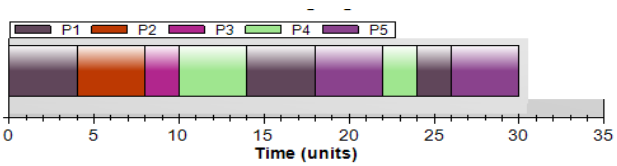

Figure 5 Simple RR Scheduling with Time Quantum=4

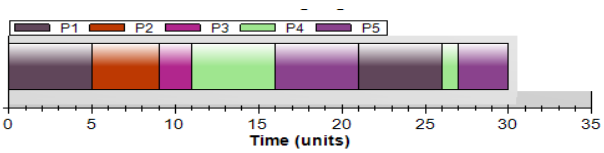

Figure 6 Simple RR Scheduling with Time Quantum=5

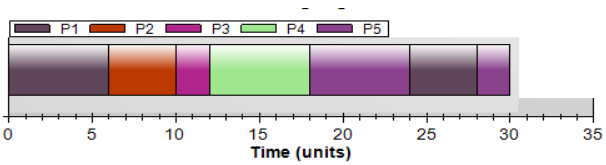

Figure 7 Simple RR Scheduling with Time Quantum=6

The Average Waiting Time, Average Turnaround Time and number of context switches of above mentioned RR scheduling algorithm is shown in table 3 and figure 8, figure 9 and figure 10 shows comparison graph of average waiting time, average turnaround time and number of context switches of Simple RR CPU scheduling technique with varying time quantum.

Table 3 Shows The Awt, Atat And Ncs

Scheduling Algorithm	Average Waiting Time (ms)	Average Turnaround Time (ms)	Number of Context Switches
RR with TQ=1	13.2	19.2	29
RR with TQ=2	10	16	14
RR with TQ=3	13	19	13
RR with TQ=4	10.8	16.8	8
RR with TQ=5	12	17.8	7
RR with TQ=6	10.2	16.2	6

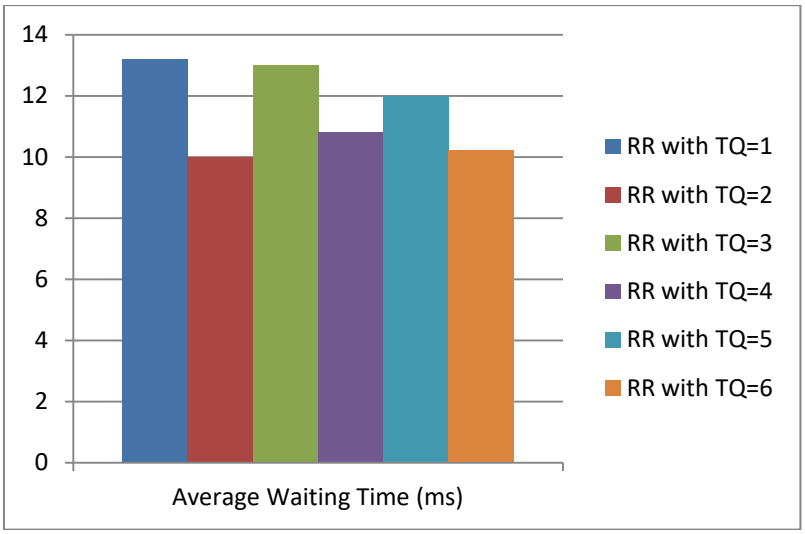

Figure 8 shows comparison graph of average waiting time of Simple RR CPU scheduling technique with varying time quantum

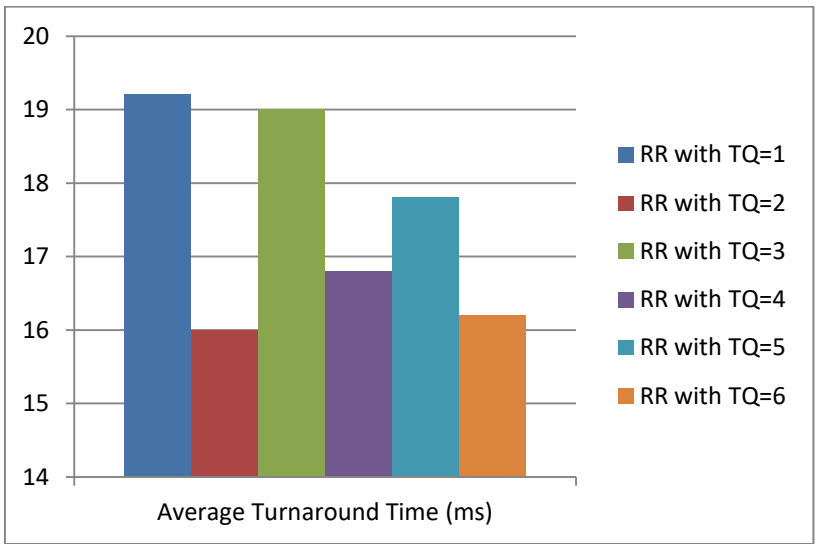

Figure 9 shows comparison graph of average turnaround time of Simple RR CPU scheduling technique with varying time quantum.

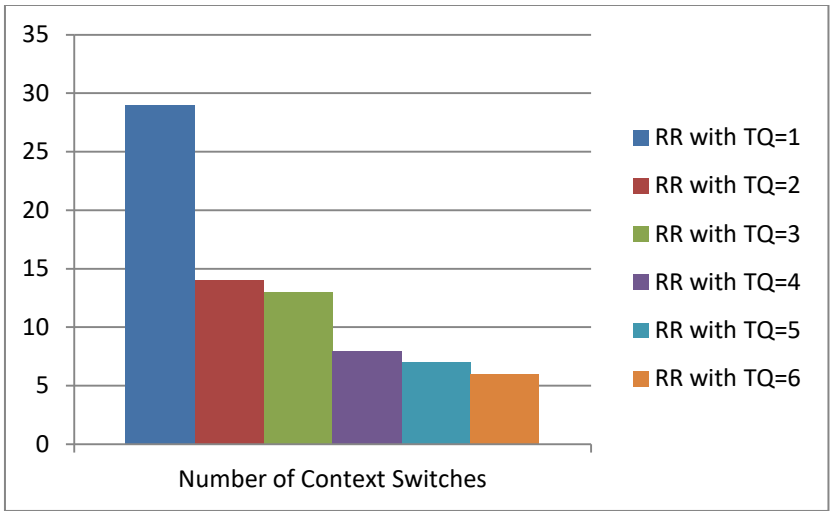

Figure 10 shows comparison graph of number of context switches of Simple RR CPU scheduling technique with varying time quantum.

VI. Conclusion

As shown in study of simple round robin algorithm with varying time quantum is shows that it does not define the selection of time quantum properly. The figure 8, 9 and 10 shows the comparison graph of average waiting time, average turnaround time and number of context switches, it clearly shows that the time quantum has more important role in enhancing the performance matrices of simple round robin algorithm. If the chosen time quantum =2 for the above mentioned example than it achieve better performance matrices of scheduling. If the chosen time quantum =1 than it found worst performance matrices of scheduling. In above study basically the time quantum is depends upon the burst time of processes. But in the simple round robin algorithm the time quantum is defined statically and it is not relevant to burst time of processes. The simple round robin is also not considering the priority of the processes which is the major issue in the scheduling system.

References

[1]. D.M. Dhamdhere operating Systems A Concept Based Approach,Second edition, Tata McGraw-Hill, 2006.
[2]. Silberchatz, Galvin and Gagne, 2003. Operating systems concepts
[3]. Rami J. Matarneh "Self-Adjustment Time Quantum in Round Robin Algorithm Depending on Burst Time of the Now Running Processes" American Journal of Applied Sciences 6 (10): 1831-1837, 2009.
[4]. Ajit Singh, Priyanka Goyal, Sahil Batra "An Optimized Round Robin Scheduling Algorithm for CPU Scheduling" International Journal on Computer Science and Engineering Vol. 02, No. 07, 2010, 2383-2385
[5]. Rakesh Mohanty, Manas Das, M.Lakshmi Prasanna ,Sudhashree "Design and performance evaluation of a new proposed fittest job first dynamic round robin (FJFDRR)scheduling algorithm"International Journal of Computer Information System Vol. 2 No. 2,2011
[6]. Abbas Noon, Ali Kalakech, Seifedine Kadry "A New Round Robin Based Scheduling Algorithm for Operating Systems: Dynamic Quantum Using the Mean Average" IJCSI International Journal of Computer Science Issues, Vol. 8, Issue 3, No. 1, May 2011
[7]. Rakesh Mohanty, H. S. Behera, Debashree Nayak, "A New Proposed Dynamic Quantum with Re-Adjusted Round Robin Scheduling Algorithm and Its Performance Analysis", International Journal of Computer Applications (0975 – 8887), Volume 5– No.5, August 2010.
[8]. Debashree Nayak,Sanjeev Kumar malla, Debashree Debadarshini "Improved Round Robin Scheduling using Dynamic Time Quantum" International Journal of computer Application (1975-8875) Volume 38-No. 5,January 2012.
[9]. Rakesh Mohanty ,H.S. Behara,Khusbu Tiwari , Manas Das, M.Lakshmi Prasanna "Priority Based dynamic Round Robin(PBDRR) Algorithm with Intelligent Time Slice for Soft Real Time System" International Journal of Advanced Computer Science and Application Vol. 2 No. 2, February ,2011.
[10]. Rakesh Mohanty, H. S. Behera, Khusbu Patwari, Monisha Dash, "Design and Performance Evaluation of a New Proposed Shortest Remaining Burst Round Robin (SRBRR) Scheduling Algorithm", In Proceedings of International Symposium on Computer Engineering & Technology (ISCET), Vol 17, 2010.
[11]. H. S. Behera and et. al. A New Dynamic Round Robin and SRTN Algorithm with Variable Original Time Slice and Intelligent Time Slice for Soft Real Time Systems. International Journal of Computer Applications 16(1):54–60, February 2011.

IOSR Journal of Computer Engineering (IOSR-JCE) is UGC approved Journal with Sl. No. 5019, Journal no. 49102.

Amit Kumar Gupta. "Review of Round Robin (RR) CPU Scheduling Algorithm on Varying Time Quantum." International Journal of Engineering Science Invention (IJESI), vol. 6, no. 8, 2017, pp. 68–72.