# "Job Scheduling Algorithm Using Finest Time Quantum for Real Systems"

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Abstract- **Round-Robin is one of the widely accepted algorithm, which performs optimally for time shared systems due to its static nature of time quantum. Selection of Time Quantum is a crucial state due to its various advantages and disadvantages. If the selected Time Quantum is low it behaves as First Come First Serve algorithm (FCFS) on the other hand if it's high then operating system has to concentrate more on context switching.**

**The aim of this paper is to improvise the disadvantage of Round Robin algorithm by selecting the Time Quantum dynamically with the help of median and highest burst time. My experimental analysis shows that this algorithm performs better than RR algorithm and SRBRR (Shortest Remaining Burst Round Robin) in terms of reducing the number of context switches, average waiting time and average turnaround time.**

**Keywords: Scheduling algorithm, Round Robin, Time Quantum, Operating system.**

## I. Introduction

Operating system has a main role in allocating the processes for its execution [1]. As there are various algorithms which are implemented depending on its individual advantages and disadvantages. Round Robin is considered as one of the most widely accepted CPU scheduling algorithm in operating system such as Windows, UNIX, and UNIX based systems etc.

A process is an activity that has to be performed within the stipulated time or has certain procedure to be completed by various algorithms used in the operating system [8].

The processes waiting to perform its job are assigned to a processor, which are put in a queue called ready queue. The time required for a process to complete is known as burst time. Arrival Time is the time at which a process arrives at the ready queue. The interval from the time of submission of a process to the time of completion is the turnaround time. Waiting time is the amount of time a process has been waiting in the ready queue. The number of times CPU switches from one process to another is known as context switch. The optimal scheduling algorithm should have minimum waiting time, minimum turnaround time and minimum number of context switches.

CPU scheduling [4] is the process of allocating a process to perform its task. Scheduling of the process is based on certain criteria of the algorithm. Criteria include:

- CPU utilization: CPU should be kept as busy as possible. That is, it should involve a maximum usage.
- Throughput: Time in one measure of work that the numbers of processes are completed per unit time, is supposed to be maximum.
- Turn Around time: The time that is involved from the time of submission of a process till its completion, is supposed to be minimum.
- Waiting time: The addition of the time that the process is waiting for its execution, is supposed to be minimum.
- Response time: The time that the process is submitted for a request until the first response is produced, is supposed to be minimum.

It is desirable to optimize the maximum and minimum values depending on the average. For example, to guarantee that all users get good service we may minimize the maximum response time.

*Basic Scheduling Algorithms*

- First Come First Serve (FCFS)
  In this algorithm, the processes are selected depending on arrival time and are scheduled until all the processes complete its task.

- Shortest Job First (SJF)
  In this algorithm, the process with the smallest burst time is selected and scheduled first. If two processes having same burst time and arrival time, then FCFS procedure is followed.

- Shortest Remaining Time First (SRTF)
  This is same as the SJF with pre emption, with small modification. For scheduling the jobs system need to consider the remaining burst time of the job (previously executed) which is presently executed by the CPU also along with the burst time of the jobs present in the ready queue.

- Priority Scheduling Algorithm
  It provides the priority to each process and selects the highest priority process from the ready queue. A priority scheduling algorithm can leave some low-priority processes in the ready queue indefinitely. If the system is heavily loaded, it is a great probability that there is a higher priority process to grab the processor. This is called the starvation problem. One solution for the starvation problem might be to gradually increase the priority of processes that stay in the system for a long time.

- Round robin Scheduling Algorithm
  Round Robin (RR) schedules depending on the time quantum by switching the processes with the given time quantum until all jobs are completed

## II. Proposed Algorithm

*Algorithm –*

*Criteria*

- Processor Utilization = (Processor buy time) / (Processor busy time + Processor idle time)

- Throughput = (Number of processes completed) / (Time Unit)

- Turn Around Time = t(process completed) – t(process submitted)

- Waiting Time (wt): Time spent in ready queue. Processor scheduling algorithms only affect the time spent waiting in the ready queue. So, considering only waiting time instead of turnaround time is generally sufficient.

- Response Time = t(first response) – t(submission of request)

When a process arrives for the first time the time quantum is equivalent to the burst time of the process arrived. If there are more than one process arrived at same time then the time quantum is computed as follows,

**TQ = Ceil (sqrt (median * highest Burst time))**

Pseudo code

a. All the processes present in ready queue are sorted in ascending order.

b. While (ready queue! = NULL)
    TQ = Ceil (sqrt (median * highest Burst time))

c. Assign TQ to process
    Pi ->TQ

d. If (i<n)
  then
    go to step c.

e. If a new process is arrived
    Update the counter n and go to step1
  End of while

f. Average waiting time, average turnaround time and Number of context switches are calculated.

g. End

## II. Experiment and Result

Case 1: Assume processes arrived at time interval = 0 with burst time 13, 35, 46, 63, and 97.

| | RR | Algorithm | Performance Increase |
|---|---|---|---|
| Turn-Around Time | 148.2 | 113.2 | 23.62% |
| Waiting Time | 97.4 | 62.4 | 35.9% |

Case 2: Assume processes arrived at time interval as 1, 3, and 2 with burst time 10, 20 and 30 respectively.

| | RR(if TQ=10) | Algorithm | Performance Increase |
|---|---|---|---|
| Turn-Around Time | 36.67 | 30.67 | 16.37% |
| Waiting Time | 20 | 12.33 | 38.35% |

An analysis of the above cases (Case 1, Case 2) shows that the time quantum of algorithm is better than RR algorithm. Also the increase in Average Turnaround time is 20% and increase in average waiting time is 37.12%.

## IV.CONCLUSION

By comparing the RR algorithm and this algorithm, a better result has been obtained as the Turnaround time, response time, CPU utilization and waiting time are minimum compared to RR algorithm. A solution has been found and been implemented by this algorithm that allows the operating system to select the time quantum dynamically.

To conclude, this algorithm is implemented to obtain an optimal scheduling algorithm which is better than RR algorithm.

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