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Modified Round Robin Algorithm by Using Priority Scheduling

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Abstract

In this paper we introduce a modified version of Round Robin Algorithm which is suitable for soft real time systems. A simple Round Robin Algorithm usually gives more number of context switches, large average waiting time and large response time. We have proposed an ideal algorithm which is known as "Modulo Based Round Robin Algorithm", which calculate an intelligent time quantum and then assign priority to the processes and according to that calculate the context switches, average waiting time etc.

Our experimental result's shows that in terms of number of context switches, average waiting time and average turnaround time the proposed algorithm is best in comparison to simple Round Robin Algorithm.

Keywords: Round Robin Algorithm, Real Time System, Context Switches, Average Waiting Time, Turnaround Time, Operating System.

INTRODUCTION:

Modern Operating Systems are mainly depend on the CPU Scheduling algorithms because it work's in a multitasking environment. We have various scheduling algorithm available to execute the multiple tasks simultaneously in CPU. Such as FCFS (First Come First Serve), SJF (Shortest Job First), SRTF (Shortest Remaining Time First), RR (Round Robin) algorithms.

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FCFS (First Come First Served): FCFS is one of the simplest scheduling algorithms in which processes are inserted in a queue in the order that they arrive. Which process comes first in the queue executed first and so on, FCFS scheduling is fair and simple in the formal sense but the average waiting time and the average turnaround time in this scheduling is very large.

SJF (Shortest Job First): SJF works on the strategy where all the processes are stored in the job queue and the process which have smallest burst time executed first and the execution of remaining processes are continued in a same manner. SJF is optimal scheduling algorithm because it minimizes the average waiting time and average turnaround time. The main issue with this method is the prior knowledge about the burst time of all the processes.

RR (Round Robin): Round Robin is the main concern of this research; it is one of the oldest, simplest and mostly used process scheduling algorithms. Round robin algorithm is mainly designed for the time sharing systems. Round Robin algorithm is an enhanced version of First Come First Serve algorithm. It works same as FCFS but preemption is added in this algorithm. In RR algorithm we give a fixed time quantum, all the processes are executed one by one according to given time quantum if the execution of process is not completed within a given time quantum the CPU is allocated to the next process and that process wait for next allocation, and if the process executed completely within the time quantum the process leave the queue and next process allocated to the CPU. To execute round robin scheduling, we keep the ready queue as a FIFO (First in First Out) queue of processes. The disadvantage of simple Round Robin algorithm is it gives higher average waiting time, higher average turnaround time and the more number of context switches.

Performance of simple Round Robin algorithm is depending upon the size of the time quantum. If we select the value of time quantum is too short, number of context switches increased due to more number of context switches the performance of CPU or efficiency of CPU is degraded.

On the other hand, if we select the value of time quantum is too large the number of context switches is less but the waiting time of processes is increasing. That's why we can say, the selection of time quantum is a very crucial task in simple round robin algorithm.

Drawbacks of Round Robin Algorithm: Round Robin Scheduling has many disadvantages as following-

- Higher Average Waiting Time.
- Low Throughput.
- More number of context switches if we take a short time quantum.
- Very high turnaround time.

Modulo Based Round Robin Algorithm:

Our approach is not to change the philosophy of simple round robin algorithm but we add one more step in this algorithm by which we decide the priority of processes which comes in a single time unit. Simply we can say our proposed Round Robin algorithm is a mesh up of Simple Round Robin algorithm and the Priority Scheduling Algorithm.

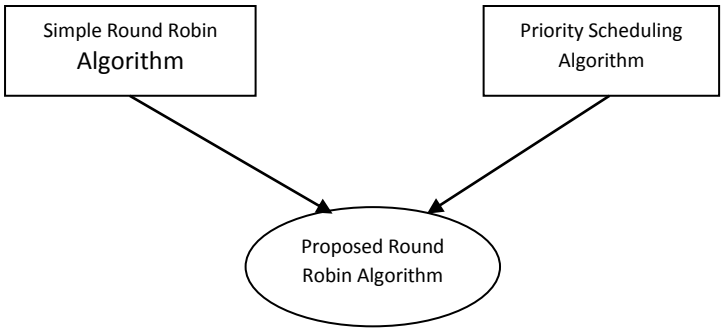


Fig (1.1): Modulo Based Round Robin Algorithm

Flow Chart: Flow chart for our new proposed "Modulo Based Round Robin Algorithm" is given in below image-

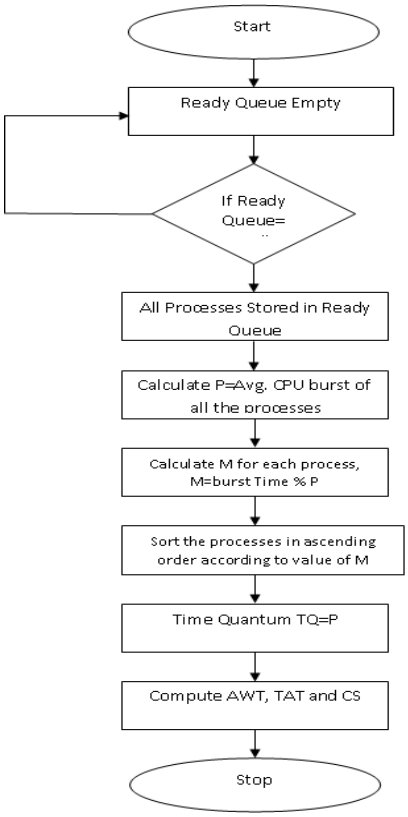


Fig (1.2): Flowchart "Modulo Based Round Robin Algorithm"

Assumption: In our new proposed algorithm we assume the following points-

- We assume that the ready queue is empty.
- We assume that all the processes arrived at a same time for execution; arrival time for all the processes is 0.
- We already have number of processes and their respective burst time.

Input Parameters:

- The number of Processes which we want to execute.
- Burst time of processes.

Result Parameters:

- Smart Time Slice or Time Quantum.
- Average Waiting Time.
- Average Turnaround Time.
- Number of Context Switches.

Result Obtained:

Our proposed algorithm for round robin scheduling work effectively. To check the effectiveness of our new proposed algorithm we compare the results of proposed algorithm with simple round robin algorithm in more than 10 test cases and each case we found our proposed algorithm give less number of context switches, small average waiting time and small average turnaround time. In this paper we use 2 test cases and compare the result with the simple round robin algorithm.

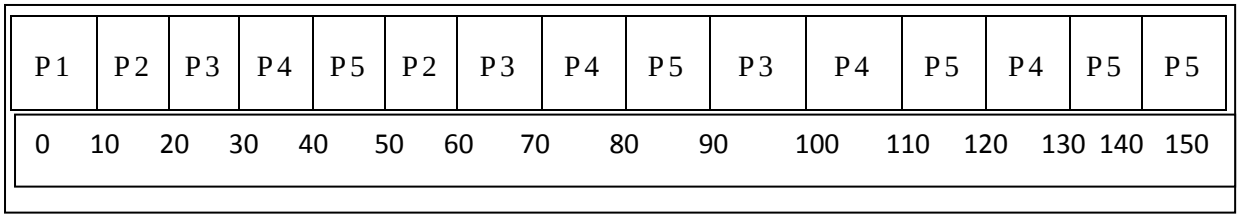
Case 1:

Table 1.1: Process Burst Time

Process	**Arrival Time**	**Burst Time**
P1	0	10
P2	0	20
P3	0	30
P4	0	40
P5	0	50

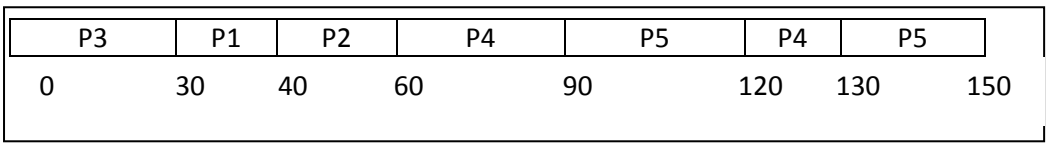
Simple Round Robin Algorithm:

Time Quantum=10ms.



Fig(1.3): Gantt chart (Simple Round Robin Algorithm)

Proposed Round Robin Algorithm:



Fig(1.4): Gantt chart (Modulo Based Round Robin Algorithm)

Comparison of Simple Round Robin and Modulo Based Round Robin Algorithm:

Algorithm	Time Quantum	Average Waiting Time	Average Turn Around Time	Number of Context Switches
Simple Round Robin	10ms	60ms	90ms	14
Proposed Round Robin	30 ms	52ms	82ms	06

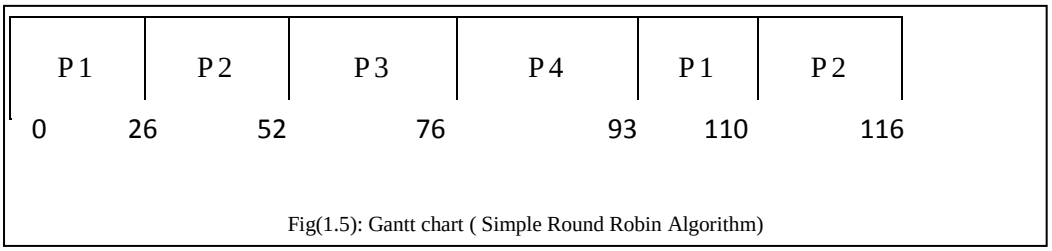
Case 2:

Process	**Arrival Time**	**Burst Time**
P1	0	43
P2	0	32
P3	0	24
P4	0	17

Table 1.3: Process Burst Time

Simple Round Robin Algorithm:

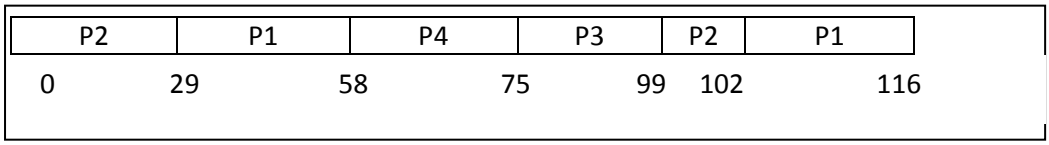
Time Quantum=26ms.



Fig(1.5): Gantt chart (Simple Round Robin Algorithm)

Proposed Round Robin Algorithm:

Time Quantum=29ms.



Fig(1.6): Gantt chart (Modulo Based Round Robin Algorithm)

Comparison of Simple Round Robin and Modulo Based Round Robin Algorithm:

Table (1.4): Comparison of Simple RR and Proposed RR

Algorithm	Time Quantum	Average Waiting Time	Average Turn Around Time	Number of Context Switches
Simple Round Robin	26	69.75ms	98.75 ms	05
Proposed Round Robin	29	69 ms	98 ms	05

CONCLUSION:

From the above analysis given in table 1.2 and table 1.4, we can say that the our proposed round robin algorithm which is known as " modulo based round robin algorithm" gives less average waiting time, average turnaround time and the less

number of context switches compared to simple round robin algorithm. So we can conclude this paper by saying that the Modulo Based Round Robin Algorithm is better than simple Round Robin Algorithm.

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