Enhanced Dynamic Adaptive Algorithm based on Round Robin Scheduling Technique (EDARR)

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***Abstract*—CPU Scheduling is the premise of multi programmed working frameworks. Round Robin CPU scheduling algorithm was considered as the enhanced CPU scheduling algorithm when contrasted with FCFS, SJF and Priority scheduling algorithm. In any case, with the elapse of time, the RR scheduling algorithm was additionally improved by utilizing broadened or mix of CPU scheduling algorithm to upgrade the proficiency of the CPU. By exchanging the CPU forms, the working framework can make the PC more productive and in this way picking up an optimized and proficient time quantum is a vital factor. This paper shows another CPU scheduling algorithm, extended mean deviation round robin (EMDRR) scheduling algorithm for real-time system as of now. EMDRR is tentatively demonstrated superior to conventional RR, SMDRR and SRBRR by diminishing the context switches, total waiting time and normal turnaround time essentially.**

I. INTRODUCTION

A PC framework comprises four segments: the operating system, the application programs, and the hardware what's more, the clients. The equipment – the CPU, the memory, and the I/O gadgets – gives the fundamental registering assets to the operating system. To upgrade the execution of the CPU, step by step diverse planning calculations are produced.

FCFS (First Come First Serve) being the first suggests that any procedure that arrives first in the ready queue is prepared first to be processed. The second being the SJF (Shortest Job First) where the procedure having the briefest burst time is prepared first. Round Robin scheduling was considered as the advanced scheduling where a time quantum was picked. Thus the procedures were executed as needed.

In RR scheduling a time quantum is given to all processes that are anticipated in a prepared line for execution. So the constant switches between processes increments by which productivity of CPU diminishes. Then again if the time cut considered is a substantial one at that point waiting time and turnaround time increments. To overcome these above circumstances we propose this algorithm.

II. LITERATURE SURVEY

1. Rakesh Mohanty, H. S. Behera, Khusbu Patwari, Monisha Dash

An Enhanced Round Robin algorithm SRBRR (Shortest Remaining Burst Round Robin) is proposed in this paper by appointing the processor to process with the shortest remaining burst in round robin manner using the dynamic time quantum. In the proposed algorithm, the jobs have been sorted in ascending order according to burst time to provide better waiting time and turnaround time. The median of the burst time is considered as the time quantum to achieve the optimal time quantum.

2. Rakesh Mohanty, H. S. Behera, Debashree Nayak

According to this paper, the entire performance of the system depends on the selection of an optimal time quantum, in order to reduce context switching. An alternative Round Robin scheduling algorithm, known as Dynamic Quantum with Readjusted Round Robin (DQRRR) algorithm. The number of context switching, average waiting time and average turnaround time has been reduced by the proposed algorithm.

3. Rami J. Matarneh

In this paper, a new algorithm has been proposed called Self Adjustment Round Robin (SARR) which is based on dynamic-time-quantum. The time quantum is calculated as per the burst time of the current running processes. According to this paper, the algorithm solves the fixed time quantum problem which is advised as a challenge for round robin algorithm. The performance and stability of the operating system is increased and adapts to the requirements of the user on its own.

4. Sourav Kumar Bhoi, Sanjaya Kumar Panda, Debashee Tarai

The paper proposes an advanced and efficient RR algorithm called Sub contrary Mean Dynamic Round Robin (SMDRR) in which harmonic mean or sub contrary mean is used to find the time quantum. According to the analysis done in the paper, it surpasses Round Robin scheduling algorithm.

5. Vishnu Kumar Dhakad , Lokesh Sharma

The principle target of this paper is to build up an algorithm called "Adaptive Round Robin (ARR) Scheduling algorithm which is a priority based scheduling algorithm. The processes are arranged in ascending order based on the burst time of the processes. Then a Smart Time Slice (STC) is chosen that mainly depends on the number of processes. If

the number of processes is odd, then the STC is equal to the mid process burst time of all CPU burst time. The time quantum according to the average CPU burst of all running processes is chosen if the number of processes is even. A high throughput has been achieved by this system.

6. Alban Allkoci, Elona Dhima, Igli Tafa

In this paper, a comparative study has been done between priority based and Round Robin scheduling algorithms. The priority scheduling algorithm is used in such a way that, in case of similar priority. It has been concluded in this paper, if we use Round Robin, the processes will need more time to finish executing compared with Priority.

7. C. Yaashuwanth and R. Ramesh

As per this paper, a simple RR scheduling approach has a high context switch rate, large waiting time and larger response time which cannot be implemented in real time operating systems. The primary target of this paper is to build up an intelligent time slice calculation for real time systems that combines rate monotonic as well as deadline monotonic algorithms and thereby reduces the waiting time, response times, reduced preemption and less context switching thereby lessens the overhead and saves memory space.

8. Rakesh Kumar Yadav, Abhishek K Mishra, Navin Prakash and Himanshu Sharma

In this paper, to improve the efficiency of the CPU they propose a new approach for round robin scheduling algorithm. The algorithm first allocates all processes to the CPU only one time like the present Round Robin scheduling algorithm. Second, after allocating all the processes for the first time we select the shortest job from the waiting queue and the shortest job assigned to the CPU. Third after that we select the next shortest job and do step 2nd. 4th- Till the complete execution of all processes we repeat steps 2nd and 3rd that means while all the processes have not been finished(executed).

9. Debashree Nayak, Sanjeev Kumar Malla, and Debashree Debadarshin

In this paper, they have proposed another variation of RR scheduling algorithm known as Improved Round Robin (IRR) Scheduling algorithm, by organizing the processes as per their shortest burst time and assigning every one of them with an optimal time quantum which can lessen all the above said weaknesses. Tentatively they have shown that the proposed algorithm performs better than the RR algorithm, by reducing context switching, average waiting and average turnaround time.

10. Sukumar Babu Bandarupalli, Neelima Priyanka Nutulapati, Prof. Dr. P.Suresh Varma

This paper's main objective is to propose an algorithm which acts as both preemptive and non-preemptive based on the arrival time called A Novel CPU Scheduling algorithm. The proposed algorithm helps to improve the CPU efficiency in real time uniprocessor-multi programming operating system. CPU Scheduling is the basis of a multi programmed operating system. The scheduler is responsible for multiplexing processes on the CPU. There are many scheduling algorithms available for a multi-programmed operating system like FCFS, SJF, Priority, Round Robin, etc. In this paper, the results of the existing algorithms (FCFS, SJF, Priority and Round Robin) are compared with the proposed algorithm.

11. Mehdi Neshat, Mehdi Sargolzaei, Adel Najaran, and Ali Adeli

In this paper, a new algorithm for the CPU scheduling is presented using FFGA (Fonseca and Fleming's Genetic Algorithm) multi objective optimization. Contrary to the classical algorithms in use, it uses the three parameters of CPU burst time; I/O devices service time, and priority of process instead of using one parameter of CPU burst time. The important point is the adaptation of the algorithm which selects a special process depending on the system situation. The performance of this algorithm was School of Information Technology and Engineering, VIT University, Vellore, Tamil Nadu, India compared with seven classical scheduling algorithms (FCFS, RR (equal, prioritized), SJF (pre-emptive, non-pre-emptive, Priority (pre-emptive, non-preemptive)), and the results showed that the performance of the proposed method is more optimized than other methods. The proposed algorithm optimizes the average waiting time and response time for the processes.

12. R. I. Davis and A. Burns

This paper investigates the problem of server parameter selection in hierarchical fixed priority preemptive systems. A set of algorithms are provided that determine the optimal values for a single server parameter (capacity, period, or priority) when the other two parameters are fixed. By contrast, the general problem of server parameter selection is shown to be a holistic one: typically the locally optimal solution for a single server does not form part of the globally optimal solution. In this paper we investigated the problem of selecting appropriate server parameters for a single processor system, running multiple applications using hierarchical fixed priority preemptive scheduling.

13. Neetu Goel, Dr. R. B. Garg

This paper presents a state diagram that portrays the relative investigation of different scheduling algorithms for a single CPU and shows which algorithm is best for the specific circumstance. Using this representation, it becomes much easier to understand what is going on inside the system and why a different set of processes is a candidate for the allocation of the CPU at different times. The objective of the study is to analyze the high efficient CPU scheduler on design of the high quality scheduling algorithms which suits the scheduling goals.

14. Jyotirmay Patel and A.K.Solanki

The problem of scheduling jobs/processes on the central processing unit (CPU) of the computer system has been discussed. Five goals that are often desired were discussed while three algorithms commonly in use were also discussed. In order to know which algorithm to use for which CPU scheduling goal, a number of randomly generated problems were solved. Therefore, based on performance, the shortest job first (SJF) algorithm is recommended for the CPU scheduling problems of minimizing either the average waiting time or average turnaround time. Also, the first come first serve (FC) algorithm is recommended for the CPU scheduling problems of minimizing either the average CPU utilization or average throughput.

15. Manish Kumar Mishra

The main aim of this paper is to improve the efficiency of the systems in multiprogramming computing systems by reducing the waiting time, turnaround time, response time and context switching. Which can be achieved by maximized by switching the CPU among waiting processes in the memory and running one or other process at all the time. An improved round robin CPU scheduling algorithm with varying time quantum with the help of R-QUEUE which involves 3 steps:

1. Creating an R-QUEUE, and the processors are arranged in ascending order of their remaining burst time.

2. Process with minimum burst time is selected and completed first.

3. Performing these steps till the R-QUEUE becomes empty

In this way the IRRVQ CPU scheduling algorithm is achieved.

16. G. Siva Nageswara Rao, N. Srinivasu, G. Rama Koteswara Rao

The main aim of this paper is to modify the time slice of those processors which require greater time than the allotted time slices. Rest of the processors will be executed in round robin manner. First the remaining burst time and no. of cycles for each process is calculated .processors are shorted based on the remaining burst time and process with less than or one slice is executed. If two or more processes have the same remaining burst time, then process are executed as SJF algorithm.

17. H.S. Behera, Brajendra Kumar Swain, Anmol Kumar Parida, Gangadhar Sahu

In this paper a new algorithm is proposed i.e. Round Robin Highest Response Ratio Next (RRRR).which takes dynamic time quantum into account with the help of ready queue. First the mean of burst time is calculated and filled in R-queue according to arrival time then response ratio of each process is determined and assign process with Highest Response Ratio to CPU. This process is continued till the R-queue becomes empty.

18. Pallab Banerjee, Probal Banerjee, Shweta Sonali Dhal

This paper provides an algorithm is proposed to maximize the CPU utilization .In the proposed algorithm, the arrival time of the already existing process is set to '0'.burst time of all processes are used as input Average Turnaround Time , Average Waiting Time and number of Context Switch are produced as output.

19. Pooja Samal, Pranati Mishra

In this paper, different approaches in connection to calculations created are investigated utilizing an examination device mainly for cloud investigator, which also calculates RR calculations. In the present work to enhance both asset usage and occupation reaction time by investigating the variations of RR calculation. The proposed calculation demonstrates better reaction time when contrasted with alternate calculations.

20. Rakesh Patel, Mrs. Mili. Patel

The proposed algorithm in this paper is Shortest Job Round Robin CPU Scheduling algorithm which is preemptive in nature and try to give fair CPU execution time by focusing on average turnaround time and waiting time of a process which can be achieved by applying certain rules such as selecting the process with minimum burst time and so on and the time quanta should be equal to the shortest process which improves the average wait time.

21. *Neelima Priyanka Nutulapati, Prof. Dr. P.Suresh Varma*

In this proposed algorithm, SJF priority scheduling algorithm is used to reduce the average turnaround time and average waiting time. This paper mainly focuses on comparison of performance of the existing algorithm with SJF based priority scheduling algorithm. FCFS and SJF algorithm in applied on existing data set and the result is analyzed to clarify that the average turnaround time and average waiting time is reduced.

22. Dr. R. B. Garg

This paper presents a state diagram for studies of various scheduling algorithms for single CPU. The objective of this paper is to analyze the high efficiency scheduler algorithms suitable according to operating System and processor. Mainly 3 types of OS scheduler come into play for efficient processing i.e. Long-term scheduler, mid-term scheduler and short-term scheduler.

23. *Ajit Singh, Priyanka Goyal, Sahil Batra*

The main focus of this paper is to enhance the Round Robin scheduling to improve the efficiency in real time and time sharing operating system which can be achieved in 3 phases.

Phase 1: Allocating all processes to CPU, at the same time by applying RR scheduling with an initial time quantum.

Phase 2: Double quantum time and select the shortest process from waiting queue and so.

Phase 3: repeating the steps until the waiting queue is empty.

III. PROPOSED METHODOLOGY

In our proposed methodology, the average of standard deviation (sd) and the maximum burst time of the burst time of considerable number of processes is taken as the time quantum. The execution of RR algorithm exclusively relies on the size of time quantum. If the time slice is small, it causes an excessive number of context switches. So in order to get the optimal time quantum, the average of standard deviation and maximum burst time is taken as the time quantum.

$$\sigma = \sqrt{\frac{\sum(x_i - \mu)^2}{N}} \qquad (i)$$

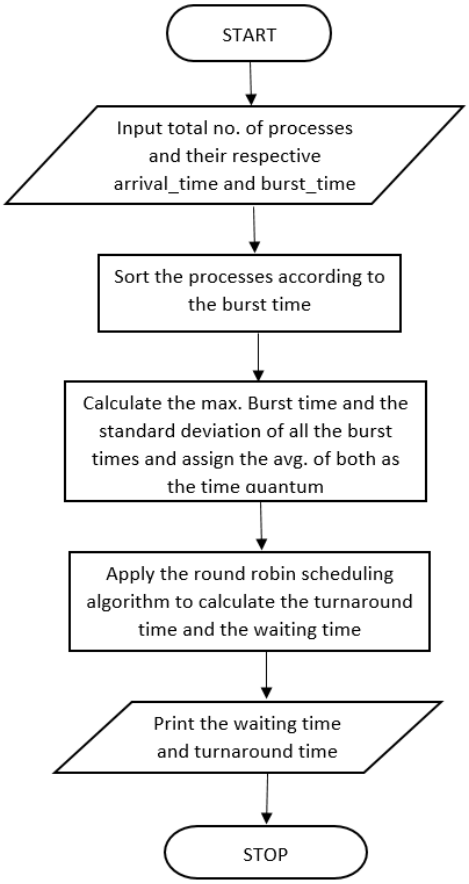
$$TQ = (sd + \max(\text{burst time}))/2 \qquad (ii)$$

Where,

sd denotes the standard deviation

TQ denotes the time quantum

Flowchart



Pseudo code

1. Take the following inputs from the user.
   - limit → Number of processes
   - arrival time[]→ Arrival time of all the processes
   - burst time[] → Burst time of all the processes
2. Calculate the maximum burst time and the standard deviation.
3. Assign their average to the time_quantum.

   time_quantum=ceil ((sd+max_burst)/2)
4. Create a temp [] to store the copy of the burst time of the processes and x stores the copy of the limit.

CASE 1(with arrival time 0):

Process	**Arrival Time**	**Burst Time**
P1	0	82
P2	0	54
P3	0	33
P4	0	22
P5	0	9

Gantt chart:

(RR)

P1	P2	P3	P4	P5	P1	P2	P3	P4	P1	P2	P1	P1

0 20 40 60 80 89 109 129 142 144 164 178 198 200

(SMDRR)

P1	P2	P3	P4	P5	P1	P2	P1

0 40 80 113 135 144 172 186 200

IV. EXPERIMENTAL ANALYSIS

(EDARR (PROPOSED ARCHITECTURE))

After sorting arrival time and burst time according to burst time:

Process	**Arrival Time**	**Burst Time**
P1	0	9
P2	0	22
P3	0	33
P4	0	54
P5	0	82

Time quantum= (Standard deviation+Highest burst time) / 2

= (26+82)/2 = 54

P1	P2	P3	P4	P5	P5

0 9 31 64 118 172 200

Comparing three Algorithms with AWT, ATAT and Context switch as factors

Algorithms	**AWT**	**ATAT**	**CS**
RR	88.00	139.00	12
SMDRR	73.80	118.00	11
EDARR	44.4	84.4	5

CASE 2(with arrival time):

Processes	**Arrival time**	**Burst time**
P1	0	9
P2	3	21
P3	4	49
P4	7	69
P5	9	73

Gantt chart (Case-2)

(RR)

P1	P2	P3	P4	P5	P3	P4	P5	P3	P4	P5	P6

0 9 30 54 78 102 126 150 174 176 196 221 222

(SMDRR)

P1	P2	P3	P4	P5	P3	P4	P5	P4	P5	P5

0 9 30 74 118 162 167 187 207 212 217 221

(EDARR)

P1	P2	P3	P4	P5	P4	P5

0 9 30 79 131 183 208 221

(EDARR (PROPOSED ARCHITECTURE))

Comparing three Algorithms with AWT, ATAT and Context switch as factors

Algorithms	**AWT**	**ATAT**	**CS**
RR	88.00	139.00	12
SMDRR	73.80	118.00	11
EDARR	59	103.2	5

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