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An Improved Method for Achieving Optimum Efficacy of CPU Scheduling

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Abstract:-
Over the past decades, with huge published efforts a good amount of research community related to CPU scheduling field has demonstrated that an act of utilized system can significantly improve with an adoption of effectual algorithm. However, each and every offered algorithm of CPU scheduling process made an endeavour to augment an act of system but most of techniques fails to maintain their efficiency with rapid growth of process or other amendments take place in system. Additionally, dissimilar method executes differently and offered several unique associated restrictions that generate the need of implementation of a new optimized method for enhancing an act of adopted system. This paper discussed an optimized version of Round Robin (RR) CPU scheduling algorithm. The vast experimental fallouts pointedly denoted the remarks of proposed method in contrast of other offered practices, proposed approach effectively improves scheduling act of CPU with attaining low length of task switching, average waiting and turnaround time span.

Keywords: Schedular, Scheduling, Round Robin, Average Waiting Time(AWT), Average Turnaround Time(ATT)

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1. Introduction

Straightforwardly, scheduling is a resource distributing mechanism of an operating system under the machine. Such operation of operating system shares the system resources among current lively executing task to complete job with an efficient way. Effective distribution of system resources significantly enhances an act of adopted system [1]. An act of scheduling is observed by schedular, a mechanism of operating system that decide under a system that which process will be executes next, take system resource and CPU time. Related literature of scheduling has exposed that an act and efficiency of employed systems primarily depend on the base of system scheduler and the technique that has been used by scheduler for scheduling the process. The scheduler can group into three types i.e., short term, medium term and long-term scheduler as depicted in fig. 1. The LTS (Long-term Schedular) determines the execution of new admitted process under the machine in an order that the process which require least time span of system resources will implemented at initial level. The process in set in a queue known as ready queue, consist system tasks info that required system resources to complete a desired job of system user. The STS (Short-Term Schedular) responsible to allocate the system resources for example CPU to the task that are presents in ready queue. The MTS (Medium-term Schedular) play a job switching role, swap the tasks among of postponed or recommenced execution stages. It mostly makes transaction with recollection of memory therefore this process exceptionally intended as an element of reminiscence OS supervision subsystem.

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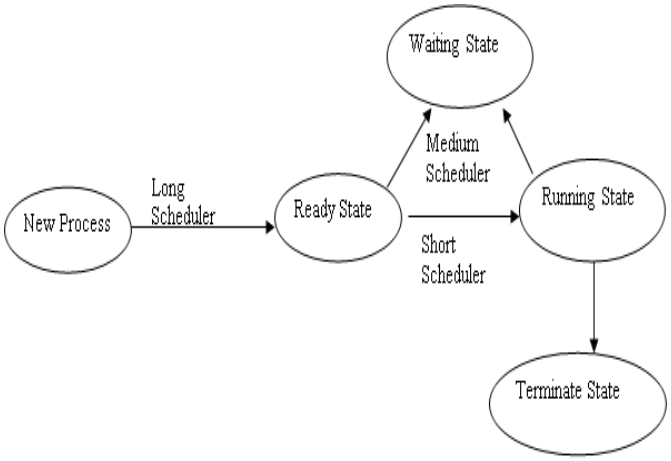

Fig. 1 Scheduler & Transitions State

For an effectual system recital, it is must that engaged algorithm satisfied some conditions, must consume entire resources of employed system in a fine and proficient way that shrinks the associated issues of process scheduling like need of low turnaround, waiting and response time. Habitually system recital deliberated on the base of an average case. Each and every scheduling technique has designed with the dissimilar characteristics therefore produce contradictory results on the base of simulation environment or conditions.

The paper is organized as follows; Section I covers the outline of proposed work, Section II covers the fundamental of classical round robin RR algorithm, Section III discussed related published efforts using optimized version of classical RR methods, Section IV demonstrated the sketch of proposed approach, contain the methodology and relevant figures, Section V covers the parameters of evaluation with the result discussions, finally section VI concludes the research work with future directions.

2. Round Robin (RR) Scheduling Procedure

Nowadays, innumerable scheduling process are offered by investigators, in midst of them the RR practice has got massive fame of related field research community. Straightforwardly the mechanism of RR method stunned the associate issues of other scheme especially FCFS technique. A working part of RR scheduling scheme is an identical process of obtainable FCFS methods i.e., maintain ready queue that consist an info about the active jobs of utilize system. For the scheduling purpose the RR scheme arranged active task in ready queue in same order as they take place in system. Each and every process executed without considering the priority of job. However, RR scheme set a time span for execution of job over CPU, each process has executed in a system for a fixed time span set by the RR method. If a job finish task before set time frame than system resources has allocated to the next job else the active job has shifted to the ready queue to wait its turn time and next process of ready queue attained system resources. The set time span known as time quantum unit, mostly remains under 10 to 100 milliseconds in an extent. With the set span of time quantum ready queue is well-looked-after as a circular queue and schedular allocate system resources to each job of ready queue for a single time quantum in circular fame until the queue not goes empty. Related published efforts has denoted some rich accepted rewards & confines of RR scheduling practice that can be point out as:

- Upfront functioning style, informal recognition.
- Suggest squat overheads quantity via operative set up course of Quantum Time.
- Starvation free instrument.
- Fight for preserve effectual job waiting & response time.
- Attain low-slung amount of throughput with an raised context switching scheme.
- Lay down scheduling performance with little period of quantum, leading cause of raised milieu of tasks switch.

3. Related Work

EDRR (Efficient Dynamic Round Robin) [2] intend a practice by utilizing the SJF and RR algorithm into a naïve way for shrinking an amount of starvation issues. As like to other published efforts the authors have adopt a dynamic time setting procedure of quantum time that executed task on the base of least requirement time of CPU, small desired time process will be executed early in comparison of other active process. Simulated fallouts demonstrated that incorporated mechanism has significantly improve an act of scheduling by producing low amount of waiting and process turnaround time in company of less context switching of active process. Additionally, with the experimental efforts the authors of this published work have demonstrated that the implemented algorithm efficiently shrinks the amount of system overhead. They have depicted different test phase of intended algorithm, simulated with burst time in increases order, decreasing order and with the random values. All simulation efforts demonstrated the significance of their implemented algorithm.

With an amendment in ancient RR scheduling method a naïve IDRR (Improved Dynamic Round Robin) algorithm has discussed in [3]. The implemented approach vigorously computes quantum time, after each cycle

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approach compute naïve time quantum for the remaining active process. Additionally, a focus has given on reducing the amount of context switching by allocating CPU to current active process if it wants less time from the recent length of quantum time. After completion of process each and every task entry eliminated from the ready queue and algorithm will compute and set naïve quantum time length for the remaining procedures. To elaborate efficiency of proposed method number of experiments with dissimilar parameters has done.

In order to expand an act of scheduling process a naïve group of investigators has optimize an operational procedures of classical RR method, proposed a Optimum Multilevel Dynamic Round Robin Scheduling Algorithm [4]. As like to other accessible process scheduling scheme this offered method set quantum time length at run time and firstly allocate CPU to the job that has least requirement of CPU time. They implement naïve procedure for the setting of quantum time length and have analyzed an act of different algorithm against their offered method. On the base of performance evaluation parameters like turnaround, waiting and response time factor the investigators has shown an efficiency of their intended algorithm.

To pick up scheduling act in naïve way one other investigation has consider the residual burst time of active executed process [5]. Typically, the intended approach examines residual burst time of each executed process after completion of set time quantum and if the residual burst time of current executed process remain less from the current set of quantum time span the implemented approach again allocate CPU of that process. Such adopted process shrinks an amount of context switching and overheads. As like other presented evaluation design the authors of this published work has depict the act of intended method with considering process in different format, takes process with increasing, decreasing and with random order burst time span. Instead of simple optimization process a naïve task scheduling algorithm has discussed in [6]. The intended procedure utilizes SJF and RR methodology into a sole form. The implemented procedure arranged the task in an increasing order in which the process that desired low burst time takes first position in ready queue and thereafter whole process arrange in ready queue in same order. For set effective quantum time length the implemented algorithm considers average burst time of all the process that exists in ready queue. With dissimilar experiments the investigators of published work have illustrated an efficiency of their proposed method.

With integrating the scheduling act of two advanced edition of customary RR scheduling process a naïve approach dynamic time quantum based Round Robin (DTQRR) has intended in [7]. Typically, the presented approach incorporates the functionality of IRR [8] with a naïve optimized version of RR scheme IRRVQ [9]. At initial level the implemented procedure arranges the task in ready queue according to associate burst time length and on the base of mean value set a cycle time of process execution over CPU. After each cycle execution process the built approach examine residual time span of current evaluated process, if it requires less time of CPU from active set of quantum time span than same procedure occupied CPU to complete its task else it will take last place in ready queue according to its residual burst time span. For demonstrating an act of proposed method, the investigators of this build procedure have considered two different cases of task scheduling, whole task has taken place in ready queue at time 0 and task has taken place with non 0-time frames. With discussed methodology a number of investigators has made different endeavor to optimize an act of task scheduling [10-11]. Each and every investigation work has put different exercise to optimize an act of traditional round robin CPU scheduling scheme. For improve an act of task scheduling in real time frame a naïve method ADRR (Advanced Dynamic Round Robin) has discussed in [12]. Typically, the intended method made an attempt to set efficient TQ (Time Quantum) for real time scheduling practices. With the different simulation parameters authors has shown the effort of proposed practice. Additionally, investigators of this published work have compared the efforts of their proposed scheme with the recent obtainable method to prove the efficiency of intended algorithm. Some of the current offered schemes has illustrated in [13-15]. The investigation demonstrated their domino effect with improved act of scheduling process.

4. Sketch of Proposed Process Scheduling Scheme

The proposed approach is an optimized version of classical RR CPU scheduling method that sets foremost emphasis over setting of an effective span of time quantum with shrinking an amount of job switching. Figure 2 depict the outline of proposed approach.

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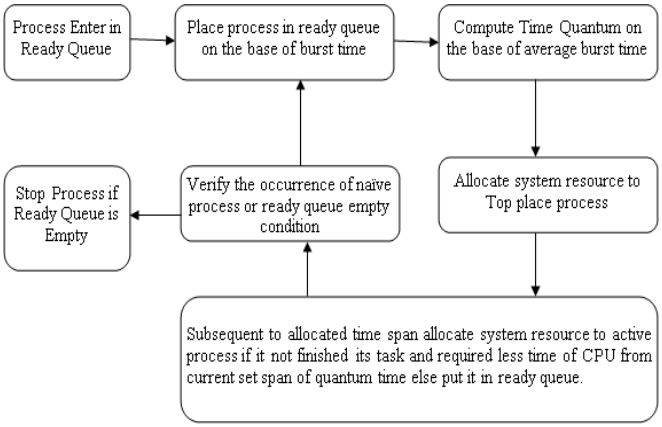

Fig. 2 Outline of Proposed Process

At initial level the intended mechanism put system entered job into ready queue. After storing the job in ready queue, the implemented scheme arranges the job of ready queue in a order that the process which required less time of CPU take top position in queue and after that next process take place that need next least time of CPU and so on. Furthermore, the build method set time quantum span on the average time base of jobs that are exists into the ready queue. After setting an effective quantum time period the scheduling process take place by allocating the CPU to first job of ready queue. The job implemented over CPU for a set time period, time quantum. If job finished its task during set time period than CPU assign to next top process of ready queue else the active job moves to the ready queue according to the burst time span. One main difference among the classical and proposed approach is that after each time quantum span the build method has confirm that if active job over CPU is not finished within set period of time quantum and require less than half time span of current time quantum than build method reallocate CPU to same job to shrink job switching amount with job waiting time span in utilized system. Such process significantly improves an act of scheduling and system. On the other hand, if current job still requires more than half time of set quantum period even it executed for a time cycle the build method put that job in ready queue and rearrange the process according to the burst time frame. Additionally, the entrance of naïve job in system is monitored by method at the end of each time quantum time cycle.

The ladder of intended practice is

Step 1. Arrange active tasks in ready queue on the base of their associated burst time. If two process consist same burst time than arrange them according to time as they entered in ready queue.

Step 2. Compute time quantum by adding of ready queue top process burst time with an average burst time span of ready queue tasks.

Step 3. Allocate system resource to top placed task of ready queue.

Step 4. Verify the status of task execution, allocate system resource to next process of ready queue if recent executed task has completed its process within set time quantum span.

If not then examine the remaining burst time of recent procedure and allocate system resource to same task if its desired time span is less than from half of current set amount of quantum time.

If current task has more burst time length from half of current set quantum time then place current task in ready queue and allocate system resource to next top position task of ready queue.

Step 5. Stop scheduling process if ready queue is empty else repeat adopted procedure from the step 1.

Step 6. Compute Average Turnaround and Average Waiting Time span.

Step 7. Depict effectiveness of intended method by comparing the attained results of intended method in contrast of published efforts.

5. Analyzing an Act of Intended Method

An act of intended approach is analyzed with well-known and adopted parameters that can be clarify as Average Turnaround Time (ATT) and Average Waiting Time (AWT). The total time span of a task that it takes in system known as Turnaround time span of related task. Such time span is an addition of task execution and its waiting time state. On the other hand, the entire time span that a task takes in system without its execution states known as waiting time span of that task. At initial evaluation process a assumption has made that all the process has take place in system at same time, arrival time frame is 0. Table 1 illustrated the figures that has consider for the evaluation an act of proposed and classical RR method.

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TABLE 1
Tasks Details for Simulation

Tasks IDs	Burst Time(ms)
T1	05
T2	12
T3	08
T4	03
T5	09

Time Quantum is 8 ms for RR scheme

T1	T2	T3	T4	T5	T2	T5
05	13	21	24	32	36	37

Fig. 3 Gantt chart of Scheduling with Classical RR Scheme

Average waiting & turnaround time span with traditional RR scheme is

AWT = (0 + 24 +13+21+28) / 5 = **17.2ms**.

ATT= (5+36+21+24+37) /5 = 123 / 5 = **24.6 ms.**

build approach arranges whole job of ready queue in order of their burst time span, hence the job will be executed in order of

T4 - > T1 - > T3 - > T5 - > T2

Gantt chart of proposed scheme is

T4	T1	T3	T5	T5	T2	T2
03	08	16	24	25	33	37

Fig. 4 Gantt chart with Proposed Optimized RR Scheme

Average waiting & turnaround time span with proposed optimized RR scheme, known as CRR (Customized RR) is

AWT = (3 + 25 +08+0+16) / 5 = **10.2ms**.

ATT= (08+37+16+03+25) /5 = 89 / 5 = **17.8 ms.**

Following figure demonstrated the difference and appropriateness of proposed optimized RR scheduling scheme CRR in an easy form.

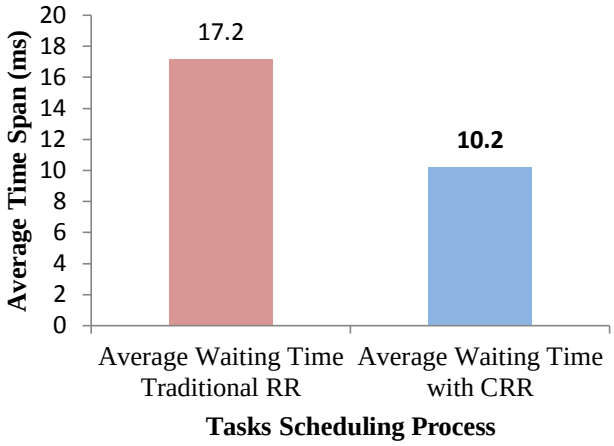

Fig. 5 AWT of Proposed & Traditional RR Scheme

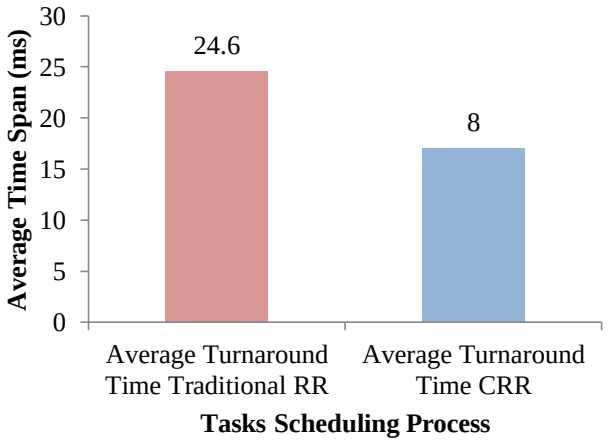

Fig. 6 ATT of Proposed & Traditional RR Scheme

The comparative values of AWT and ATT, depicted in figure 5 and figure 6 clearly indicates the effectiveness of proposed approach over an act of classical RR method. The proposed approach has offered low waiting and turnaround time span in front of simple classical RR algorithm. Attained evaluative results of proposed approach denote that proposed approach is healthier in comparison of traditional RR scheme. The other evaluation tasks details is depicted in following table

TABLE 2
Process Arrival and Burst Time Details

Tasks IDs	Arrival Time	Burst Time(ms)
T1	0	45
T2	5	90
T3	8	70
T4	15	38
T5	20	55

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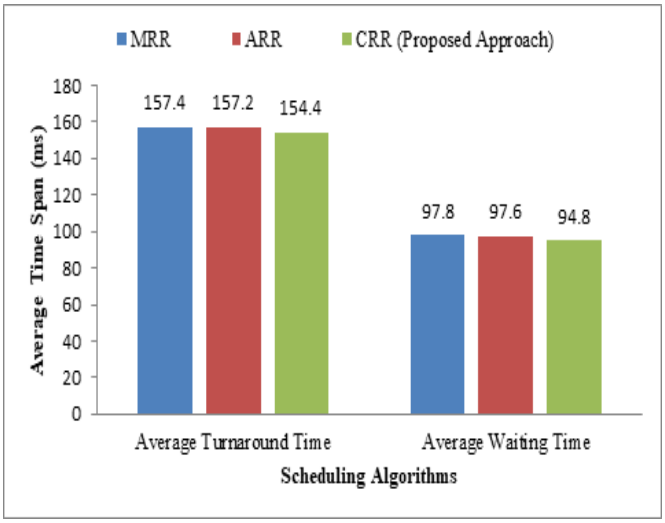

Fig. 7 ATT & AWT of Proposed & Other Optimized Scheme

Same as previous evaluation the above figure values reconfirm that proposed method is more appropriate in comparison of some of the recent offered MRR and ARR [16] technique for scheduling tasks even arrival time of tasks is 0 or random. In both case evaluation the build method has attained low time span of turnaround and waiting time that illustrate its efficiency and acceptability in comparison of that offered methods.

6. Conclusion and Future Scope

This paper intended a naïve optimized addition of classical Round Robin CPU scheduling algorithm. Huge research efforts have demonstrated the numerous advantages and restrictions of traditional RR method. Some of the associated issues of RR method has considered into proposed approach and the comparative values of proposed approach depicted in figure and table evidently demonstrate its suitability over the classical and other offered tasks scheduling techniques. The entire comparative values indicate that build method has outperformed over customary and new accessible algorithms of CPU scheduling.

As with every single published effort, the proposed scheme can also be further heightened by including the more efficient method for setting of quantum time span.

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