UNIVERSITI PUTRA MALAYSIA

IMPLEMENTATION OF NEW IMPROVED ROUND ROBIN (NIRR) CPU SCHEDULING ALGORITHM USING DISCRETE EVENT SIMULATION

CHANG JAN VOON

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By

CHANG JAN VOON

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Chairman: Idawaty Ahmad, PhD.

Faculty: Computer Science and Information Technology

Round Robin scheduling algorithm is the most widely used scheduling algorithm because of its simplicity and fairness. However it has higher context switching, larger response time, larger waiting time, larger turnaround time, and lower throughput. (Abdulrahim et al., 2014) proposed a new algorithm, called New Improved Round Robin (NIRR) to enhance the Round Robin scheduling algorithm. The proposed NIRR algorithm has shown improvement over the traditional Round Robin algorithm. However the lack of details of general NIRR simulation model is a clear limitation for the further improvement of the algorithm. The main objective of this research is to validate the NIRR algorithm by developing a comprehensive simulation model using Discrete Event Simulation (DES). An NIRR simulator is deployed and is validated by ensuring the output data closely resemble the output data published by (Abdulrahim et al., 2014). Extensive experiments were done to validate the developed NIRR simulator by ensuring the output data closely resemble the output data published by (Abdulrahim et al., 2014). The success of the developed NIRR simulator was proven by the generated results.

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DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at University Putra Malaysia or at any other institutions.

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Name: CHANG JAN VOON

Date: 27th JULY 2015

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LIST OF ABBREVIATIONS

ART	Average Response Time
ATAT	Average Turnaround Time
AWT	Average Waiting Time
CPU	Central Processing Unit
DES	Discrete Event Simulation
FCFS	First Come First Serve
IRR	Improved Round Robin
NIRR	New Improved Round Robin
PS	Priority Scheduling
RR	Round Robin
RT	Response Time
SJF	Shortest Job First
TAT	Turnaround Time
TOS	Termination of Simulation
WT	Waiting Time

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CHAPTER 1

INTRODUCTION

An operating system is essential system software of a computer system. It manages the computer resources and provides services to the application programs. It acts as the intermediary between the application programs and computer resources. In the modern computer system, multi-tasking operating systems are used in which more than one application programs can run concurrently. It is the operating system responsibility to schedule tasks for efficient use of system resources.

CPU is one of the most important resources to be shared among the application programs. Therefore the CPU scheduler in the operating system plays an important role in time-sharing and dividing the processor time efficiently between multiple tasks or processes. CPU scheduling algorithms determines which task runs when there are multiple tasks ready to execute.

1.1 Commonly Used Scheduling Algorithm

In general, there is no “best” scheduling algorithm. The choice of scheduling algorithm is based on the type of system used and the users’ requirement. The requirements are based on one or more criteria describe in Section 2.2.

According to (Abdulrahim et al., 2014), Round Robin (RR) scheduling algorithm is the most widely used scheduling algorithm because of its simplicity and fairness. However it has higher context switching, larger response time, larger waiting time,

larger turnaround time, and lower throughput. A lot of researches are conducted to improve the performance of RR scheduling algorithm. According to (Abdulrahim et al., 2014), the performance of RR is sensitive to the time slice selection. The value of time slice affects the algorithm's efficiency which is measure in the tasks average waiting time, average turnaround time, average response time and number of context switches.

1.2 Problem Statement

(Abdulrahim et al., 2014) proposed a new algorithm, called New Improved Round Robin (NIRR) to enhance the existing Round Robin scheduling algorithm. The NIRR algorithm determines the time slice dynamically, taken from the average of the burst time of the tasks to be executed by the CPU. The NIRR algorithm is simulated and has shown improvement over the traditional RR algorithm. However the lack of details of general NIRR simulation model is a clear limitation for the further improvement of the algorithm.

1.3 Research Objective

The main objective of this research is to validate the NIRR algorithm by developing a comprehensive simulation model using Discrete Event Simulation (DES). An NIRR simulator is deployed and is validated by ensuring the output data closely resemble the output data published by (Abdulrahim et al., 2014). The proposed simulation model in this research may led researcher to greater understanding of the

algorithm and provides a platform for future investigations in NIRR scheduling algorithm.

1.4 Organization of the Thesis

This thesis is organized into six chapters including this introductory chapter. Chapter 2 presents a review on recent works on RR algorithm. Chapter 3 discusses the research methodology and the simulation life cycle in developing the simulator. The details of the NIRR scheduling algorithm are discussed in Chapter 4. The experimental setting and results are presented in Chapter 5. The last chapter, Chapter 6 concludes the thesis and suggests future research directions.

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BIODATA OF STUDENT

Chang Jan Voon was born on the 7th November 1973 in Klang, Selangor. He went to Sekolah Kebangsaan Jalan Batu Tiga Klang, Selangor for his primary education and completed his secondary education in Sekolah Menengah Tinggi Klang, Selangor. He pursued his first degree in University Malaya and graduated with First Class Honours Degree in Electrical Engineering in 1997. He started his career as an R&D Engineer and subsequently moves on to technical support. He is currently working as a Technical Manager, managing a team of technical support engineers and technicians. He is currently pursuing his M.S. degree in Computer Science at University Putra Malaysia (UPM). His areas of interest include real-time system, scheduling algorithm and simulation modeling.