*Understanding the Behavior of Round Robin Algorithm with Implemented Alternative Sorting Algorithm Using an Automaton*

Jhaeus Herzian T. As-il   
Baguio City, Philippines  
jhaeus8@gmail.com  
  
Julius Bernadin S. Baleña  
Baguio City, Philippines  
juliusbalena9@gmail.com  
  
John Ariel Dominic J. Castillo  
Baguio City, Philippines  
nikcastillo11@gmail.com

*Abstract*— The round-robin algorithm with an integrated alternating algorithm was created to improve the average waiting time and turnaround time of processes. Although it did not work as intended, this algorithm was chosen by the researchers to study its behavior. The researchers plan to construct an automaton based on this algorithm to show how the alternating algorithm was integrated. The researchers also plan to create a non-deterministic automaton (NFA) and deterministic finite automaton (DFA). The algorithm is converted into regular expressions. With these regular expressions, the researchers can create a non-deterministic finite automaton and deterministic finite automaton. Lastly, the researchers will attempt to optimize the non-deterministic finite automaton and deterministic finite automaton into fewer states. The researchers were to create a digital output of the non-deterministic finite automaton and deterministic finite automaton that show the behavior and integration of the alternating algorithm. However, the researchers were unsuccessful at optimizing the states of the non-deterministic finite automaton and deterministic finite automaton since further breaking the states down will not show the proper behavior of the automatons. The researchers were able to present the behavior of the round-robin algorithm with an integrated alternating algorithm using a non-deterministic finite automaton and a deterministic finite automaton.

Keywords— Round Robin Scheduling Algorithm, Alternating Sorting Algorithm, Automaton

# Introduction

The Round Robin Algorithm was used by the researchers to understand its behavior when an Alternative Sorting Algorithm is implemented within it. Its behavior will be represented by an automaton for the researchers and users to understand how the algorithm functions. The algorithm will be represented as a Regular Language and be expressed into a Regular Expression, Regular Grammar, Deterministic Finite Automaton, and Non-deterministic Finite Automaton.

The Round Robin Algorithm that makes use of an Alternative Sorting Algorithm was derived from studies that improve the algorithm’s scheduling. The studies that the researchers focused on discussed on improving the scheduling criteria Turnaround Time and Waiting Time. Since the Round Robin Algorithm is a preemptive process scheduling algorithm, the researchers also had to find a way to modify the Time Quantum to be inline with the changes that the Alternative Sorting Algorithm provides. [1] [2]

The researchers had made use of similar datasets and concepts during the testing phase. The notable similarities that will be found include the number of processes, the arrangement of variables, and the values of Burst Time. [3] [4] [5]

Round Robin Algorithm relies heavily on Context Switching. The researchers based their Time Quantum on the process’ minimum and maximum Burst Times in order to reduce context switching. [6]

A Round Robin Algorithm with a static Time Quantum will affect the time efficiency of the algorithm. By making the time Quantum dynamic, any criterion of the scheduling criteria will be affected. [7]

# Ease of Use

## Selecting a Template (Heading 2)

First, confirm that you have the correct template for your paper size. This template has been tailored for output on the US-letter paper size. If you are using A4-sized paper, please close this file and download the file “MSW\_A4\_format”.

## Maintaining the Integrity of the Specifications

The template is used to format your paper and style the text. All margins, column widths, line spaces, and text fonts are prescribed; please do not alter them. You may note peculiarities. For example, the head margin in this template measures proportionately more than is customary. This measurement and others are deliberate, using specifications that anticipate your paper as one part of the entire proceedings, and not as an independent document. Please do not revise any of the current designations.

# Prepare Your Paper Before Styling

Before you begin to format your paper, first write and save the content as a separate text file. Complete all content and organizational editing before formatting. Please note sections A-D below for more information on proofreading, spelling and grammar.

Keep your text and graphic files separate until after the text has been formatted and styled. Do not use hard tabs, and limit use of hard returns to only one return at the end of a paragraph. Do not add any kind of pagination anywhere in the paper. Do not number text heads-the template will do that for you.

## Abbreviations and Acronyms

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

## Units

* Use either SI (MKS) or CGS as primary units. (SI units are encouraged.) English units may be used as secondary units (in parentheses). An exception would be the use of English units as identifiers in trade, such as “3.5-inch disk drive”.
* Avoid combining SI and CGS units, such as current in amperes and magnetic field in oersteds. This often leads to confusion because equations do not balance dimensionally. If you must use mixed units, clearly state the units for each quantity that you use in an equation.
* Do not mix complete spellings and abbreviations of units: “Wb/m2” or “webers per square meter”, not “webers/m2”. Spell out units when they appear in text: “. . . a few henries”, not “. . . a few H”.
* Use a zero before decimal points: “0.25”, not “.25”. Use “cm3”, not “cc”. (*bullet list*)

## Equations

The equations are an exception to the prescribed specifications of this template. You will need to determine whether or not your equation should be typed using either the Times New Roman or the Symbol font (please no other font). To create multileveled equations, it may be necessary to treat the equation as a graphic and insert it into the text after your paper is styled.

Number equations consecutively. Equation numbers, within parentheses, are to position flush right, as in (1), using a right tab stop. To make your equations more compact, you may use the solidus ( / ), the exp function, or appropriate exponents. Italicize Roman symbols for quantities and variables, but not Greek symbols. Use a long dash rather than a hyphen for a minus sign. Punctuate equations with commas or periods when they are part of a sentence, as in:

*a**b* 

Note that the equation is centered using a center tab stop. Be sure that the symbols in your equation have been defined before or immediately following the equation. Use “(1)”, not “Eq. (1)” or “equation (1)”, except at the beginning of a sentence: “Equation (1) is . . .”

## Some Common Mistakes

* The word “data” is plural, not singular.
* The subscript for the permeability of vacuum **0, and other common scientific constants, is zero with subscript formatting, not a lowercase letter “o”.
* In American English, commas, semicolons, periods, question and exclamation marks are located within quotation marks only when a complete thought or name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.)
* A graph within a graph is an “inset”, not an “insert”. The word alternatively is preferred to the word “alternately” (unless you really mean something that alternates).
* Do not use the word “essentially” to mean “approximately” or “effectively”.
* In your paper title, if the words “that uses” can accurately replace the word “using”, capitalize the “u”; if not, keep using lower-cased.
* Be aware of the different meanings of the homophones “affect” and “effect”, “complement” and “compliment”, “discreet” and “discrete”, “principal” and “principle”.
* Do not confuse “imply” and “infer”.
* The prefix “non” is not a word; it should be joined to the word it modifies, usually without a hyphen.
* There is no period after the “et” in the Latin abbreviation “et al.”.
* The abbreviation “i.e.” means “that is”, and the abbreviation “e.g.” means “for example”.

An excellent style manual for science writers is [7].

# Using the Template

After the text edit has been completed, the paper is ready for the template. Duplicate the template file by using the Save As command, and use the naming convention prescribed by your conference for the name of your paper. In this newly created file, highlight all of the contents and import your prepared text file. You are now ready to style your paper; use the scroll down window on the left of the MS Word Formatting toolbar.

## Authors and Affiliations

**The template is designed for, but not limited to, six authors.** A minimum of one author is required for all conference articles. Author names should be listed starting from left to right and then moving down to the next line. This is the author sequence that will be used in future citations and by indexing services. Names should not be listed in columns nor group by affiliation. Please keep your affiliations as succinct as possible (for example, do not differentiate among departments of the same organization).

### For papers with more than six authors: Add author names horizontally, moving to a third row if needed for more than 8 authors.

### For papers with less than six authors: To change the default, adjust the template as follows.

#### Selection: Highlight all author and affiliation lines.

#### Change number of columns: Select the Columns icon from the MS Word Standard toolbar and then select the correct number of columns from the selection palette.

#### Deletion: Delete the author and affiliation lines for the extra authors.

## Identify the Headings

Headings, or heads, are organizational devices that guide the reader through your paper. There are two types: component heads and text heads.

Component heads identify the different components of your paper and are not topically subordinate to each other. Examples include Acknowledgments and References and, for these, the correct style to use is “Heading 5”. Use “figure caption” for your Figure captions, and “table head” for your table title. Run-in heads, such as “Abstract”, will require you to apply a style (in this case, italic) in addition to the style provided by the drop down menu to differentiate the head from the text.

Text heads organize the topics on a relational, hierarchical basis. For example, the paper title is the primary text head because all subsequent material relates and elaborates on this one topic. If there are two or more sub-topics, the next level head (uppercase Roman numerals) should be used and, conversely, if there are not at least two sub-topics, then no subheads should be introduced. Styles named “Heading 1”, “Heading 2”, “Heading 3”, and “Heading 4” are prescribed.

## Figures and Tables

#### Positioning Figures and Tables: Place figures and tables at the top and bottom of columns. Avoid placing them in the middle of columns. Large figures and tables may span across both columns. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation “Fig. 1”, even at the beginning of a sentence.

1. Table Type Styles

| Table Head | Table Column Head | | |
| --- | --- | --- | --- |
| Table column subhead | Subhead | Subhead |
| copy | More table copya |  |  |

1. Sample of a Table footnote. (*Table footnote*)
2. Example of a figure caption. (*figure caption*)

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity “Magnetization”, or “Magnetization, M”, not just “M”. If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write “Magnetization (A/m)” or “Magnetization {A[m(1)]}”, not just “A/m”. Do not label axes with a ratio of quantities and units. For example, write “Temperature (K)”, not “Temperature/K”.

##### Acknowledgment *(Heading 5)*

The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g”. Avoid the stilted expression “one of us (R. B. G.) thanks ...”. Instead, try “R. B. G. thanks...”. Put sponsor acknowledgments in the unnumbered footnote on the first page.

##### References

[1] Manuel, Baquirin, Guevera, and Tandingan Jr., “Fittest Job First Dynamic Round Robin (FJFDRR) scheduling algorithm using dual queue and arrival time factor: a comparison”, 2019

[2] Shyam and Nada, “Improved Mean Round Robin with Shortest Job First Scheduling”, 2014

[3] Mishra and Rashid, “An Improved Round Robin CPU Scheduling Algorithm with Varying Time Quantum”, 2014

[4] Pati, Korde, and Dey, “An advanced approach to prioritize process with residual burst time nearest to the specified time quantum”, 2017

[5] Dash, Sahu, and Samantra, “An Optimized Round Robin CPU Scheduling Algorithm with Dynamic Quantum”, 2015

[6] Behera, Mohanty, and Nayak, “A New Proposed Dynamic Quantum with Re-Adjusted Round Robin Algorithm and It’s Performance Analysis”, 2010

[7] Indursee and Prabadevi, “Enhanced Round Robin CPU Scheduling with Burst Time-based Time Quantum”, 2017

[8] Hyytia and Aalto, “On Round Robin Algorithm with FCFS and LCFS scheduling”, 2016

[9] Rida, Hamad, and Mostafa, “Improving Waiting Time of Tasks Scheduled Under Preemptive Round Robin Using Changeable Time Quantum”, 2010

[10]