

Universiti Teknologi MARA

**Estimation of Train Arrival Punctuality
Using Fuzzy Logic Approach**

Nur Syafiqah Binti Yusri

**Report submitted in fulfillment of the requirements for
Bachelor of Science (Hons.) Management Mathematics
Faculty of Computer and Mathematical Sciences**

November 2018

STUDENT'S DECLARATION

I certify that this report and the research to which is refers are the products of my own work and that any ideas or quotation from the work of other people, published or otherwise are fully acknowledge in accordance with the standard referring practices of the discipline.

.....
NUR SYAFIQA BINTI YUSRI
2016635806

NOVEMBER 30, 2018

ABSTRACT

Public transport plays a significant role in society. Nowadays, many people use public transport to save time and costs. KTM Commuter is one of the favourite public transport that people prefer to use. However, the punctuality of the train gives difficulties to KTM user. Any delays and disruptions would give bad consequences to its users. This research focuses on a commuter train that departs from Bukit Mertajam at 16:36 and arrive at Arau at 17:57. The objective of this study is to estimate the punctuality of the train arrival using fuzzy logic approach and MATLAB software was used for data analysis. There are three variables were considered to achieve the objective which is condition of the train, time of the train departure and total time the train travelled. Six linguistic variables are used which is punctual, late, too late, good, moderate and poor to interpret all the parameters. The result obtained from the MATLAB software was compared with the actual data based on TRUE or FALSE statement with accuracy rate is 87%. The result shows punctuality of the train arrival can be estimated by using fuzzy logic approach. Therefore, the model develop in this study has provided an advance method in estimating train punctuality.

TABLE OF CONTENTS

CONTENTS	PAGE
SUPERVISOR'S APPROVAL	ii
STUDENT'S DECLARATION	iii
ACKNOWLEDGEMENT	iv
ABSTRACT	v
TABLE OF CONTENTS	vi
LIST OF FIGURES	ix
LIST OF TABLES	x
CHAPTER ONE: INTRODUCTION	
1.1 Background of the Study	1
1.2 Problem Statement	2
1.3 Objective of the Study	2
1.4 Scope of the Study	2
1.5 Significance of the Study	2
CHAPTER TWO: LITERATURE REVIEW	
2.1 Public Transportation in Malaysia	4
2.2 Railway Transportation	5
2.2.1 KTM Commuter	5
2.3 Problem of Commuter Service	6
2.4 Fuzzy Logic Approach	7
2.4.1 Fuzzy Logic in Transportation	7
2.5 Summary	9

CHAPTER THREE: RESEARCH METHODOLOGY

3.1	Method of Data Collection	10
3.2	Method of Data Analysis	10
3.3	Linguistic Variable	11
3.4	Fuzzy Membership Function	12
3.5	Fuzzy Logic Research Framework	14
3.5.1	Fuzzification	14
3.5.2	Fuzzy Rule Based	16
3.5.3	Fuzzy Inference Engine	17
3.5.4	Defuzzification	17

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.1	Determining Input and Output Variables of Mamdani Fuzzy Inference System	19
4.2	Fuzzification	20
4.2.1	Fuzzy Number of Train Condition Variable	20
4.2.2	Fuzzy Number of Time Depart Variable	21
4.2.3	Fuzzy Number of Time Travelled Variable	22
4.2.4	Fuzzy Number of Estimated Time Variable	23
4.3	Parameter Used in Membership Function	24
4.4	Arrangement of Fuzzy Number for Input and Output Variable	25
4.5	Fuzzy Rule Based and Inference Engine	26
4.6	Defuzzification	28
4.7	Performance Evaluation Method	30

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1	Conclusions	32
5.2	Recommendations	32

REFERENCES	33
-------------------	-----------