

**Universiti Teknologi MARA**

**Solving the Travelling Salesman  
Problem by using Artificial Bee Colony  
Algorithm**

**Noor Ainul Hayati binti Mohd Naziri**

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

**July 2020**

## STUDENT'S DECLARATION

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



.....  
NOOR AINUL HAYATI BINTI MOHD NAZIRI  
2017796653

AUGUST 5, 2020

## **ABSTRACT**

Travelling Salesman Problem (TSP) is defined as a list of cities that must visit all cities that start and end in the same city with the aim of finding the minimum cost of time or distance. In this study, the Artificial Bee Colony (ABC) algorithm was used to resolve the TSP. ABC algorithm is an optimisation technique that simulates the foraging behaviour of honey bees and has been successfully applied to various practical issues. ABC algorithm has three types of bees that are used by bees, onlooker bees, and scout bees. In Bavaria from Library of Traveling Salesman Problem with the distance from a city to another city has been used to find the best solution of the shortest distance. The result shows that the best solution for the shortest distance that traveller have to travel all the 29 cities in Bavaria is 3974km.

Keyword: Travelling Salesman Problem, Artificial Bee Colony Algorithm

## TABLE OF CONTENTS

CONTENTS	PAGE
<b>SUPERVISOR'S APPROVAL</b>	ii
<b>STUDENT'S DECLARATION</b>	iii
<b>ACKNOWLEDGEMENT</b>	iv
<b>ABSTRACT</b>	v
<b>TABLE OF CONTENTS</b>	vi
<b>LIST OF FIGURES</b>	viii
<b>LIST OF TABLES</b>	ix

### CHAPTER ONE: INTRODUCTION

1.1	Background of the Study	1
	1.1.1 Travelling Salesman Problem	1
	1.1.2 Artificial Bee Colony Algorithm	2
1.2	Problem Statement	3
1.3	Objectives of the Study	4
1.4	Significance of the Study	4
1.5	Scope of the Study	4
1.6	Summary	4

### CHAPTER TWO: LITERATURE REVIEW

2.1	Travelling Salesman Problem	5
2.2	Artificial Bee Colony Algorithm	6
2.3	Improved Artificial Bee Colony Algorithm	7
2.3	Summary	8

### **CHAPTER THREE: RESEARCH METHODOLOGY**

3.1	Data Collection Method	9
3.2	Mathematical Model for Travelling Salesman Problem	9
3.3	Artificial Bee Colony Algorithm	10
3.4	Model Validation	15
3.5	Summary	16

### **CHAPTER FOUR: RESULTS AND DISCUSSIONS**

4.1	Data Collection	17
4.2	Artificial Bee Colony in MATLAB	20
4.3	The Shortest Distance and Optimum Route	23
4.4	Model Validation	25
4.5	Summary	26

### **CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS**

5.1	Conclusions	27
5.2	Recommendations	28

<b>REFERENCES</b>	<b>29</b>
-------------------	-----------