

**UNIVERSITI TEKNOLOGI MARA**

**TRADITIONAL MARBLE GAME  
USING ANT COLONY  
OPTIMIZATION**

**MUHAMMAD IZZAT IMRAN BIN CHE ISA**

**Bachelor of Computer Science (Hons.)**

**JANUARY 2017**

## ACKNOWLEDGEMENT

Alhamdulillah, praises and thanks to Allah S.W.T because of His Almighty and His utmost blessings, I was able to finish this research within the time duration given. Firstly, my special thanks goes to my supervisor, Sharifah Nurulhikmah Binti Syed Yasin because she always guide me and contribute in stimulating suggestions and encouragement. She also very patience in treating her students' behaviour. Without her I cannot completely finish write this thesis.

Special appreciation also goes to my beloved parents, Che Isa Bin Che Mat and Zalina Binti Talib because they appreciate my interests in computers and technology. They also helped me financially to finish this project. They always support me and give all the best in education.

Last but not least, I would like to give my gratitude to my dearest friends and classmates because they help me a lot in writing this thesis and give many ideas in this project.

## ABSTRACT

The traditional marble game is a stochastic game which has random probability of distribution or pattern that may be analysed statistically but not be predicted precisely. It needs to target which marble is the most suitable to be shot accurately. The study of the traditional marble game will be implemented in a game prototype using Ant Colony Optimization (ACO). ACO technique is used for searching method in order to find the nearest marble that can be selected to be shot. Instead of getting a random value of position, ACO helps to optimize the nearest marble. Collision detection technique is one of the physical laws that manipulate the movement and position of marbles. The prototype is evaluated based on the distance between the initial position and the selected marble position. The shortest distance is defined as the best result. A set of data containing the positions of marbles is tested for the ACO algorithm in the prototype. As a result, the accuracy of the shortest distance is moderate because the number of marbles is limited to fifty. The more the number of marbles, the higher the search accuracy. In the future, the traditional marble game can be applied with other search algorithms to optimize the solution.

# TABLE OF CONTENTS

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

## **CHAPTER ONE: INTRODUCTION**

1.1 Background of Study	1
1.2 Problem Statement	4
1.3 Objective	5
1.4 Project Scope	5
1.5 Project Significance	6
1.6 Research Methodology Framework	7
1.7 Conclusion	7

## **CHAPTER TWO: LITERATURE REVIEW**

2.1 Video Game	8
2.1.1 An Overview of Video Game	8
2.1.2 Video Game Platform	10
2.1.3 Design of Video Game	12
2.1.4 Video Game Genre	14
2.1.5 Importance of Video Game	16

2.2 Malaysian Traditional Game	17
2.2.1 An Overview of Traditional Game	17
2.2.2 Traditional Games	17
2.3 Swarm Intelligence	18
2.3.1 An Overview of Swarm Intelligence	18
2.3.2 Techniques of Swarm Intelligence	19
2.4 Ant Colony Optimization (ACO)	23
2.4.1 An Overview of ACO	23
2.4.2 Ant Colony Optimization Algorithm	25
2.4.3 Application using ACO	28
2.5 Physics Engine	29
2.5.1 An Overview of Physics Engine	29
2.5.2 Physical System	30
2.5.3 Application using Physic Engine	33
2.6 Similar System	33
2.7 Conclusion	35

### **CHAPTER THREE: METHODOLOGY**

3.1 Introduction	36
3.2 Project Overview	36
3.3 Project Analysis Phase	38
3.3.1 Preliminary Study	38
3.3.2 Data Collection	38
3.4 Project System Design and Implementation Phase	39
3.4.1 Ant Colony Flow	40
3.4.2 Collision Detection Flow	41
3.4.3 Evaluation	42
3.5 Implementation	43
3.5.1 Ant Colony and Collision Detection Integration with Traditional Marble Game	43
3.6 Method Used	44
3.7 Gantt Chart	47