

Universiti Teknologi MARA

Knowledge-Based System Development  
For The Game Congkak

Syah Ali Reza bin Yaacob

**Thesis submitted in fulfillment of the requirements for  
Bachelor of Science (Hons) Intelligent System  
Faculty of Information Technology And  
Quantitative Science**

**April 2006**

## DECLARATION

I certify that this thesis 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

APRIL 27, 2006

SYAH ALI REZA BIN YAACOB

2004633122

## ABSTRACT

Game playing can be considered as a typical intelligent task, because games always form a closed environment with limited possibilities and clearly defined rules. This research studies a traditional game, Congkak. This game has 2 *Rumah*, 2 rows of 7 *Kampung* and each *Kampung* consist of 7 *Buah*. The objective is to implement Minimax and  $\alpha$ - $\beta$  pruning in this game. In this project, some of the game rules are modified in order to make it into a turn-based game. The original game requires both players to move simultaneously. Therefore, the Minimax algorithm is not applicable. The players are human and a goal-based agent. The agent will use Minimax and  $\alpha$ - $\beta$  pruning as the search algorithms. Game rules will act as the evaluation function, evaluating all moves created by the algorithms. The tree size is an approximate  $3.6199 \times 10^{18}$ . As much as 100 test games are done within a week. The agent wins all game. This is due to logical errors in designing this game.

## TABLE CONTENTS

CONTENT	PAGE
TITLE PAGE	i
DECLARATION	ii
APPROVAL	iii
ACKNOWLEDGEMENT	iv
ABSTRACT	v
CONTENTS	vi - viii
LIST OF FIGURES	ix
<b>CHAPTER 1: RESEARCH OVERVIEW</b>	
1.0 Introduction	1
1.1 Background	1
1.2 Problem Statement	2
1.3 Objective & Aim of the Research	3
1.4 Scope of the Research	3
1.5 Significance of the Research	5
1.6 Software & Hardware Requirement	6
1.7 Summary	6
<b>CHAPTER 2: LITERATURE REVIEW</b>	
2.0 Introduction	7
2.1 Goal-Based Agent	7
2.2 Minimax	9
2.3 $\alpha$ - $\beta$ Pruning	9
2.4 Previous Research on Congkak	10
2.5 Summary	11

## **CHAPTER 3: METHODOLOGY**

<b>3.0</b>	<b>Introduction</b>	<b>13</b>
<b>3.1</b>	<b>Problem Identification &amp; Scope</b>	<b>13</b>
<b>3.2</b>	<b>Data Collection</b>	<b>14</b>
<b>3.3</b>	<b>Data Analysis</b>	<b>14</b>
	<b>3.3.1 Defining the Problem as a State Space Search</b>	<b>15</b>
	<b>3.3.2 Minimax Algorithm</b>	<b>16</b>
	<b>3.3.3 <math>\alpha</math>-<math>\beta</math> Pruning Algorithm</b>	<b>20</b>
<b>3.4</b>	<b>Prototype Design</b>	<b>22</b>
<b>3.5</b>	<b>Prototype Development</b>	<b>25</b>
<b>3.6</b>	<b>Prototype Testing</b>	<b>26</b>
<b>3.7</b>	<b>Documentation</b>	<b>27</b>
<b>3.8</b>	<b>Summary</b>	<b>27</b>

## **CHAPTER 4: RESULTS AND ANALYSIS**

<b>4.0</b>	<b>Introduction</b>	<b>28</b>
<b>4.1</b>	<b>Results</b>	<b>28</b>
<b>4.2</b>	<b>Problems Encountered</b>	<b>30</b>
<b>4.3</b>	<b>Summary</b>	<b>30</b>

## **CHAPTER 5: CONCLUSION**

<b>5.0</b>	<b>Introduction</b>	<b>31</b>
<b>5.1</b>	<b>Recommendation</b>	<b>31</b>
<b>5.2</b>	<b>Conclusion</b>	<b>32</b>