INTELLIGENT SCHOOL COMPUTER LABORATORY RESERVATION SYSTEM
BY USING MULTIPLE AGENTS BASED

A thesis submitted to the College of Arts and Sciences
in partial fulfillment of the requirements for the degree of
Master of Science (Intelligent System)
Universiti Utara Malaysia

by

Sulaiman Mahzan

© Sulaiman bin Mahzan, 2009, All Rights Reserved
Saya, yang bertandatangan, memperakukan bahawa
(I, the undersigned, certify that)

SULAIMAN MAHZAN
(89048)

calon untuk ijazah
(candidate for the degree of) MSc. [Intelligent System]

telah mengemukakan kertas projek yang bertajuk
(has presented his/her project paper of the following title)

INTELLIGENT SCHOOL COMPUTER LABORATORY RESERVATION
SYSTEM BY USING MULTIPLE AGENTS BASED

seperti yang tercatat di muka surat tajuk dan kulit kertas projek
(as it appears on the title page and front cover of project paper)

bahawa kertas projek tersebut boleh diterima dari segi bentuk serta kandungan
(dan that the project paper acceptable in form and content, and that a satisfactory
dan meliputi bidang ilmu dengan memuaskan.
knowledge of the field is covered by the project paper).

Nama Penyelia Utama
(Name of Main Supervisor): MR. MOHD. ZABIDIN HUSIN

Tandatangan
(Signature) : 

Tarikh
(Date) : 3/12/09
PERMISSION TO USE

In presenting this thesis in partial fulfillment of requirement for a postgraduate degree from Universiti Utara Malaysia, I agree that the University Library may make it freely available for inspection. I further agree that permission for copying of this thesis in any manner, in whole or in part, for scholarly purpose may be granted by my supervisor(s) or, in their absence by the Dean of the Graduate School. It is understood that any copying or publication or use of this thesis or parts thereof for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to Universiti Utara Malaysia for any scholarly use which may be made of any material from my thesis.

Requests for permission to copy or to make other use of materials in this thesis, in whole or in part, should be addressed to

Dean of College of Arts and Sciences
Universiti Utara Malaysia
06010 UUM Sintok
Kedah Darul Aman
ABSTRACT

One of the problems about school computer laboratory is to handle the reservation for class subject (non-computer based relation) or any events in Malaysia. The reservation process was still using manual approach. To make reservation, a user must fill the form; meet the administrator to check lab availability and lastly the admin will approve it. A computer system must be developed to manage the reservation for user request. This system was used multiple intelligent agents that assist the user and the admin to manage the lab reservation based on a few constraints such as holiday and permanent classes. The agents also try to give alternative session if the request session is not available. The agents have ability to evaluate user authentication based on inconsistent action on the system and will keep up the security level based on individual authentication. The collection of user action pattern is recorded then gives direction to the agent to reconstruct its internal action related to user behavior. FIPA-ACL as communication standard between the agents to make them able to be socializes in their environment.

This system was developed by using JAVA computer programming language. JAVA programming is the best choice to create multi-agent functions and reacted base on intelligent agents approach. The system will be deployed as a stand-alone system and also might share through internal local area network (LAN). MS Access was used as the database for storing the data and might it easy to integrate with Education Management Information System (EMIS) that already exist. The level of user’ acceptance was determined using Technology Acceptance Model (TAM) by Davis (1989) where data is gathered through a set of designed questionnaire. In conclusion, this system has a great potential to encounter school computer lab reservation problem by using intelligent multi-agent as human behalf.
ABSTRAK

Salah satu masalah mengenai makmal komputer sekolah ialah menangani tempahan untuk kelas (mata pelajaran yang bukan berorientasikan komputer) atau apa-apa majlis di sekolah di Malaysia. Proses tempahan makmal masih lagi menggunakan pendekatan manual. Untuk membuat tempahan, seseorang pengguna perlu mengisi boring khas; bertemu dengan penyelia makmal untuk memeriksa jadual makmal komputer dan seterusnya penyelia akan meluluskan permohonan tersebut. Oleh yang demikian, salah satu untuk menguruskan tempahan yang dibuat oleh pengguna ialah dengan membangun sebuah system komputer untuk tujuan tersebut. Sistem ini menggunakan agent-agent pintar yang membantu pengguna dan penyelia makmal untuk menguruskan tempahan makmal komputer dengan mengambil kira beberapa kekangan seperti cuti dan kelas makmal tetap. Agen-agenn ini akan mengambil initiatif untuk memberikan pendapat atau alternatif sesi yang sesuai sekiranya sesi yang dipilih tidak kosong. Agen-agen juga mahir untuk menentukan tahap capaian pengguna berdasarkan tindakan yang tidak konsisten semasa menggunakan system.

Satu set koleksi paten tindakan pengguna akan direkodkan dan ia akan memberi panduan kepada agen-agen untuk membina semula tindakan dalaman yang bersesuaian dengan kelakuan pengguna. Piawaian komunikasi FIPA-ACL dipilih sebagai komunikasi piawai untuk perhubungan antara agen dengan agen yang lain dan seterusnya membolehkan mereka saling berinteraksi dalam persekitaran sistem.

system ini mempunyai potensi yang besar untuk menangani masalah tempahan makna komputer sekolah dengan menggunakan pendekatan agen pintar yang mewakili pengguna.
ACKNOWLEDGEMENT

"IN THE NAME OF ALLAH S.W.T, THE MOST GRACIOUS, THE MERCIFUL"

Alhamdulillah, I have finally completed my Project for my master. I would like to express my highest gratefulness to Allah S.W.T. for encourage me and giving me extra patient and strength to complete this project.

First of all, I would like to address special appreciation to my beloved parent for their loving, caring, and supporting me by giving their moral support. Without them I will not be able to complete his project.

A special thanks goes to En Mohd Zabidin bin Husin as my dedicated Supervisor for this project. Thanks for his support, guidance, patience and tolerance whenever I need it towards the completeness of this project. Thanks also to other lecturers for helping me in some ways or another for giving his guidance, comment and encouragement.

Special thanks also for to my fellow friends for their kindness in sharing knowledge and given their moral support towards making this project. Last but not least, I would like to express my deep appreciation to those who involved directly or indirectly in completing the project.

Thank you.
TABLE OF CONTENT

APPROVAL ii
DECLARATION iii
ACKNOWLEDGEMENT iv
ABSTRACT V
ABSTRAK v
TABLE OF CONTENTS vii
LIST OF TABLES x
LIST OF FIGURES xii
LIST OF ABBREVIATIONS xiii

CHAPTER ONE: INTRODUCTION
1.0 Introduction 1
1.1 Project Overview 1
1.2 Problem Statement 2
1.3 Project Objectives 3
1.4 Project Scope 4
1.5 Project Significance 4
1.6 Outline Project 5
1.7 Conclusion 6

CHAPTER TWO: LITERATURE REVIEW
2.0 Introduction 7
2.1 User Acceptance 7
2.1.1 Technology Acceptance Model 8
2.2 JAVA 9
2.3 Artificial Intelligent 11
2.3.1 Intelligent Agent 13
2.3.1.1 Communication Agent 14
2.4 Similarities from the previous studies 17
2.4.1 UUM Web-Based Computer Laboratory Reservation System: A Prototype 17
2.4.2 Intelligent Parking System 18
2.4.3 Online Intelligent Hotel Reservation (IHR) using WAP-enabled mobile devices 18
2.5 Conclusion 19

CHAPTER THREE: RESEARCH APPROACH AND METHODOLOGY
3.0 Introduction 20
3.1 Project Methodology 21
3.1.1 Project Planning 21
3.1.1.1 Primary Data Collection 21
3.1.1.2 Secondary Data Collection 21
3.1.1.3 Project Framework 21
3.1.2 Requirement Analysis 22
3.1.2.1 Hardware Requirement 22
3.1.2.2 Software Requirement 22
3.1.2.2 User Requirement 23
3.1.3 Project Design 23
3.1.3.1 Database Development 24
3.1.3.2 System Architecture 29
3.1.4 Phase 4: Implementation 37
3.1.5 Phase 5: Testing 37
3.1.6 Phase 6: Maintenance 38
3.2 Research on Evaluation of User Acceptance 38
3.2.1 Conceptual Framework 38
3.2.2 Research design 39
3.2.3 Research Variable 39
3.2.4 Data Collection and Instrumentation 40
3.2.5 Benchmarking and Scale of Scores 40
3.3 Conclusion 40

CHAPTER FOUR: SYSTEM OVERVIEW
4.0 Introduction 41
4.1 Overview of the system 41
4.2 Interface Design 42
4.2.1 User’s Login 42
4.2.2 Computer Lab Reservation by the User 44
4.2.2.1 First Time User or New User 44
4.2.2.2 The User with Reservation History 46
4.2.2.3 The user with Reservation History but Not Available in That Day 47
4.2.2.4 The user with have already made reservation 47
4.2.2.5 The User with Selected Date is Holiday or Event Date 48
4.2.2.6 The User with Selected Date is not available 49
4.2.3 System Monitor by Admin 50
4.2.3.1 Insert New Holiday or Event Date 50
4.2.3.2 Remove a Holiday or Event Date 51
4.3 Conclusion 52

CHAPTER FIVE: RESULT AND FINDING
5.0 Introduction 53
5.1 Survey analysis 53
5.1.1 Section 1: Demographic Profile 53
5.1.2 User Acceptance Factor 54
5.2 Result Discussion 58
5.3 Conclusion 59

CHAPTER SIX: CONCLUSION AND RECOMMENDATION
6.0 Introduction 60
6.1 Conclusion 60
6.2 Recommendation 61
6.3 Future Work 62
# LIST OF TABLES

<table>
<thead>
<tr>
<th>FIGURE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 2.1 Java Versions</td>
<td>11</td>
</tr>
<tr>
<td>Table 2.2 FIPA-ACL message elements.</td>
<td>15</td>
</tr>
<tr>
<td>Table 2.3 FIPA-ACL performative’s message</td>
<td>16</td>
</tr>
<tr>
<td>Table 3.1 Hardware Requirement</td>
<td>22</td>
</tr>
<tr>
<td>Table 3.2 Software Requirement</td>
<td>22</td>
</tr>
<tr>
<td>Table 3.3 Com 1 (A5 – A7)</td>
<td>34</td>
</tr>
<tr>
<td>Table 3.4 Com 2 (A5 – A6)</td>
<td>34</td>
</tr>
<tr>
<td>Table 3.5 Com 3 (A6 – A3)</td>
<td>34</td>
</tr>
<tr>
<td>Table 3.6 Com 4 (A7 – A4)</td>
<td>35</td>
</tr>
<tr>
<td>Table 3.7 Com 5 (A7 – A2)</td>
<td>35</td>
</tr>
<tr>
<td>Table 3.8 Com 6 (A6 – A8)</td>
<td>35</td>
</tr>
<tr>
<td>Table 3.9 Com 7 (A8 – A2)</td>
<td>36</td>
</tr>
<tr>
<td>Table 3.10 Com 8 (A8 – A2)</td>
<td>36</td>
</tr>
<tr>
<td>Table 3.11 Com 9 (A7 – A1)</td>
<td>36</td>
</tr>
<tr>
<td>Table 3.12 Com 10 (A4 – A3)</td>
<td>36</td>
</tr>
<tr>
<td>Table 3.13 Com Error</td>
<td>36</td>
</tr>
<tr>
<td>Table 3.14 Lists of Independent and Dependent Variables</td>
<td>39</td>
</tr>
<tr>
<td>Table 5.1 Gender</td>
<td>53</td>
</tr>
<tr>
<td>Table 5.2 Group of Age</td>
<td>54</td>
</tr>
<tr>
<td>Table 5.3 Academic Background</td>
<td>54</td>
</tr>
<tr>
<td>Table 5.4 Working Experience in Computing Area</td>
<td>54</td>
</tr>
<tr>
<td>Table 5.5 Respondent’s Perceive Ease of Use Analysis</td>
<td>56</td>
</tr>
<tr>
<td>Table 5.6 Respondent’s Perceived Usefulness Analysis</td>
<td>57</td>
</tr>
<tr>
<td>Table 5.7 Summary of Result Finding</td>
<td>58</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 2.1</td>
<td>8</td>
</tr>
<tr>
<td>Theory of Reasoned Action (from Fishbein and Ajzen, 1975)</td>
<td></td>
</tr>
<tr>
<td>Figure 2.2</td>
<td>9</td>
</tr>
<tr>
<td>Technology acceptance model</td>
<td></td>
</tr>
<tr>
<td>(Davis, Bagozzi &amp; Warshaw, 1989)</td>
<td></td>
</tr>
<tr>
<td>Figure 2.3</td>
<td>10</td>
</tr>
<tr>
<td>Java bytecode can be executed on any computer with a JVM</td>
<td></td>
</tr>
<tr>
<td>Figure 2.4</td>
<td>12</td>
</tr>
<tr>
<td>Dimensions in AI (Russell and Norvig, 2003).</td>
<td></td>
</tr>
<tr>
<td>Figure 2.5</td>
<td>13</td>
</tr>
<tr>
<td>An agent with its environment</td>
<td></td>
</tr>
<tr>
<td>Figure 3.1</td>
<td>20</td>
</tr>
<tr>
<td>Waterfall Model of the System Development Life Cycle</td>
<td></td>
</tr>
<tr>
<td>Figure 3.2</td>
<td>21</td>
</tr>
<tr>
<td>Use Case Diagram</td>
<td></td>
</tr>
<tr>
<td>Figure 3.3</td>
<td>24</td>
</tr>
<tr>
<td>Databases interaction with i-Cors internal environment</td>
<td></td>
</tr>
<tr>
<td>Figure 3.4</td>
<td>25</td>
</tr>
<tr>
<td>The Comp Lab database’s tables</td>
<td></td>
</tr>
<tr>
<td>Figure 3.5</td>
<td>26</td>
</tr>
<tr>
<td>Table structure in Event database</td>
<td></td>
</tr>
<tr>
<td>Figure 3.6</td>
<td>26</td>
</tr>
<tr>
<td>The EMIS’s database architecture</td>
<td></td>
</tr>
<tr>
<td>Figure 3.7</td>
<td>27</td>
</tr>
<tr>
<td>TGStaf table with its associated tables in EMIS</td>
<td></td>
</tr>
<tr>
<td>Figure 3.8</td>
<td>28</td>
</tr>
<tr>
<td>List of fields in TGStaf table in EMIS</td>
<td></td>
</tr>
<tr>
<td>Figure 3.9</td>
<td>29</td>
</tr>
<tr>
<td>The system architecture</td>
<td></td>
</tr>
<tr>
<td>Figure 3.10</td>
<td>30</td>
</tr>
<tr>
<td>The agents’ relationship and communication among them in the internal system architecture</td>
<td></td>
</tr>
<tr>
<td>Figure 4.1</td>
<td>41</td>
</tr>
<tr>
<td>System Overview</td>
<td></td>
</tr>
<tr>
<td>Figure 4.2</td>
<td>42</td>
</tr>
<tr>
<td>Loading Page</td>
<td></td>
</tr>
<tr>
<td>Figure 4.3</td>
<td>43</td>
</tr>
<tr>
<td>Login Window</td>
<td></td>
</tr>
<tr>
<td>Figure 4.4</td>
<td>43</td>
</tr>
<tr>
<td>Unable Access Window</td>
<td></td>
</tr>
<tr>
<td>Figure 4.5</td>
<td>44</td>
</tr>
<tr>
<td>First page for a new user</td>
<td></td>
</tr>
<tr>
<td>Figure 4.6</td>
<td>45</td>
</tr>
<tr>
<td>“Buat Tempahan” or Make Reservation panel</td>
<td></td>
</tr>
<tr>
<td>Figure 4.7</td>
<td>45</td>
</tr>
<tr>
<td>i-Cors Agent panel</td>
<td></td>
</tr>
<tr>
<td>Figure 4.8</td>
<td>46</td>
</tr>
<tr>
<td>Computer Lab Weekly Schedule panel</td>
<td></td>
</tr>
<tr>
<td>Figure 4.9</td>
<td>47</td>
</tr>
<tr>
<td>i-Cors agent ask for reservation base on history pattern</td>
<td></td>
</tr>
<tr>
<td>Figure 4.10</td>
<td>47</td>
</tr>
<tr>
<td>i-Cors agent brief that regularly reservation date is not available</td>
<td></td>
</tr>
<tr>
<td>Figure 4.11</td>
<td>47</td>
</tr>
<tr>
<td>i-Cors agent ask for cancelation</td>
<td></td>
</tr>
<tr>
<td>Figure 4.12</td>
<td>48</td>
</tr>
<tr>
<td>The Selected Date and Time is Holiday</td>
<td></td>
</tr>
<tr>
<td>Figure 4.13</td>
<td>49</td>
</tr>
<tr>
<td>The Selected Date and Time is have the Class</td>
<td></td>
</tr>
<tr>
<td>Figure</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>4.14</td>
<td>System admin window</td>
</tr>
<tr>
<td>4.15</td>
<td>Insert a new Holiday or Event day</td>
</tr>
<tr>
<td>4.16</td>
<td>i-Cors saved confirmation</td>
</tr>
<tr>
<td>4.17</td>
<td>Remove a Holiday or Event day</td>
</tr>
<tr>
<td>4.18</td>
<td>i-Cors deleted confirmation</td>
</tr>
</tbody>
</table>
SQL - Structured Query Language
TAM - Technology Acceptance Model
TCP - Transmission Control Protocol
TRA - Theory of Reasoned Action
UAT - User Acceptance Testing
URL - Uniform Process Locator
UUM - Universiti Utara Malaysia
XML - Extensible Markup Language
WAP - Wireless Application Protocol

xiii
CHAPTER 1
INTRODUCTION

1.0 INTRODUCTION

This chapter provides some overview of the project. It covers the scope and the objectives of the project. It also covers the significance of developing a School Computer Laboratory Reservation System. Besides, the project framework was included in this chapter.

1.1 PROJECT OVERVIEW

In the new era of information age, computer skill becomes important skills that anyone must have it. ICT would change human work and increase the efficiency itself. Knowing about the important of ICT, Malaysia wants to become one of the most role players in ICT technology by developing MSC strategies. MSC was established on 1995 in order to become one of global hub for ICT and multimedia innovation, operation and services, transforms Malaysia into a knowledge-economy and achieve Vision 2020 to become developed nation (Multimedia Super Corridor (MSC) Malaysia, 2009). One of the core strategies is to develop human capital in ICT. It was brings the motivation for government to improve education quality that supports this new transformation. The government was taken the initiatives like building the particular emphasis to science and IT learning facilities for schools; increased educational support programs; revising the syllabus for mathematics and science; introducing Computer Literacy Program and computer aided learning methods; teacher training on computer usage (Ramasamy, e.t al, 2004). A part of its strategy is to develop at least a computer laboratory for each school and there is around more than 10,000 schools in Malaysia. According to Saadiyah & Luin, (2008) many secondary schools in Malaysia were supplied with computers, notebooks, LCD projectors and software and at the same time many new schools also have rooms that specially equipped with computers for students to attend classes. Every student will have chances to learn about computer technology and how to use it efficiency.
The contents of the thesis is for internal user only
REFERENCES


