DEVELOPMENT OF PRE-PROGRAMMED OPERATING COURSEBOT (PO'C'DON) FOR UCTI (UNIVERSITY COLLEGE OF TECHNOLOGY & INNOVATION)

VINOTHINI KASINATHAN

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Centre for Advanced Software Engineering
Faculty of Computer Science and Information System
Universiti Teknologi Malaysia

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This thesis is dedicated to my parents, my dad for always the pillar of necessities.
My mom for her driving force and support all this years.

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ABSTRACT

Expert systems are problem-solving programs that mimic the way human expert's reason. Expert systems have been developed by larger firms and businesses for a variety of applications. While only a few systems can be purchased, packages are available to enable those interested in developing their own. Expert systems are computer programs that use captured human knowledge to solve problems that ordinarily require human experts. They can be used by no experts as well as experts to improve problem solving capability and to provide assistance in areas such as auditing, tax, financial planning, as well as professional education. A chatterbot is a program, designed for the computer that is supposed to come off like it is a real person in a conversation. The idea of these programs is to give the user an assumption that the chatterbox is a real person, not a computer program. Current method used by UCTI is the manual way of employing marketing staff. There is no current system for this task. A new software called PO'C'DON will be developed. PO'C'DON is an expert system that is equipped with a knowledge base which specialises in the domain problem of courses provided by UCTI. The objective of PO'C'DON is to solve UCTI's problems in course information distribution. This report documents the development of the PO'C'DON (Pre-programmed Operating Coursebot Developed Only for Novices) expert system and is based on the Expert System Life Cycle (ESLC) methodology. Outcome of this report is to produce all the required software engineering technical documentation with the prototype of the system which has been implemented in UCTI.

ABSTRAK

Sistem pintar merupakan program penyelesai masalah yang dibangunkan mengikut ciri-ciri kepintaran manusia. Ia dibangunkan untuk pelbagai aplikasi. Memandangkan kurangnya sistem yang terdapat di pasaran, pakej diperkenalkan untuk mereka yang berminat membangunkan aplikasi mereka sendiri. Sistem pintar dibangunkan untuk menyelesaikan masalah yang selalunya memerlukan kepakaran manusia. Ianya boleh digunakan oleh semua pengguna tanpa mengira tahap kepakaran mereka bagi mempertingkatkan kebolehan penyelesaian masalah dan membantu dalam bidang audit, cukai, perancang kewangan dan juga pendidikan professional. Chatterbot merupakan program yang dibina untuk komputer yang meyerupai perbualan manusia. Matlamat program-program ini adalah supaya pengguna menganggap bahawa chatterbot ialah manusia sebenar, dan bukannya program komputer. Laporan ini merupakan keseluruhan pembangunan sistem pakar PO'C'DON (Pre-programmed Operating Coursebot Developed Only for Novices) yang dibina mengikut kaedah ***Expert System Life Cycle (ESLC)***. Pada ketika ini UCTI menggunakan kaedah yang lama iaitu mengambil orang untuk membuat pemasaran kursus-kursus yang ditawarkan. Perisian baru yang memenuhi semua informasi tentang UCTI akan di bina dan dinamakan PO'C'DON. Hasil laporan ini akan meliputi semua "software engineering technical documentation" dan system perisian PO'C'DON yang telah di implementasi di UCTI.

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CHAPTER 1

PROJECT OVERVIEW

This chapter is concerned with similar concerns to the abstract and provides an overview of the project with more details. It sets the scene by describing the company profile is explained in order to understand the purpose of the project builds. The methods used are explained and an overview is given on the fundamentals knowledge on Artificial Intelligence upon which the project is based.

1.1 Introduction

This sub chapter describes the introduction about the owners of UCTI and how did it form.

1.1.1 Company Background (Group Overview)

For over three decades, the Sapura Group has taken the lead in the acquisition and development of strategic technologies. Established in 1975, the Sapura Group is a 100% Malaysian-owned technology-based organisation. From a humble beginning as a telecommunications infrastructure & service provider, the

Group has expanded and diversified its businesses across four major business areas, namely: Secured Communications, Oil & Gas, Industrial & Automotive, Knowledge & Education and Premium Automotive Retail. Sapura Group listed entities are SapuraCrest Petroleum Bhd, Sapura Industrial Berhad, Sapura Resources Berhad.

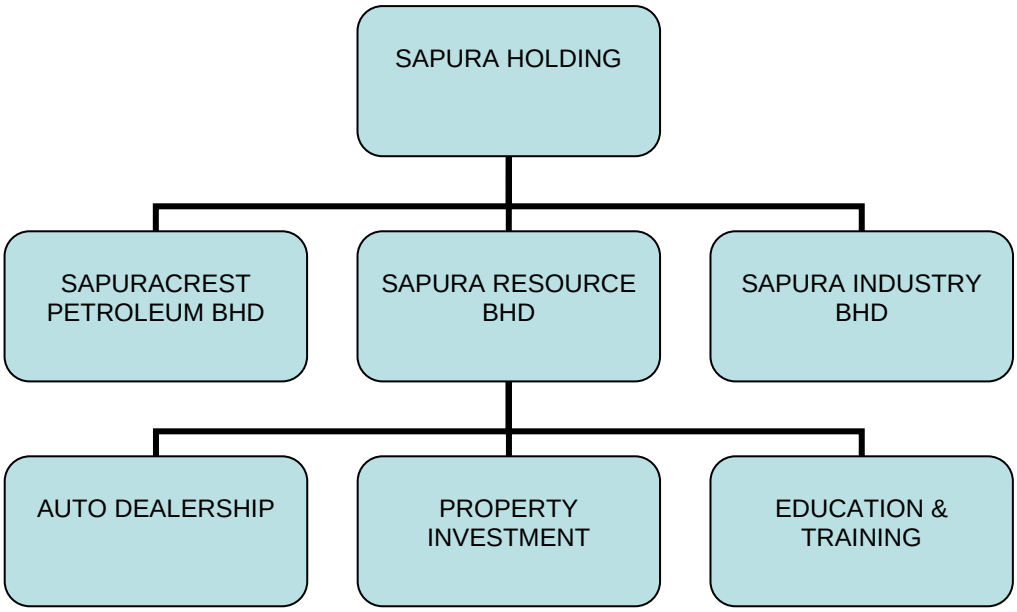

Figure 1.1 SAPURA'S Holdings Hierarchy Chart

Over the years, Sapura's business is backed by a fundamental belief in integrating People with Technology. Sapura's persistent efforts in capability-building of home-grown talents and aggressive investment in R&D have positioned the Group to be globally competitive, producing highly-specialised and multi-skilled pool of technology experts. The Sapura Group today has capabilities and competencies that cover the full lifecycle of systems and products.

Sapura's globalisations effort has taken them to countries such as Australia, Singapore, Brunei, Thailand, Sri Lanka, Philippines, Pakistan and China. Sapura is a strong technology advocate. This is evident in their efforts to continuously invest and nurture human capital and intellectual growth. With Technology as a key determinant in the development process to move the economy up the value chain,

Sapura through our subsidiary Sapura Resources Berhad [SAPRES] has evolved to become a strategic investor in human capital development through providing education and training services.

Human capital and innovation capabilities are critical resources that fuel the development of economies. The Asia Pacific University College of Technology and Innovation (UCTI) is a level institution for technology education in Malaysia, while the Asia Pacific Institute of Information Technology (APIIT) offers innovative programmes in a number of IT specialisations to address the national need for technology professionals at all levels, and to equip them with skills required for the fast growing multi billion ringgit IT industry in Malaysia. Both Institutions are recognised for the quality of education provided, and have developed a reputation for producing graduates who are highly sought after by employers.

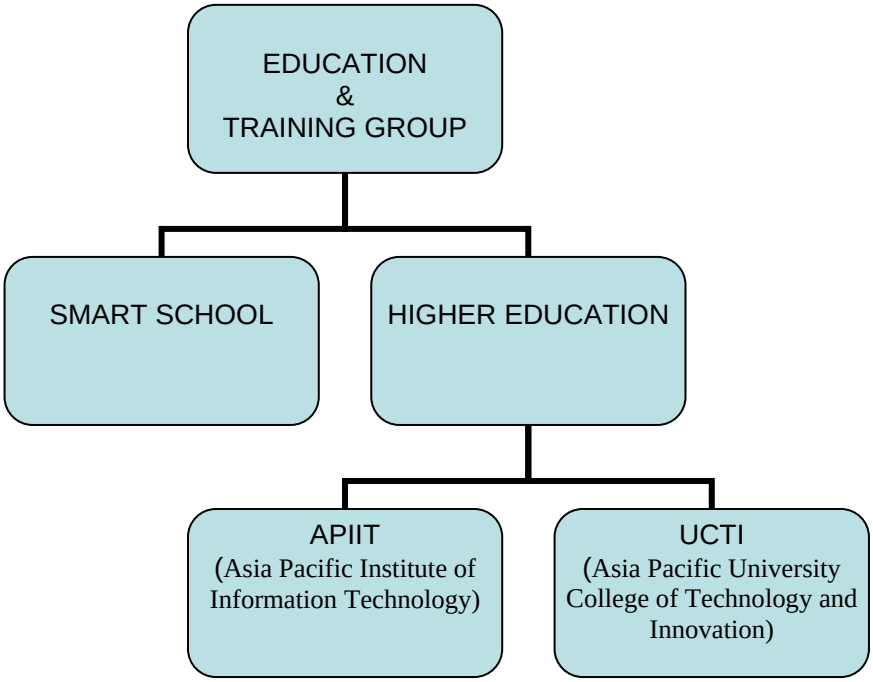

Figure 1.2 Hierarch chart for the Education & Training Group

Together, both UCTI and APIIT aim to ensure a continuous supply of skilled Technology professionals in Malaysia and to raise the level of Research, Development and Commercialisation in the country. APIIT is also a major regional

player with activities and overseas centres in Karachi [Pakistan], Colombo [Sri Lanka], and Delhi [India].

In addition, UCTI and APIIT in Malaysia provide high-quality education to an

international community of students from more than 50 countries, and therefore play integral roles in supporting the Nation's mission to establish Malaysia as an international hub of education excellence.

Recognising the need to contribute to the development of young Malaysians at an even younger age, the Group has also set up the APIIT Smart School with the objective of providing innovative, multidisciplinary and holistic education at Primary and Secondary levels. Developed with a clear vision of producing students who are thinking, learning and caring, the Smart School is benchmarked against international standards, and the use of technology to support teaching/learning activities is indeed an integral feature.

1.1.2 Company Origins

Initiated by the Malaysian Government to address the critical shortage of IT professionals at all levels in Malaysia and the region, APIIT was tasked with producing IT professionals equipped with necessary skills required by the fast-growing multibillion-ringgit IT industry in Malaysia. APIIT works toward the vision and strategy of the Malaysian Government for 2020 by filling the national need for technology professionals at all levels, particularly those with specialist skills.

Since 1994, the Institute has now grown from being a successful local player in Malaysia to establishing itself as a major regional player, with activities and overseas centres in Karachi and Lahore, Pakistan; Colombo, Sri Lanka; Panipat, India; and Perth, Australia.

Supported by the Ministry of Science, Technology and Environment, approved by the Ministry of Education and funded by the Sapura Group of companies, APIIT has built solid reputation for excellence in IT education.

UCTI, the Asia Pacific University College of Technology and Innovation, is a premier private university in Malaysia. Since its inception in 1993 as the Asia Pacific Institute of Information Technology (APIIT), the University has produced more than 14,000 graduates.

Together with APIIT, UCTI offers internationally benchmarked undergraduate and postgraduate programmes in various areas of Computing, Information Technology, Media, Technopreneurship, and Business & Computer Games which focus on developing students into well-rounded professionals with the right blend of knowledge, skills and attitudes to succeed in their careers. Having established operations in Malaysia, India, Sri Lanka and Pakistan, employability is a major focus at UCTI and APIIT at all its sites.

Asia Pacific University College of Technology & Innovation (UCTI) has just been awarded the “Education Excellence Award 2007 (University Category)” by NAPEI (National Association of Private Education Institutions). The prestigious award was presented by Y.B. Ong Tee Keat, Deputy Minister of Higher Education, Malaysia on 29th November 2007 at the NAPEI Awards Ceremony. Award for Education Excellence 2007 is recognition of UCTI standing as among the top private university in Malaysia.

APIIT and UCTI together offer more than 50 programmes at Foundation degree, Diploma, Bachelor's degree and Master's degree. All programmes share common themes of creativity and innovation, and the notion of technology as a key enabler. UCTI offers a wide range of specialist degree programmes, all of which are quality assured and awarded in association with Staffordshire University. This arrangement means that students will get degrees which are awarded in association with Staffordshire University.

UCTI and APIIT will continue to expand the portfolio of Technology programmes offered to include areas such as Engineering, Media, Entertainment Technology, Bioinformatics and Biotechnology, Tourism Technology, Film Technology and Sports Technology.

1.1.3 Company Mission

Our mission is to ensure a continuous supply of skilled IT professionals to meet the shortage in Malaysia and the region, to raise the level of IT development in the country, and to meet the IT goals of the Multimedia Super Corridor as well as the region.

1.1.4 Vision and Aims

Their vision and aims are as below

- To tighten the relationship between industry and university to fulfil the needs of the industry
- To practice education democracy through giving opportunities to public to increase professionalism
- To prepare curricula and standards for educational and training programs
- To develop creative and innovation student processing a high technical skills and sense

1.2 Technology and Innovation

This sub chapter describe how the idea of the chatterbot concept begin.

1.2.1 Introduction to Artificial Intelligence

"Works by Herb Simon (1995) have shown that Artificial Intelligent can have two purposes. One is to use the power of computers to augment human thinking, just as we use motors to augment human or horse power. Robotics and expert systems are major branches of that. The other is to use a computer's artificial intelligence to understand how humans think. In a humanoid way. If you test your programs not merely by what they can accomplish, but how they accomplish it, they you're really doing cognitive science; you're using AI to understand the human mind."

Artificial Intelligence (AI) can be generally defined as intelligence exhibit by anything created by humans or other sentient beings. Our perceptions of AI tend to be clouded by science fiction movies in which machines act like humans. However, there is some value in the fact that we instantly compare the intelligence of a machine to the intelligence of a human because this is precisely the approach which is taken in the scientific community.

Here are a few definitions of Artificial Intelligence

- The study of how to build and/or program computers to enable them to do the sorts of things that minds can do
- Making computers do thing that would require intelligence if done by people
- The development of computers whose observable performance has features which in humans we would attribute to mental processes
- The science of intelligence in general
- The intellectual core of cognitive sciences

1.2.2 Areas of Artificial Intelligence

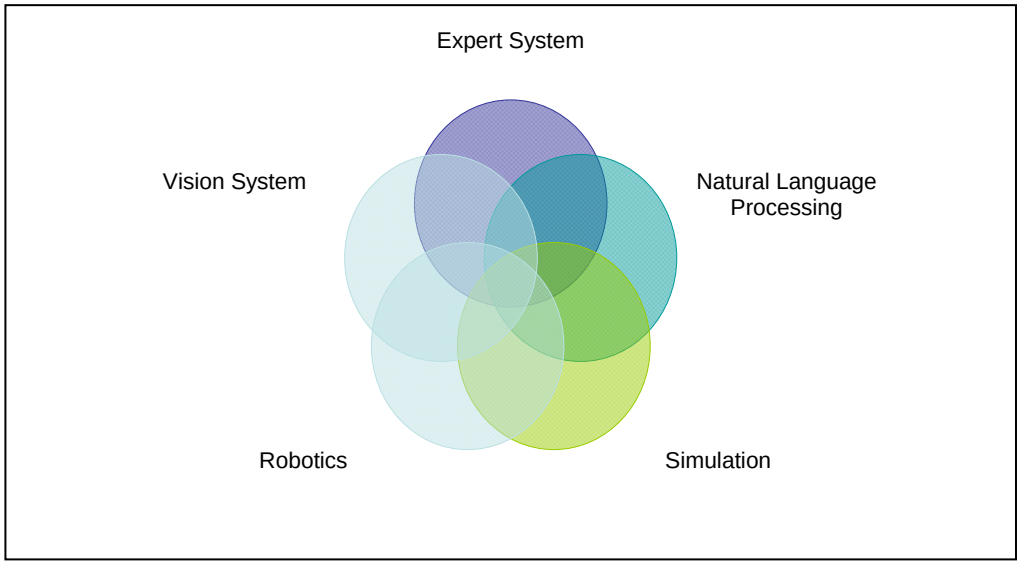

Figure 1.3 Show the Areas of Artificial Intelligence

i **Expert System** is the most mature and widely used commercial application coming out of artificial intelligence. In an expert system, the computer applies heuristics and rules in a knowledge-specific domain to render advice or make recommendations, much like a human expert would. Expert systems have managed to achieve fairly high levels of performance in task areas which require a good deal of specialized knowledge and training. Often they perform tasks which are physically difficult, tedious s, or expensive to have a human perform.

ii **Natural language processing (NLP)** is a subfield of artificial intelligence and computational linguistics. It studies the problems of automated generation and understanding of natural human languages. Natural-language-generation systems convert information from computer databases into normal-sounding human language. Natural-language-understanding systems convert samples of human language into more formal representations that are easier for computer programs to manipulate.

iii **Simulation of human memory capabilities.** Interactive simulation environments constitute one of today's promising emerging technologies, with applications in areas such as education, manufacturing, entertainment and training. These environments are also rich domains for building and investigating intelligent automated agents, with requirements for the integration of a variety of agent capabilities, but without the costs and demands of low-level perceptual processing or robotic control.

iv **Robotics** deals with the practical application of many artificial intelligence techniques to solving real-world problems. This combines problems of sensing and modelling the world, planning and performing tasks, and interacting with human beings and other robots. Plus we get to play with some pretty neat toys, and call it research.

v **Vision Systems is to make useful decisions about real physical objects and** scenes based on sensed images. It uses statistical methods to extract data using models based on geometry, physics and learning theory. Vision applications range from mobile robotics, industrial inspection and satellite image understanding, to human computer interaction, image retrieval from digital libraries, medical image analysis, proteomic image analysis and realistic rendering of synthetic scenes in computer graphics

1.2.3 Definition of Chatterbot

A chatterbot is defined as a bot program which attempts to maintain a conversation with a person. Among its many implementations, the majority successful chatterbots must be able to process natural language, and craft meaningful and coherent responses based on user input. Many chatterbots also attempt to implement artificial intelligence by including methods that learn form conversations and progressively expand its knowledge with each session

The famous Alan Turning proposed in 1950 a test to determine program's capability to act human-like. His test required that a human judge engage in a conversation with both the program being testes and another human. If the judge, deliberately trying to determine the true nature of both chats, believes that the program would pass the Turing test. However, no programs have passes the Turing test yet.

1.2.3.1 Early of Chatterbot

Early chatterbots faced the limitations of computer systems at the time and could not command large processing power and storage space. However, in the 1960s and early 1970s, a few chatterbots emerged that solidly establishes a foothold for future chatterbots: Eliza, Parry and SHRDLU.

i **Eliza.**

In 1966, the Eliza bot was written by Joseph Weizenbaum. This program, which parodied a therapist, was highly successful in producing human-like responses. Despite its fairly simple pattern recognition and its limits word associations and responses, Eliza was very convincing because it used the concept of psychotherapy, as Weizenbaum explained to sidestep the problem of giving the program a database of real-world knowledge. Therefore in operation, Eliza would take user input, maths certain keywords, and construct a response that used parts of the input through pattern matching. Most of the time, the response is in the form of a question. By doing this, Eliza was able to have users continue talking by answering questions while not knowing a single thing about the conversation. In a sense, the user is talking to him or her.

ii **Parry.**

Parry was written in 1972 by psychiatrist Kenneth Colby, then at Stanford University. Parry's personality as a paranoid schizophrenic was a complete opposite of Eliza's personality was a psychotherapist. Parry was a step up from Eliza because it tried to add more personality through beliefs and emotional

classification (simply accept, reject, neural). Instead of just matching trigger words with responses, Parry has a conversation strategy built in for better dialoguing

iii **SHRDLU.**
Written by Terry Winograd at the M.I.T. Artificial Intelligence Laboratory in the late 1960s, SHRDLU focused on understanding natural language and artificial intelligence rather than respond in a humanlike fashion. SHRDLU operated in a virtual world containing objects. By knowing very little at first, SHRDLU could learn about the objects in the world and retain that knowledge (i.e. one can stack rectangular blocks on top of each other but not pyramids). Since SHRDLU has a memory bank, it could process input in context, deduce what a user meant by past inputs and contain a record of the current state of the world. SHRDLU was a good demonstration of artificial intelligence in programs

1.2.3.2 Modern Chatterbots

Modern chatterbots have evolved from their classic predecessors by utilizing better natural language processing and by implementing learning algorithms that adapt to use input. While there are many chatterbots today, two stand out for their new approaches in generating human response: Alice and Jabberwacky.

i **Alice.**
Alice, a chatterbot created in the late 1990s by Richard Wallace and many contributors, uses heuristics in pattern matching to process input and respond accordingly. It was successful in winning the Loebner prize for 2000 and 2001. A unique feature of this bot is that it uses an XML DTD called AIML (Artificial Intelligence Markup Language). Rules for pattern matching can be specified in AIML making it possible to quickly change the behaviour of the chatterbot.

ii **Jabberwacky.** Most chatterbots function by processing input and then applying a set of rules to craft an output that is hopefully as human-like as possible. They do not actually attempt to understand the conversation. However, a very recent

chatterbot, Jabberwacky, seeks to understand the conversation for more relevant responses by contextual pattern matching techniques. Jabberwacky incorporates artificial intelligence b learning and storing all user input. In future responses, Jabberwacky uses the learnt material. “Works by Jabberwacky (2006) have shown if you speak in a foreign language it will learn it, and respond appropriately if it has enough to go on. It can be taught slang English, word games, jokes and any other form of identifiable language trait.” Today, Jabberwacky represent some of the latest technologies that chatterbots are implementing.

1.3 Project Background

This report documents the development of the Pre-programmed Operating Coursebot Developed Only for Novices (PO‘C’DON) using the Expert System Development Life Cycle.

PO‘C’DON is an expert system that is equipped with a knowledge base which specialises in the domain problem of courses provided by UCTI. The objective of PO‘C’DON is to solve UCTI’s problems in course information distribution.

1.4 Project Scope

In this scenario, the systems of running things at UCTI are looked into. After some consideration, the author to focus on the courses provided by UCTI and some crucial components related to them. The following is the domain problem specification drawn up by the author

The distribution of Course Information, Course Fee Structures, Academic Entry Requirements to study at UCTI and the Career/job Opportunities available to students upon graduation from UCTI

This statement becomes the main direction/heading for the author, that is, to develop a system that can address the above mentioned domain satisfactorily.

1.5 Project Benefits

The descriptions of the main deliverables are:

- Cost effective software
- 100% delivery on client requirement
- An user friendly interface
- Revenues increased
- 62% of visitors converted to registrations
- An increase in usability

1.6 Project Deliverables

The deliverables for the activities during the event of the Industrial Attachment is

- SRS documentation
- SDD documentation
- STR documentation
- STD documentation
- Software Prototype

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