

**USING ADAPTIVE NAVIGATION SUPPORT METHOD
FOR INTELLIGENT WEB-BASED LEARNING
SYSTEMS**

Technical Report for the
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By

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HUMAN CAPITAL DEVELOPMENT

Number of Human Capital		On-Going	
		Malaysian	Non-M
1	No. of Master student		1
2	No. of PhD Student		
3	No. of Undergraduate Student (PSM/SRA)		1
Total			2

Project progress report must be submitted to CRIM every six (6) months using the **UTeM/CRIM/RND/006** form
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1. **Number of Related Research Conference/Training/Workshop attended: FOUR**

2. **Publication status**

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- ii) Bayasut, Bilal, Pramudya Ananta, Gede and Basiron, Halizah, ULUL-ILM : 'The Design of Web-Based Adaptive Educational Hypermedia System Based on Learning Style'. Proceedings of the 13th International Conference on Intelligent Systems Design and Applications (ISDA 2013), 08-10 December 2013, UPM, Malaysia. **(published)**
- iii) Bayasut, Bilal and Pramudya, Gede and Basiron, Halizah (2013) *The Review of Adaptive Educational Hypermedia System Based on Learning Style*. In: Colloquium On Active Learning (CAL 2013), May 2013, UTeM. **(published)**
- iv) Pramudya Ananta, Gede and Basiron, H. and Abdullah, T.A. (2012) Methods for adaptivity in intelligent web-based learning systems. In: International Conference on Active Learning (ICAL2012), September 2012, UTeM. **(published)**

3. **Intellectual Property Rights related activity (IP search / IP talk attended etc)**

-

4. **Number of Commercialization activity (exhibition/competition/business effort etc.)**

-

Research Constraint, if any

- i) The software that was planned to be used to develop the web-based system is no longer sold. Instead, we use Moodle, another tool to develop web-based adaptive system.
- ii) There was a student who did the research for her PSM. Besides, we have a Master student that is working on slightly similar topic with our research.
- iii) The simple evaluation phase is done but cooperative evaluation is preferred.

DECLARATION OF PROJECT LEADER

I acknowledged UTeM in providing the fund for this research work.

I certify that the information given in this project progress report is true to the best of my knowledge.

Project Leader's Signature :



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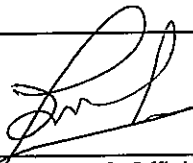
Date :

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ENDORSEMENT BY DEAN or DEPUTY DEAN (RESEARCH), FACULTY/CENTRE

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DEDICATION

We would like to give a token of appreciation to our families who had given us full support and motivation to me in the completion of the project. Our source of inspiration had come indefinitely from the exchange of ideas with our colleges and the faculty as well as our beloved students. For that, we would like to share our gratitude and thankfulness to all.

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First of all, we would like to voice our supreme gratitude and praises to Allah who protect us with His unlimited grace so that we are able to accomplish the project successfully. It is His unlimited promises gave us support and power to move forward.

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ABSTRACT

Students' need to attend the lessons at a single location, at a fixed time or at fixed amount of time for educational interaction is a challenge of traditional teaching. As the teaching in classroom is used to be conducted by lecturers using a single teaching method, students may not be able to adapt to the teaching method. Moreover, because of the size of classes, lectures have been unable to provide more individualized learning environments. Intelligent Tutoring Systems (ITS) have been introduced to cater individual learning for some decades. This project is to design and develop a CLIPS tutoring system with the implementation of adaptive link hiding technologies for catering students' needs, learning styles, or learning pace. The prototype of the system was trialled on 20 (twenty) undergraduate students in order to find out its efficacy. The results showed that the system enabled to improve students' knowledge as well as their comprehension to the CLIPS.

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LIST OF ABBREVIATIONS

AVG	-	Average
CLIPS	-	C Language Integrated Production System
FTMK	-	Fakulti Teknologi Maklumat dan Komunikasi
GPL	-	General Public License
ITS	-	Intelligent Tutoring System
KBS	-	Knowledge Base System
LMS	-	Learning Management System
MCQ	-	Multiple Choices Question
Moodle	-	Modular Object-Oriented Dynamic Learning Environment
S.D	-	Standard Deviation
SDLC	-	Software Development Life Cycle
UTeM	-	Universiti Teknikal Malaysia Melaka
VLE	-	Virtual Learning Environments
PD	-	Professional Development

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CHAPTER I

INTRODUCTION

1.1. Project Background

Knowledge Base System (KBS) is a core subject for Bachelor of Computer Science (Artificial Intelligence) course in Universiti Teknikal Malaysia Melaka (UTeM). This subject will be taken by second year students of Bachelor of Computer Science (Artificial Intelligence) course. C Language Integrated Production System (CLIPS) is a forward-chaining, pattern-matching knowledge-based system shell. Using CLIPS is one of important topics in KBS course.

Every single human have their own learning path and the ability to learn a new knowledge is different. So, this project will design and develop an adaptive tutoring system. Adaptive tutoring system is one way to analyse user characteristics by the way they answer the test and try to give the suitable learning material (Ananta, Basiron, and Arifin, 2012).

For an example, a teacher will use only one method to teach in class. For those who unable to catch up some part of content then will miss. We cannot expect all teachers to teach according the level of each student because this is time consuming. Therefore, how to help students in learning that matches their individual

goal, study path, and current knowledge will be a new challenge in this era. Adaptive presentation and adaptive navigation support are two main methods for implementing adaptivity in adaptive tutoring systems (Ananta et al. 2012). Link hiding technique is one of the subdivided from adaptive navigation support and will implement into adaptive tutoring system. Adaptive link hiding also have three branches which are hiding, disabling and removal.

Adaptive link hiding is use to hide the additional learning material. The system will predict whether the user was likely to access the link to additional material (Oboko and Wagacha, 2012). Learning path will be optimizing by using link hiding technique. Unrelated or unnecessary link will hide and this means that they will study only necessary topics. Hiding technique is easy to understand and implement. Besides, it is more effective to restrict navigation space (Mekpiroon, Tummarattananont, Pravalpruk, Neetiwit and Apitiwongmanit, 2008).

1.2. Problem Statements

- i. As the teaching in classroom is conducted by one lecturer using a single teaching method, some undergraduate students may not be able to adapt to the teaching method. Hence, the students will get confuse and difficult to continue learning.
- ii. Lecturers are unable to give full attention to every student in the class as there are too many student ratios to one lecturer.

1.3. Objectives

- i. To design a CLIPS tutoring system with adaptive link hiding technique.
- ii. To develop a CLIPS tutoring system with adaptive link hiding technique for the usage of both lecturer and student.
- iii. To evaluate a CLIPS tutoring system with adaptive link hiding technique from trial.

1.4. Scope

In this project, adaptive link hiding technique is division of adaptive navigation support will be implemented in CLIPS tutoring system. The CLIPS tutoring system will include three topics which is introduction of CLIPS, fact and rule. The users of this system are both the lecturer and student.

1.5. Project Significance

The project is to design a CLIPS tutoring system with adaptive link hiding technique. This system is developed to hide link that are not ready to be learned for the purpose of limit the navigation space. Link hiding that limits the number of navigation opportunities will reduce the user's cognitive overload and prevent the user disorientation to ensure effective learning.

1.6. Expected Output

- i. Design and develop a CLIPS tutoring system with adaptive link hiding technique that will contribute to UTeM as second year second semester students of Bachelor of computer Science (Artificial Intelligence) course learning assistance.
- ii. Help users to learn CLIPS by using this system. User level of understanding can be known from the test result.

1.7. Conclusion

In conclusion, this project will design and develop CLIPS tutoring system with adaptive hiding link technique. This is due to inability of lecturers to cater all the student needs. The next chapter will discuss about literature review and project methodology at depth.

CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1. Introduction

Fact and finding, methodology, project requirements and project schedule will discuss in this chapter. The purpose of this chapter is to do more research on the adaptive link hiding technique. To support and get some ideas for continue this project by browse some journals as references.

2.2. Review on Learning Styles

People are different. Different people tend to have different learning styles, in other words there are various types of learner. For example, personal style will influence human thinking either in working, playing or making a decision (Stahl,

1999). Therefore, by just having one learning style is not efficient. According to researchers in their pedagogy view, the learning process must be dynamic and intelligent to meet the need of different user. However, an applicant and trustful system or models are seldom very expensive and hard to be developed.

Tarver and Dawson (1978) reviewed studies that matched visual learners to sight word approaches while auditory learners to phonic approaches. However, this technique is not efficient (Arter & Jenkins, 1979). Besides that, Kampwirth and Bates (1980) also concluded that it is not an effective way to match student's modality strengths to reading materials. Kavale and Forness (1987) and Snider (1992) using a more advanced technique which is meta-analysis to review on the technique of preparing studying material according to matching strategy. The result shows that neither modality testing nor modality teaching are effective (Stahl, 1999). In addition, a more recent study of David (2009), by just matching study material accordingly is not enough.

According to Stahl (1999), there are various ways of learning styles. Students can be two-dimensional or three-dimensional, simultaneous or sequential, reflective or impulsive or others. Learning preference, cognitive style and personality types can take into account in learning. However, it is almost impossible to meet all the preferences of different learning. Besides learning style, students also varied in term of the amount of exposure to written text with different skill and abilities and the exposure to languages. Rather than different methods appropriately being applied to different people, it is more appropriate to consider having different methods being appropriately applied to different people with different level or stages in their development. Although the human expert tutor can be flexible where he or she can adapt a proper sequence of lessons and training speed accordingly, but the expert tutor is infrequent due to attendance and expensive (Ghadirli and Rastgarpour, 2012).

2.3. The Computer as a Tool for Learning

In 1970s, the computer was being introduced into education. Nowadays, almost every school has computers and computers-related technologies. As technology improves day by day, the computer has been slowly becoming the tutor or virtual teacher replacing teacher. Due to the growth of the computer software, an online course are getting more and indirectly causes the learning opportunities in a different of subject area increased. With the advancement of technology, an existing and interesting learning environment can be created for the sake of students. However, implementation of a successful and interesting learning system with technology is not easy and has been widely discussed. Question like how would one improve to a higher level of technology are arising. According to studies, the majority human believes that the main purpose of expansion of technology should be as a learning tool instead of to enhance student in technological knowledge. It is believed that technology will enhance student learning and achievement.

Much research has been done by researchers in order to understand the role of technology in education toward children. The usage of computer in the classroom was at first being used to teach basic skills and traditional curriculum by acting as a supplement of teacher to deliver instruction. Computer and related technologies have expanded from an instructional delivery medium to a transformational tool and an integral part of the learning environment since the last decade.

According to Means and Olson (1995), fundamental changes in classrooms and schools can support by technology with the benefits in terms of student motivation, self-direction and accomplishment. Another emerging body in their research stated computers and technology play an important role for reforming education. In addition, Fouts and Stuen (1999), student motivation and enthusiasm has influenced by technology.

These findings propose that technology can help students to gain experience education, to understand content, become active student, and learning is connected to the “real-world”. Besides that, Solmon (1998) also report that majority of teacher

believed that student learning will improve by technology which is a powerful tool. Other than that, Birenbaum and Kornblum (1998) has concluded a positive role of computer mediated learning communities is helping teachers, students and families to find the educational resources.

In short, when using computer in learning, student tend to learn fast and better memorization. Besides that, computer has positively affected student's attitudes toward learning and school. Students result does not guarantee with the computer and computers-related technology but also included many other factors that play important roles such as instructional design and software complex. Besides that, an intelligent tutoring system with the add-on of advanced planning and natural language will become the focus of the new generation (Fouts, 2000).

2.4. Intelligent Tutoring System (ITS)

Nowadays, people live in a world that is full with technological advancement where web-based learning and intelligent learning often been discussed. Artificial intelligence is one of the techniques that have been applied in education over the past 25 years with the noticeable result.

Intelligent Tutoring System (ITS) was origin from the Artificial Intelligence (AI) movement of the 1950's and early 1960's (Ghaoui and Janvier, 2001). Tutoring systems that adapt artificial intelligence techniques into computer programs to facilitate instruction is name ITS (Gharehchopogh *et al*, 2011). Provide one-on-one lessons is the goal of ITS. According to Benjamin Bloom 1984, students who undergo one-to-one lessons perform better than students who undergo traditional classroom lessons by two standard deviations. ITS let participate to form their skill by perform tasks just like training simulations. ITS will adapt instructional strategies, in term of content and style. Besides, ITS will also provide explanations, examples, demonstrations, and practice problem as required (Ong and Ramachandran, 2000).