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Pre-Generation of Student Module in Intelligent Tutoring System

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ABSTRACT

Learning is one of the most important fields in the world to promote innovative ideas regarding education and research. Without tutoring system no one can get information of any new technologies. We proposed intelligent tutoring system(ITS) which can provide directly interaction with students without interference of human being .A large amount of researches have been used ITS for assessment, reforming of the learning objects and change of the learning object finding paths. Intelligent tutoring system will take place of proficient human tutors. We investigates and discuss all levels and provide feedback of the proposed system. Hence feedback phase produced learning than simple practice. Therefore we are analyzing learning system using ITS to show technology advancement to the world and show importance for the quality of work.

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Keywords : Intelligent Tutoring System, Artificial Intelligence, Cognitive Tutors,

1. INTRODUCTION

This work is related to Artificial Intelligence, specifically in Intelligent Tutoring System (ITS), which has been an issue in teaching. Various researchers have worked on ITS, some focused on a certain subject, for example how to teach math's by using ITS (Htaik, T.T., & Amnuaisuk, P.S., 2003) while others go further to make it global or general means in various fields. For a better understanding on ITS bellow are some explanations on issues surrounding the subject.

A system that provides direct modified tutoring or response to students is ITS. While doing a task, ITS gives response to the students without the interference of human. ITS can play major role in a range of different fields or domain. However, those systems are more barely conceived as AI systems. Further especially expert systems built to replicate characteristics of a human teacher. ITS comprise of four subsystems or modules. Such as, the interface module, the expert module, the student module, and the tutor module as shown in figure1

* The material presented by the authors does not necessarily portray the viewpoint of the editors and the management of the Institute of Business and Technology (IBT) or Yala Islamic University, Thailand and University of Sindh, Jamshoro, Sindh, Pakistan.

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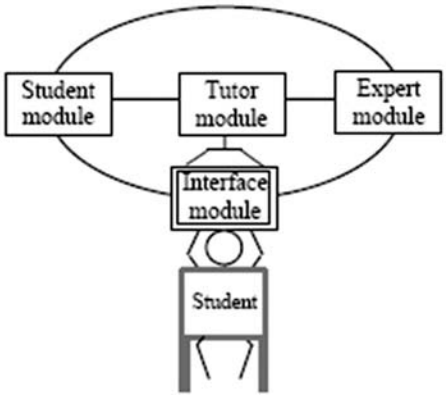
Fig. 1
The general architecture of ITS. (Htaik, T.T., & Amnuaisuk, P.S., 2003)



The interface module supports to intend for the students to interrelate with system. Commonly through a graphical user interface. Sometimes through simulation of the task domain the student's learning. The expert module illustrate knowledge in the subject-mater that ITS is teaching. More over, that module addresses an specialist or domain representation controlling a sort of the knowledge of the subject. The student module controlling descriptions of student understanding or activities. Also keep students misconceptions and knowledge gaps.

The tutor module holds the knowledge which is requiring giving the students. This module takes curative action, for example giving feedback or corrective teaching. Toward be capable to achieve this, it requires knowledge about what a human teacher would do in such condition.

ITS is alternative in such conditions, despite of its high development costs. It still reduces the overall costs through decreasing the need for human teachers. When large groups need to be taught at the same time. In such situations many frequent teaching efforts are needed. In cases of technical training situations suppose training of military recruits and high school mathematics. A particular type of ITS, Cognitive Tutors (Matsuda, N., Cohen, W. W., & Koedinger, K. R., 2005), has integrated into mathematics curricula in a large amount of United States high schools. For developing better student's learning results on final exams and usual tests. ITS built to assist students to learn circuits (Jackson, B. G., 2002), medical diagnosis (Crowley, R., Medvedeva, O., & Jukic, D., 2004), computer programming (Butz, C. J., Hua, S., & Maguire, R. B., 2002), mathematics (Chien, T. C., Md.Yunus, A. S., Ali, W. Z. W., & Bakar, A. R., 2008), physics (Vanlehn, K., Lynch, C., Schulze, K., Shapiro, J. A., Shelby, R., Taylor, L., Treacy, D., Weinstein, A., & Wintersgill, M., 2005), genetics (Huang H. S., Huang M. J. & Chen M. Y., 2006), chemistry (Tsovaltzi, D., McLaren B. M., Rummel N., Scheuer O., Harrer A., Pinkwart, N. & Braun I., 2008), etc.

Now days computer based teaching has successfully entered in all fields or domain. Such as, education, training, markets, home, schools, universities, business and government. Still it remains far from the normal educational practice. Whereas research is an ongoing in the application of AI in education field more than thirty five years with some outstanding success stories. There is relatively little collision on education with intelligent tutoring and training in the world. There are some causes for this deficiency of diffusion. ITSs are expensive to develop and the basic computing power was expensive to deploy (Corbett, A. T., Koedinger, K.R., & Anderson, J. R., 1997). Mostly the resourceful revelation of intelligent computer tutors has done by the AI researchers instead of education experts. ITS is a rich that recognized by the researchers and it is important natural environment

for deploy and modify Al algorithms.

Intelligent tutoring system is an electronic tutoring system that is capable to provide the several requirements of novice. The system is worked through artificial intelligent system. It focused in managing the knowledge and analyzing learners according to their vision. Intelligent tutoring systems have useful more capably for representing the supporting system for the several requirements learners (Tuaksubun, C., & Mungsing, S., 2007). Also it is capable to boost the potential of the learners for better understanding of the lessons.

Human beings built systems for centuries for remembering and manipulating data. The components of those systems were based on the modern available tools and technologies. Although, human beings are trying to automate cognitive activities, which are understood and be described by algorithm. Learning is a very complex process and actually how people learn, is not fully understood till now (Samuelis, L., 2007). ITSs became increasingly composite software systems and the reusability of their components plays vital role in their property and further evolution.

Intelligent teaching is a knowledge demanding act. In practice ITS have shown itself to be useful. Nevertheless, particularly resource demanding to improve, demanding vast knowledge about instructional technology. Mostly that model is used in particular and in a complex of software development expertise (Siddappa, M., & Dr.Manjunath, A. S., 2008). It helps to build progress of ITS easier. Tutor authoring tools or shells have been developed.

The remainder of the paper focuses on the an intelligent tutoring system. In section 2, related work is presented. Section 3 explores the methodology for tutoring system while Section 4 presents some discussion. Finally, 5 provide the conclusions and identities directions of future work.

2. RELATED WORK

The computer world has been determined to follow the intelligence of the human brain for many years. These attempts at mimicking the reasoning ability of the brain are commonly described as artificial intelligence (AI). The most hopeful, goal of AI is to create an intelligent tutoring system (ITS) with the human teacher's ability to gather a student level of understanding (Thompson, J. E., 1996). An ITS is desirable because schools could better meet the expense of individualized attention for students if that attention were provided by low-cost computer programs. At present, all students are required to do all problems because teachers cannot provide individualized attention.

Today, computer-based simulations are comparatively simple. Simulations can motivate the students to choose from a few choices at each step (Ong, J., & Ramachandran, S., 2003). These simulations become more complex by giving many possible actions to the students and forming various cause-and-effect relationships. It becomes more difficult for the students to decide accurately whether they did well or not throughout the assumption. Still if students succeeded in reaching the goals of the exercise. Hence it is doubtful that everything they did was correct or best.

Hence EGIP (Explanation Generations for Integration Problem) is capable to make explanations about the integration problems. The system checks out student's answers and produces proper explanations for students (Htaik, T.T., & Amnuaisuk, P.S., 2003). In the undertaken study, explanations are in conditions of structural variation. Such as, place of errors, number, variable, value of power and so on. Further more, the system syntactically evaluate the two solutions. Also system marks out differences between two solutions. After checking the two solutions the system will graphically displays mistaken places of the student's answer by highlighting the text with distinct colors.

The study focused on the intelligent knowledge tutor mode which is based on the theory of ontology. Architecture of Integrated Intelligent Tutoring System (IITS) is proposed, where its ontology model is established, and its application characteristics are analyzed. Ontology characters could be classified into four categories according to classic ontology theory (Tan, Z., Weiling, L., Liu, L., & Yang, Z., 2008). The character and integration of ontology nodes could change the system structure and emphasize system's unique character.

Till now ITSs did not take place into provide learning as effective, as human expert tutors do [8]. Nevertheless, to fill the gap between current ITSs and human tutors. Previous studies proved that natural language (NL) interfaces could be one of the keys (Di Eugenio, B., Fossati, D., Yu, D., Haller, S. and Glass, M., 2005). However it is still not clear what type of NL feedback should be use in the system. When and how to deliver it and to produce significantly more learning than simple practice in ITSs. Such as, researchers noticed out that student learned more when it given more conceptual. Also some times it should be more directive in an ITS that teaches problem solving Tuaksubun, C., & Mungsing, S., 2008). For NL interfaces implementation, existing tutorial dialogue systems carry out discussion management in a casual way. Till now there are no such kinds of models that explain how to generate effective tutorial feedback (Lu, X., 2007). The reason is that what makes human tutoring effective that is not well understood yet. As well, what is the most suitable and convenient way to implement the effective tutoring language?

The problem of developing an intelligent learning environment for programming discussed in some studies. Wherever the environment factor can adjust its interface and performance to the student's knowledge level as (novice and an experienced) (Brusilovsky, P., 1993). The major concept proposed to think that the student as the user of the environment. On other hand to use the student model as the user model for the purpose of adaptation.

Problem objects are comprised into the student model. A problem which is to be taught represents the problem component. That is including questions and answers compulsory to solve the problem (Rasmussen, K., 2006). The student model evaluates the student's actions which are inputted through the user interface.

A student model applying Atomic Dynamic Bayesian Networks. This consists of two connected Atomic Bayesian Networks. The student models are representing the concepts and important relationships. For example, requirements and features. Tracking a record of student's learning. Combining a student model from both open and close-ended work. All these things student model does in real time (Wei, F., 2007). Therefore ITS can be responsive to the students as they work on an assigned problem.

The student model characterizes the computer system's idea about the learner's knowledge and cognitive state. For modeling and evaluating student's cognitive state there is an automated test rule (Liu, H., Tang, S., & Ma, L., 2008). This approach comprises of three components. First one domain conceptual modeling, Second collection of cognitive state and abilities, and last collection of testing rules.

Every student has to take a pre-test. Although the topic has not yet been taught. May be Students perform well or may be not on an idea. However pre-test makes it clear to the students what is to be learned. Every student has different level of understanding it will be clear after taking pre-test (Driscoll, D., 2009). After getting result of pre-test teacher must have to divide, resolve and fill the gaps by a separated teaching dialog that includes explanation, questions, practice and feedback.

The M-OBLIGE model for developing multi-tutor ontology-based learning environments. The model is depending on local ontologies. That describes the domain of each independent tutor in the environment. Therefore external ontologies describe more general concepts. All ontologies are used by ontology processors to choose which tutors may benefit to the student who needs to learn new concepts. M-OBLIGE model allows domain expertise to

be shared. Also it can be used as a framework for integrating multiple tutors on the web (Mitrovic, A., & Devedzic, V., 2004).

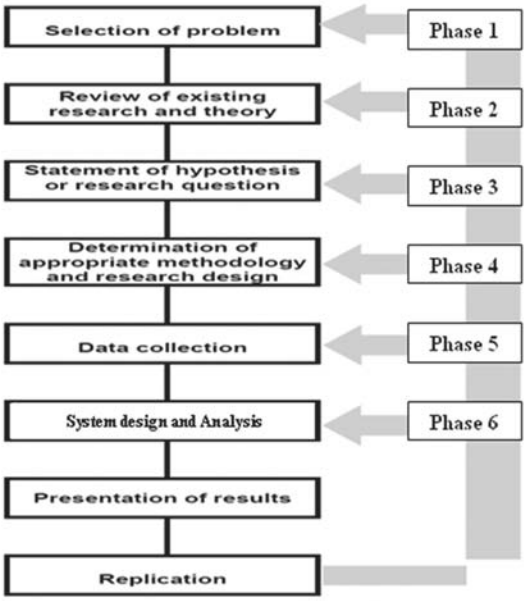
Researchers present a new structural design of agent-based simulation of teaching and learning process. Researchers proposed an abstract architecture of system. They presented several views. Such as, how the usage of ontologies for the control of students progress can improve the efficiency of intelligent tutoring systems (Graudina, V., & Grundspenkis, J., 2005)]. Main consideration is given to the usage of ontologies for agent communication. And the usage of formal description of learning content and process.

In earlier times, Learning Management Systems (LMS) supports well for interaction between learner and lesson, learner and teacher. On the other hand, each student has individual skills such as, (knowledge, goal, experience, interest, background). Therefore, there is developing demand for adapting learning material such as, (lessons, exercises, tests) to each individual. Hence, this is learning adapted method and the system which supports that method was called Adaptive Learning System. As a result, learning adaptive system is capable to alter its action by provide both learning content and pedagogic method for each student. Adaptive systems based on the depiction of learner's concepts called learner model. So, the method which collects information to construct learner model. Then update the learner modeling. Adaptive system adjusts learning material and teaching method to learner model (Nguyen, L. & Do, P., 2008).

3. METHODOLOGY

The general methodology of design research was chosen to implement this project. Figure 2 represents the methodology consists of six phases. One selection of problem, second review of existing research and theory, third statement of hypothesis or research question, fourth determination of appropriate methodology and research design, fifth data collection and sixth system design and analysis.

Fig. 2
General Methodology of Design Research

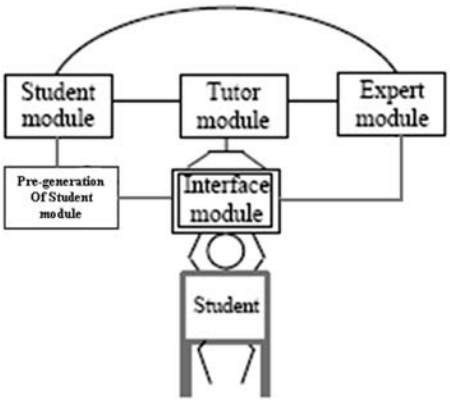


The existing student models inherent many domain dependencies. The existing student models design were both fully or incompletely domain dependent. Therefore, by assembling the consequent ITSs to teach in other fields basic major changes in the design of the student model (Chakraborty, S., Roy, D., & Basu, A., 2010).

The student module uses a student model holding descriptions of student's knowledge/behaviors. That model includes his/her misconceptions and knowledge gaps. Therefore, the reason of gathering information about student is to find out the education level of student. Model includes the most appropriate learning method for this. Later on gathers several information such as, (voice, gesture, appearance, etc) may be required in order to get the dates about student performance and knowledge level. It could not be possible for every time to identify a complete student module (Gharehchopogh, F. S., & Khalifelu, Z. A., 2011).

There are many implementations of ITS that can be used to support teaching and training in any field. Intelligent Tutoring System can be used to support any domain or field. There are many more architecture of ITS, some them are 4 modules, 5 modules or ontologies based modules and many more architectures with different techniques. Four module architecture we already have shown in figure1. Five module architecture also exists the four modules are same and fifth one module named pedagogical module/pedagogy module. In this paper we proposed a conceptual architecture which supports the old architecture of ITS by adding one new approach which we named pre-generation of student module. The EGIP ITS (Htaik, T.T., & Amnuaisuk, P.S., 2003) starts teaching to all students in same level; problem is this all students have no same knowledge. Every student has to take a pre-test. Although the topic has not yet been taught. May be Students perform well or may be not on an idea. However pre-test makes it clear to the students what is to be learned. Every student has different level of understanding it will be clear after taking pre-test (Driscoll, D., 2009). An ITS architecture for the proposed approach is shown in Figure 3.

Fig. 3
General Architecture of ITS with Pre-generation of student module

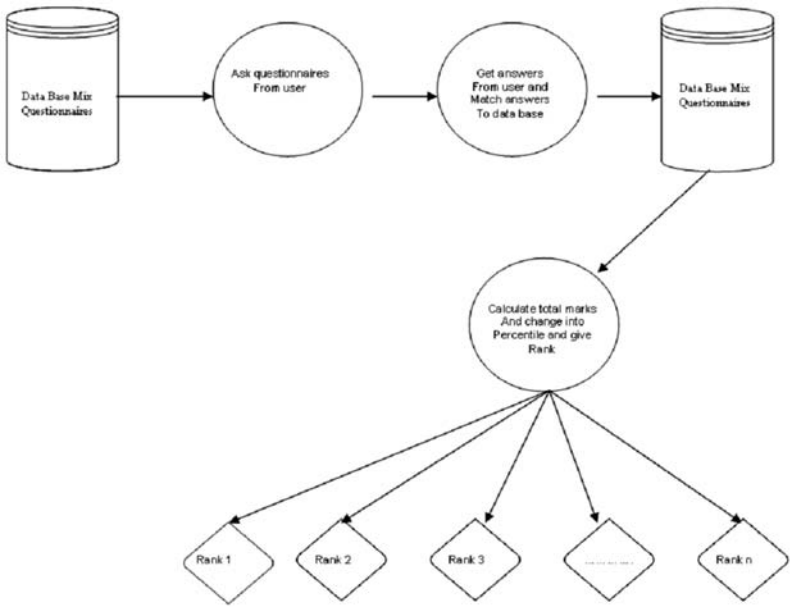


This work contributes in field of AI. General architecture has four modules shown in figure 3 above. In this study we work on a supported module to student module named pre-generation of student module which is shown in figure 3 above. About four modules of ITS named (Student module, Interface module, Expert module and Tutor module) we have been discussed in "introduction" section. In pre-generation of student module supports the student module to get the level of the students understanding or pedagogy by generating pre-test. Before the teaching session starts, this module gives a test which contains IQ-logic questions and related to the subject. That pre-tests are designed to test student's

ability to recognize sharpness under strictly timed conditions. Each question has options such as two, three or four. The options set as the similar as the exact answer to know the student ability. Students are given different time to answers different types of questions. For example, if a question has two options (Right or Wrong/True or False) the timer is set to 30 seconds. If the question provides three or four options then the timer is set to 45 seconds. The specific methodology for pre-generation of student module is shown in figure 4.

In the end of the pre-test session, system will give the percentage of correct answers. Then system will start teaching based on the identified level. Each level has different set of teaching questions which contains different options and different category as shown in Table 1.

Fig. 4
Pre-generation of Student Module Methodology

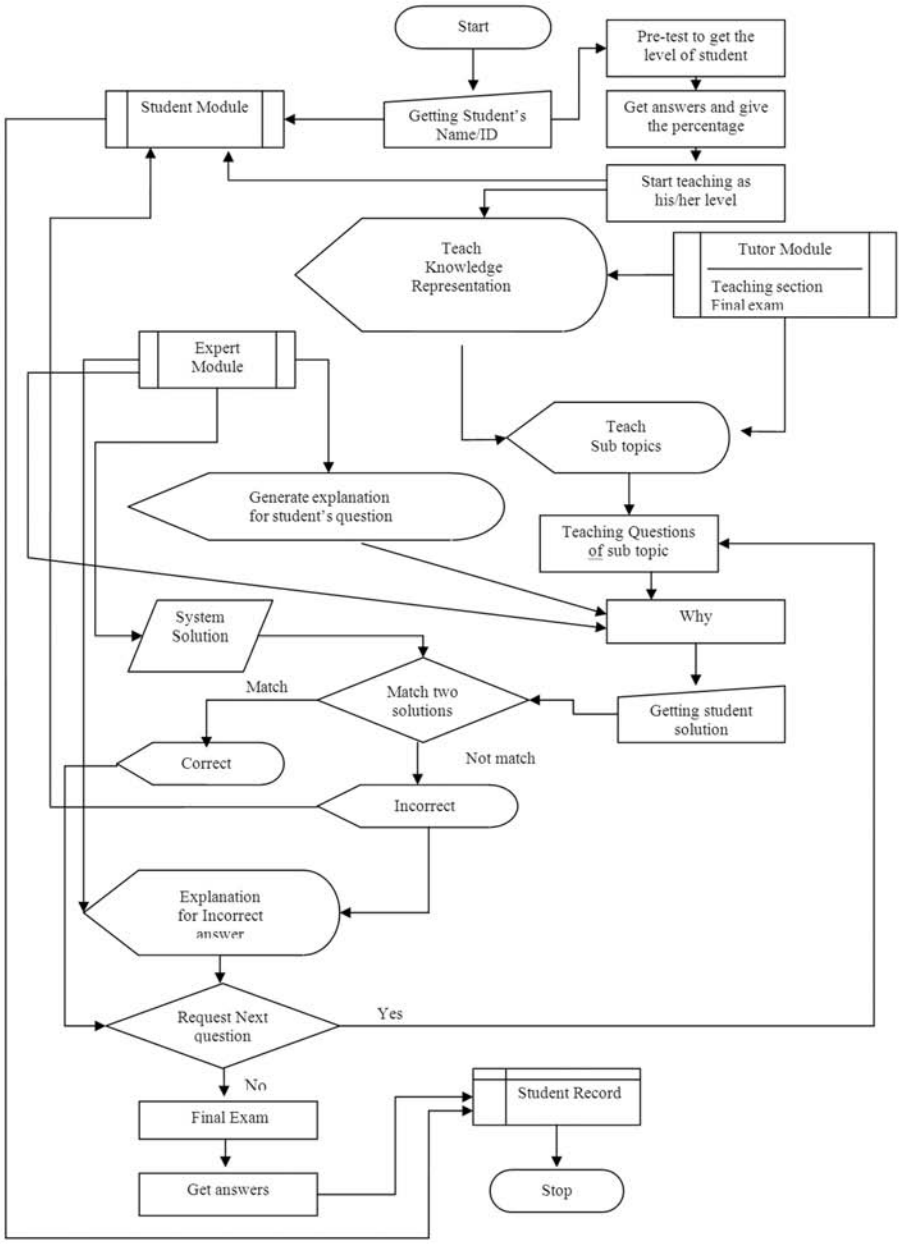


On the basis of pre-test result student will start learning by the system expect of their level. Furthermore explanation, the system consists of questions related to subject which were taken from previous exams questions of the subject. Subject questions are divided into three categories; easy, medium and hard. As shown in above table each level is divided into different percentage of two categories. Hence the flow of the data of this system is shown in figure 5.

4. RELATED DISCUSSION

A user has to enter his/her name and matric number. Upon login, the system shows the main menu which contains two buttons; Start Test to Get the Student Level and Exit. User can click on 'Start Test to get the Student Level' to begin the Pre-test session. Upon clicking the 'Start Test to get the Student Level' button, the system will start Pre-test by asking IQ-Logic questions and there is time limitation for each question.

Fig. 5
Flow Chart of ITS



User needs to choose answer and click next to move to the next question. After completing the teaching session, users are presented with a window containing two buttons; Final Exam and Back to Main Menu. When a user clicks the Final Exam button, the system will begin the final exam session. There is also a time limitation. Upon completing the exam

session, users are presented with their results.
In Figure 5. We have shown the flow of activity of our proposed ITS system. That is registration system together with student learning analysis tool. We have presented flow of data in figure 5.
zIn the end of the pre-test session, system will give the percentage of correct answers. Then system will start teaching based on the identified level. Each level has different set of teaching questions which contains different options and different category as shown in Table 1.

Table 1
Range, Level and Question type

Range	Ranking Level	Named in System	Division of Question type
1 - 20	Low average	L1	75% easy and 25% medium
21 - 40	Average	L2	50% easy and 50% medium
41 - 60	High average	L3	25% easy and 75% medium
61 - 80	Superior	L4	50% medium and 50% hard
80 +	Very superior	L5	5% medium and 75% hard

5. CONCLUSION AND FUTURE WORK

This work contribute in the area intelligent tutoring systems; as pre generation of student module in an ITS. The conditional possibilities got from the pre-test indicated the students' understanding of a particular requirement. It provided a form of preset self-assessment for the students as it pointed their ability in each topic. The objective of the testing will be achieved and the results will be shown to be helpful for the tutoring sessions. As the students could then be guided intelligently. The proposed work can help users of the ITS to learn at their own pace and hence enjoy the learning process. This will therefore create a lifelong learning environment. Finally we have analyzed through chart to use of ITS s ystem is compatible and valuable for education system. Future work will develop GUI for huge data to produce final results.

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