

Revival of Tutor Model: A Domain Independent Intelligent Tutoring System (ITS)

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Abstract - Ever since the birth of ITS (Intelligent Tutoring System) in late 1970's and early 1980's, it has live through numerous evolutions. Through this paper we opt to explore and revive the Tutor (Pedagogical) Model of ITS. Pedagogy is referred to as the correct use of teaching strategies. The objective is to emphasize on various abstract pedagogies that can be incorporated into an Intelligent Tutoring Systems irrespective of the knowledge domain being taught. Hence the current research and development is to make sculpt that is used to provide tutoring of almost any knowledge domain. Despite of the outgrowth of technology (Computer) based learning, traditional learning/ teaching is still a dominant and a preferred choice not only by the students but also by the teachers. The reasons being reluctance to give up conventional practice, habit of face-to-face teaching and withhold benefit of one to one tutoring. So instead of trying to take over the traditional pattern, we come up with an ITS that bestow each student with a familiar one-to-one tutoring practice, flexibility to learn almost any knowledge domain using same gadget and to learn using contented pedagogies until he masters and governs that knowledge domain.

Index Terms - Knowledge Base, Knowledge Representation, Intelligent Tutoring System, Pedagogy.

1. INTRODUCTION

From the dawn of Internet, technology (Computer) based learning has outgrown to its fullest. [2, 6]. Computer-based learning conjoined with Internet spans a wide spectrum of learning methodologies viz e-learning, distance learning, web based learning, collaborative learning and many more to name. Obvious merits offered by them are self-paced learning of anyone, at anytime and from anywhere. And of course the obvious demerits are feeble urge because of absence of teacher, short in instantaneous communication and frail hold of the learning environment. [3] To overcome the drawbacks of this first generation learning environment a sunrise of second generation learning systems in the form of adaptive educational systems came into reality [3]. Adaptive hypermedia/multimedia system and Intelligent Tutoring System forms the basis of second generation learning environment. To be specific there are systems that are i) Intelligent but not adaptive ii) Adaptive but not really intelligent iii) Adaptive and intelligent [5], see Figure 8. The evident distinctiveness of ITS which facilitated us are one to one teaching with learner being entirely regulated by computer coaching/tutoring and triggering students to learn by getting involved in every step of tutoring.

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Furthermore, Intelligent Tutoring Systems accumulate three basic kinds of knowledge [1]: Domain knowledge (Domain Module), Knowledge about learners (Student Module), and Pedagogical knowledge (Pedagogical Module). [4].

2. BUILDING GENERIC TUTOR MODEL

As the name implies the model will provide tutoring for almost any knowledge domain. We are testing the model for some of the knowledge domain of computer technology domain.

2.1 Domain Model (Knowledge Base Building)

First and foremost step toward initiating the tutor model is working on domain model i.e. knowledge base building or creating learning objects The process of building knowledge has to be done for every domain that you wish to teach. Once the knowledge base (learning objects) is build, it needs to be copied into the model using the administrative interface provided (Figure 2 & Figure 3).

2.2 Knowledge Structuring

The spirit of ITS is Domain module (KB building) and its spirit in turn is Knowledge structuring, done by using a standard way for knowledge representation. Building a knowledge base concentrates on selecting a proper representation for that knowledge as it will be eventually made available to the learner in their learning process. For every knowledge domain we have chosen four level of structuring. (Figure 1). The entire independent knowledge domain will be collected into a common folder (KB). Each knowledge domain is a collection of chapters and each chapter in turn is a collection of topics and every topic is taught using four different pedagogies (Knowledge representation).

3. PEDAGOGICAL MODELING

Pedagogy is the art or science of being a teacher. There exist numerous pedagogies. The one, which we are using, are elaborated in Table 1 and Figure 1.

Pedagogy generally refers to strategies of instruction or a style of instruction. Pedagogy is also sometimes referred to as the correct use of teaching strategies. The main objective is to provide each student with a study experience similar to ideal one-to-one tutoring. It is shown in many expert studies that one of the most effective ways for student to learn is to work with an expert tutor in and individual way [4].

Pedagogical model contains the knowledge of how to teach i.e. teaching or tutoring strategy. It coordinates the whole tutoring process and deals with issues like which topic is to present, when to present a new topic.

Level No.	Pedagogy	Description
1	Theory	Simple Theoretical Description

Level No.	Pedagogy	Description
2	Media Files	Audio and Video tutorials
3	Example	Elaborative Examples
4	Practice	Worksheets

Table 1: Pedagogies used

3.1 Making Learner Meticulous (Examination Process)

Our focus is not mere tutoring the learner but to tutor until the learner actually becomes thorough in the knowledge domain opted by him for learning. To achieve it, we fire the learner with an examination that tests his understanding of the conception, his misconceptions and accordingly decides whether he needs revising the same topic with different pedagogy or can move forward to next topic toward completion of the knowledge domain.

If the learner fails to understand a particular topic by one of the pedagogy, the same topic is taught by more interactive pedagogy, providing a higher probability to be meticulous in that topic and eventually this is done in knowledge domain. The knowledge base already contains number of pedagogy for same topic. The pedagogy should be taken from knowledge base.

3.2 Pedagogy Selection (Result Analysis)

This is the most important phase, as it is the phase that decides whether the student will proceed to next topic or whether he needs to learn the same topic again. If the result of a particular learner is positive (range of percentage will be predefined) then system will continue teaching him new topic with same pedagogy but if result is average or undesired then system will teach the same topic by applying next level of pedagogy and learner will keep learning by second level. Same process will be applied until completing entire lessons for the selected domain. The Level-1 pedagogy is set as default for the learner i.e. learner always initiated with theoretical description. If the learner understands the topic, which means clear/pass, the exam appeared for the same topic. The same pedagogy is used to teach next topic but if he disqualifies then level-2 pedagogy is used to teach the same topic.

4. SAMPLE SCREENSHOTS

We have included some of the experimental results showing model working.

4.1. Domain Management

At the click of browse we upload the files with different pedagogies of that topic and at the press of update those files gets copied into the model which eventually are retrieved for tutoring the learner. The button ‘Manage Topic Exam Question’ lets the administrator build the exam set for that topic which will be used to test the learner after his study of that topic. (KB)

4.2 The User Interface

The model has two users:

- i) Admin/Teacher who injects the knowledge domain and
- ii) Student/Learner who acquires the tutorials of knowledge domain available in the system.

4.3 Result Analysis

Refer Figure (6, 7).

4.4 Learner’s Progress

The learner has completed the first topic using first level of pedagogy and is yet to finish the remaining topics, all the topics are shown proposed with first pedagogy as we have set level 1 as default pedagogy for tutoring.

5. CONCLUSION

This model is sure going to prove pioneering for teachers, who can use it for teaching any knowledge domain. And to make this model newfound for the learner as well, we have experimented teaching the learner using multiple pedagogies and providing tutoring on one to one basis. Our model makes decision and selection of the pedagogies that would best help the learner to understand and govern the domain he has opted for learning.

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