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The Role of Pedagogical Agents in Designing KITWEB

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Abstrct: An intelligent tutoring system is computer software designed to simulate a human tutor's performance and assistance. Intelligent Tutoring Systems (ITSs) are designed with using Artificial Intelligence (AI) techniques in computer programs and called cognitive tutors or Knowledge Based Tutoring Systems which can guide learners to progress in the learning process at their greatest and to facilitate instruction. . Although CAI software is commonly used as a teaching material it also inspires learners. But for the effective use this software must be individualized. So to develop such personalized software the instructions that are provided by the software must be individualized and also it should motivate the student in such teaching learning situation. Pedagogical agent is generally described as educational programs that guide, motivate learners while encouraging them during learning by providing feedback. These agents are human like pictures, cartoon characters, audio or text to inform, guide to the learners.

This paper discusses the instructional and motivational role of pedagogical agents also it elaborates its importance. This paper describes KITWEB, the Knowledge based Interactive Tutoring system for WEB application testing. KITWEB teaches different testing techniques as well as it gives the practical testing experience to its users. While evaluating the users the test data and testing results the system presents appropriate feedback regarding any errors in their solution and motivates the learner. The pedagogical agents used in KITWEB motivate learners with different skill levels achieving main aim of the system to personalize instruction as per the ability of learner.

Keywords- *Pedagogical agents, ITS, CAI, AI*

I. Introduction

Advances in computer and communication technology have provided new opportunities to assist human learning through technologies such as pedagogical agents (Baylor, 1999a, 2002a; Johnson et al., 2000; Kearsley, 1993). Pedagogical Agents are animated life-like characters designed to assist and support human learning by interacting with learners in an interactive computer-supported learning environments (Craig, Gholson, & Driscoll, 2002). Pedagogical agent is generally depicted as educational programs that guide, encourage learners by providing feedback. Animated pedagogical agents can promote student motivation and engagement, and engender affective as well as cognitive responses (Baylor, 2005). Thus, animated pedagogical agents offer great promise for enlarging the bandwidth of tutorial communication and amplifying learning environments ability to engage and inspire novices.

Pedagogical agents can be classified under three sub groups, such as visual, audible and textual (text-based) regarding presentation forms (Atkinson, Mayer & Merrill, 2005).

Visual agents are in the form of:

• Human-like (a real human image or animating a real human image by drawing).
• Cartoon film character (animating a cartoon film character or a shape/figure).
• Gestures (Using human gesture images or drawings).

Audio agents only include the guidance of a person (by talking) at the background.

Alternatively, textual agents involve guiding users by providing sentences or words.

As per their tasks Pedagogical agents can generally be classified (Chan, 1995; Veletsianos, 2012; Yilmaz & Kilic-Cakmak, 2011, 2012) as

• Smart agents (agents, which can learn by using artificial intelligence and respond to users).
• Guide agents (agents which inform users about the usage of software).
• Subsidiary agents (agents who provide clues to users about the topic and questions)

II. Pedagogical Agent's Instructional Roles

Over the years, researchers have suggested various roles of pedagogical agents, such as agent as cognitive tool (Baylor, 1999), mentor (Baylor, 2000), and learning companion (Kim, 2005). The important aspect of designing PA is to carefully design their role within the learning environment to serve the intended educational purposes (Baylor & Kim, 2003). In their studies, they effectively simulated pedagogical agents as an expert, a motivator, and a mentor who served distinct instructional purposes.

Table 1: Characteristics of the Agent's Instructional Roles (Baylor & Kim, 2003)

	Expert	Motivator	Mentor
Image			
Animation	Limited gestures	Highly expressive	Highly expressive
Voice	Limited intonations	Enthusiastic, higher speed	Calm, engaging
Script	Information	Encouragement	Information & Encouragement
Affect	Low	High	High

An expert agent exhibits mastery or extensive knowledge and perform better than average within a domain. Whereas a motivator agent not necessarily knowledgeable but rather suggested his own ideas and verbally encouraging the learner to sustain the task (Bandura, 1997). As for a mentor agent, it does not simply provide information but rather provides guidance for the learner to bridge the gap between the current and desired skill levels (Craig, Gholson, & Driscoll, 2002).

III. Its Architecture

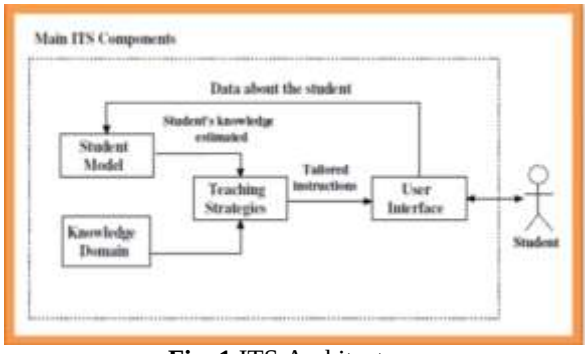

Fig. 1 ITS Architecture

"Intelligent Tutoring Systems" [ITS] attempt to simulate such a "teacher", who guides the student's lesson flow, uses pedagogical methods suitable to a student and monitors progress on an individual basis, in an online setup based on his or her level of understanding in the subject.

The traditional ITS model includes four components: the domain model, the student model, the teaching model, and a learning environment or user interface as shown in fig. 1.

IV. Kitweb Architecture

In the proposed ITS consist of six emerging subsystems, namely:
Student Module
Knowledge Module
Tutor Module
Pedagogical Module
Report module
User Interface Module
Two major issues related to an ITS are "what to teach" and "how to teach". The student module and knowledge module deals with the "what to teach" part, whereas the tutor module and pedagogical module are concerned with "how to teach" part. This proposed module also deals with "how to report" part by using report module and user interface module.
The structure of the ITS is shown in the figure 2.

A. Student Module

The student module contains descriptions of student knowledge or behaviors, including his misconceptions and knowledge gaps [19,28]. The collected information is stored in data base and whenever necessary it can be retrieved and used.
ITSs serve two basic aims [23,24]:
1. To form a learning program adaptable according to the student
2. To be a guide to solve student's problem.

B. Knowledge Module

The Knowledge module references an expert or domain model consist of a description of the knowledge or behaviors that represent expertise in the subject-matter. It is the module in which main information and tutorial information that are going to be taught resets.

C. Tutor Module

A mismatch between a student's behavior or knowledge and the expert's presumed behaviors or knowledge is signaled to the tutor module, which subsequently takes corrective action, such as providing feedback or remedial instruction with the help of pedagogical module.

D. Pedagogical Module

The pedagogical module is the driving engine of the teaching system and is closely linked to the student module. It designs and controls instructional interactions with the student for their better understanding. It uses the student model and knowledge model to make its pedagogical decisions. The pedagogical module forms and updates the student model and offers hints when the student is struggling, supplies advice, support and explanations, selects a new topic, etc.

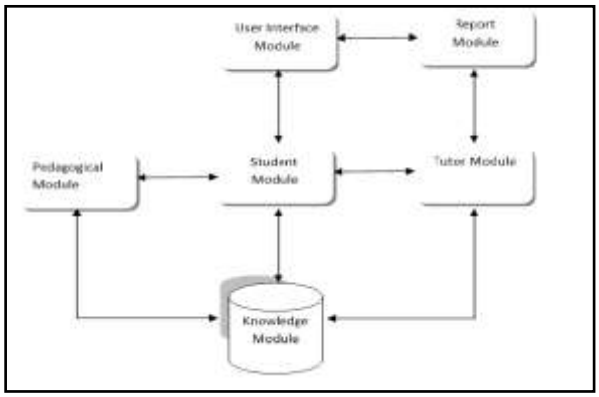

Fig.2 KITWEB ITS structure

E. Report Module

This module generates report related with the performance of the student as well as produces status of knowledge acquainted by the student. This module also support tutor to update the information about his student.

F. User Interface Module

The user interface module provides the means for the student to interact with the ITS, usually through a graphical user interface and sometimes through a rich simulation of the task domain the student is learning [23, 28, 31].

Pedagogy is the art or science of being a teacher. There exist numerous pedagogies for example Simple Theoretical Description, Media Files Audio and Video tutorials, Elaborative Examples, Practice Worksheets, etc. Pedagogy generally refers to strategies of instruction or a style of instruction.

V. Kitweb : Pedagogical Module

In system KITWEB, here we use the combination of model tracing and computer coach approach for the pedagogical model. We use Visual as well as textual pedagogical smart and subsidiary agents for the effective and individualized feedback to the student. When user wants to test functionality of the text box and if he/she enters the related value into the respective field. After clicking on the TEST button the system produce the appropriate result with the help of pedagogical agent.

Here the in fig. 3we can see that as the user wants to test the alphabet and by mistake he/she enters the digit into respective textbox. The system gives the message "PLEASE CHECK ALL ENTERED VALUES. PROPER WAY IS: USE VALUES BETWEEN A TO Z AND a to z". This is how we have implemented the Computer Coach approach.

Fig. 3 KITWEB illustrating Computer Coach Approach

Some times where the user is doing silly mistakes at that time our system gives hint to the user by immediately giving response to the action of the user performed. For ex. In the integrity testing if the user remains the any field blank and which is mandatory our system gives such instruction to the user quickly before moving further. This approach is the example of model tracing shown in the figure 4.

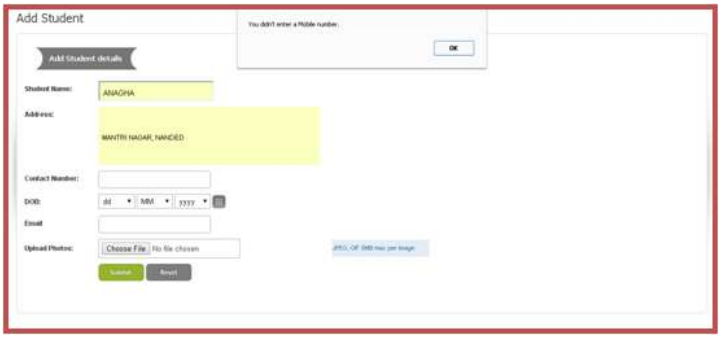

Fig. 4 Sample Hint given by KITWEB

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. After tutoring Web Application Testing to their student, the user of the KITWEB goes through the examination process where the knowledge gain of the student can be tested. Depending upon the result of the examination and the performance of the user during the learning process KITWEB produces report to their student.

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 intimate such to the user and suggest its user to focus on the same topic again.

VI. Conclusion

Pedagogy is 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. Pedagogical model contains the knowledge of how to teach i.e. teaching or tutoring strategy. This paper has discusses the instructional and motivational role of pedagogical agents also it elaborates its importance. Through this study, we hope to design and develop a multimedia instruction that will benefit both low-ability and high-ability learners. This paper describes KITWEB, the Knowledge based Interactive Tutoring system for WEB application testing. KITWEB teaches different testing techniques as well as it gives the practical testing experience to its users. KITWEB uses various pedagogical agents to motivate its students while providing individualized feedbacks as they interact with students. As a result, students may choose to use interactive learning environments frequently and for longer periods of time.

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