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Learning computer networks using intelligent tutoring system

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Abstract

Intelligent Tutoring Systems (ITS) has a wide influence on the exchange rate, education, health, training, and educational programs. In this paper we describe an intelligent tutoring system that helps student study computer networks. The current ITS provides intelligent presentation of educational content appropriate for students, such as the degree of knowledge, the desired level of detail, assessment, student level, and familiarity with the subject. Our Intelligent tutoring system was developed using ITSB authoring tool for building ITS. A preliminary evaluation of the ITS was done by a group of students and teachers. The results were acceptable.

Keywords: intelligent tutoring system, computer network, ITSB, student learning

1. Introduction

Intelligent Tutoring Systems are computer-based coaching programs that apply artificial intelligence [16]. ITS are more advanced, allowing students to improve their skills by completing tasks as part of the interactive lecture hall environment. ITS can answer questions and provide personalized support to the student. ITS, as opposed to other educational technologies, to assess each student's response in order to assess his/her knowledge and skills. ITS can modify teaching strategies; give explanations, examples, demonstrations and practical exercises where you need them [17].

The main goal of this intelligent tutoring system was to make available the benefits of one-on-one tuition in a cost effective way to the students of Computer Network.

The ITS system was mainly envisioned for coaching undergraduate students of Computer Network, but it can be likewise effective in other education environments, as well. Our current ITS provide adaptation of the teaching material based on the student performance and the data collected during the learning session.

The eminence of the adaptation delivered by the system is influenced by numerous factors, for example the precision of the pinpointing tools that gather and process data, the student model that is used to accumulation the data and the coaching rules [2,3].

2. Literature Review

Individual tutoring is definitely an old paradigm and remains one of the most active methods of land on the instructions. Experiments showed that specialized human guardians can create a vast volume of training benefits [1, 2]. The dawn of computers has displayed the aptitude of computers to be an encouraging another mentors rights experts, as they appear a untiring and profitable regarding human tutors. Intelligent tutoring is observed today as one of the greatest new advances in the field of instructive technology. The notion of intelligent tutoring systems (ITS) originated in the late 1960s, the ITS is an influential software that organize different kinds of knowledge models, such as the domain model, student model, the student model, and user/teacher interface model. ITS is a multi-area and thus even the resources to construct them need to be gotten from many sources of research, such as artificial intelligence, software development, human-computer interface, education, and cognitive science [3].

Some of the ITS that were developed: ITS for teaching advanced topics in information security [17], development and evaluation of the Oracle Intelligent Tutoring System (OITS) [36], ITS for learning Computer Theory [37], e-learning system [12], ADO-Tutor: Intelligent Tutoring System for leaning ADO.NET [38], an agent based ITS for Parameter Passing in Java Programming [24], and Predicting learners performance using NT and ITS [28], CPP-Tutor for C++ Programming Language [31], a comparative study between Animated Intelligent Tutoring Systems (AITS) and Video-based Intelligent Tutoring Systems (VITS) [20], authors in [41] developed a stomach disease Intelligent Tutoring System, authors in [16] presented an Intelligent Tutoring System for diabetes, in [21] the authors built an Intelligent Tutoring System for Learning Java Objects that will help students to study Java objects, ITS teaching grammar English tenses [18], Java Expression Evaluation[19], Linear Programming [25, 27], an Knowledge-based Intelligent Tutoring System for Teaching Mongo Database [40], Design and Development of an Intelligent Tutoring System for C# Language [39], effectiveness of e-learning [22], effectiveness of the CPP-Tutor [23], teaching AI searching algorithms [30, 32], teaching database [26], and ITS for Teaching the 7 Characteristics for Living Things [42].

3. ITS Architecture

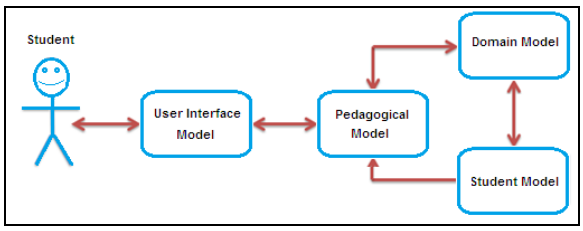

Fig 1: Typical architecture of the Intelligent Tutoring System.

In this paper we used the Intelligent Tutoring System Builder (ITSB) tool in the construction of an intelligent tutoring system for learning computer network.
ITSB designed development tool using Delphi Embarcadero XE8 2015; ITSB Development Tool consists of two systems. Teacher form system through which materials are added, questions and answers, etc. And the students of the system through which to learn of course, the materials and response exercises [29].

3.1 Domain Model Architecture

The domain model contains information about computer Network to explain the course; intelligent training system uses a domain model to solve problems or solutions to policy issues. The model presents the materials and the teachings in a simple and it creates a lot of problems for each lesson taking into account, the individual differences. When a student responds to the problem, determines whether good or bad, as well as it evaluate the student.
The material of computer Network includes the followings [4-15]:

- Introduction to Computer Network
- Security Mechanisms and Principles
- Encryption, Perfect Secrecy, One-Time Pad
- Cryptographic Hash Functions
- Hashing Applications and Constructions
- Secret Sharing
- Block Ciphers
- Block Cipher Modes
- Message Authentication Codes
- Prime Finding and other "Crypto" Math
- Diffie-Hellman Key Exchange and Crypto Groups
- Pedersen Commitment, PK Encryption, DDH
- Malleability of El Gamal, IND-CCA2.

3.2 Student Model Architecture

The student model is applied to the domain model. It focuses on the student's cognitive and emotional states with respect to their evolution, as well as the fact that the learning process in advance. While the student is working step-by-step through the problem-solving process, the system engages tracking process model. Before a student can use the ITS system, a profile for that student should have been created and stored in the database. Furthermore, information like student name, student number, last date the ITS visited, score, level of difficulties, lessons finished etc.

3.3 Pedagogical Module Architecture

Pedagogical model works as teaching strategies or academic plan. This model needs information on the points specified in the student's interaction. Based on this information, the Pedagogical model can generate tutorial action early interaction activities. But the system needs to understand what the right way or how to present the same work for different students that they may have different skills, cognitive thinking.

3.4 User Interface Model

The user interface module is the communicating component of the IT'S which controls interaction between the learner and the system, as shown in Figure 1. In both directions, it interprets between the system's internal representation and an interface language that is comprehensible to the learner. The current IT'S for computer network has two main interfaces: user interface and teacher interface. The teacher interface allows the teacher to enter the lessons, questions, answers (as in Figure 2), level of difficulties for each question. The user Interface consists of the lesson form (as in Figure 4) and question form (as seen in Figure 3).

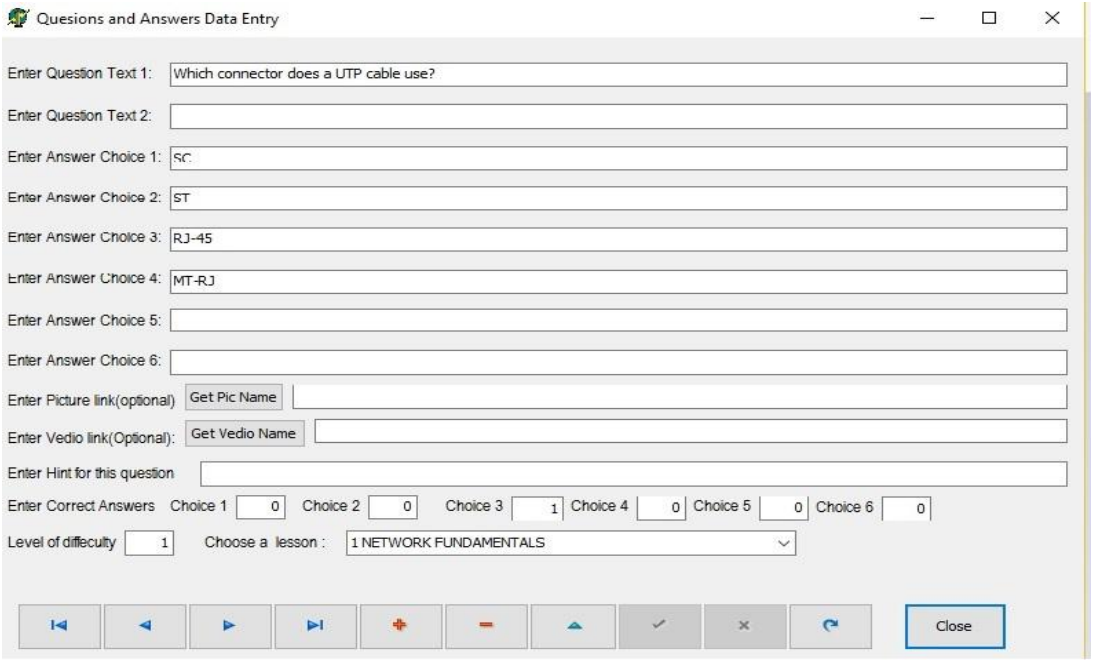

Fig 2: Form for Entering questions and answers for each lesson.

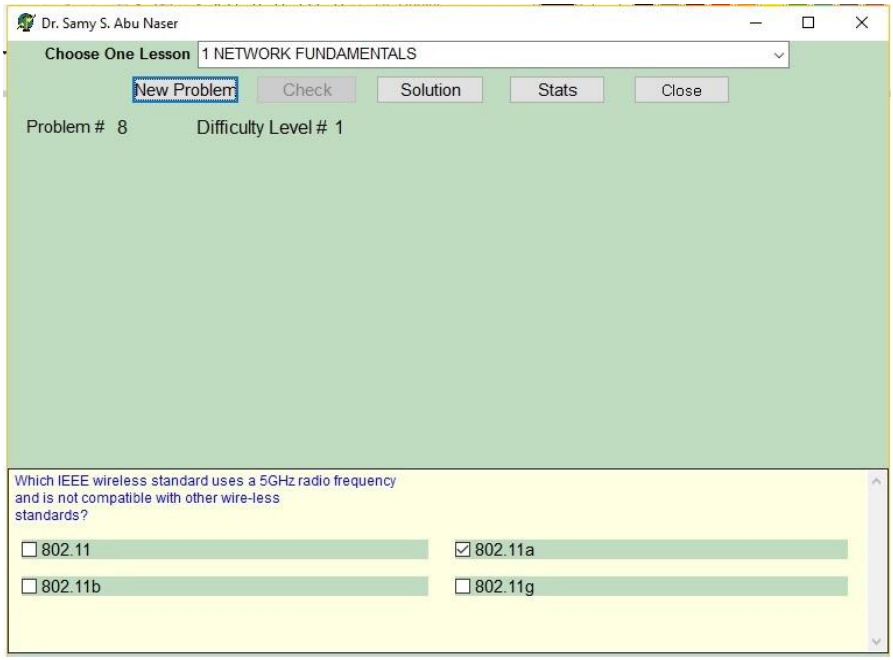

Fig 3: Interface for the user to answer the questions

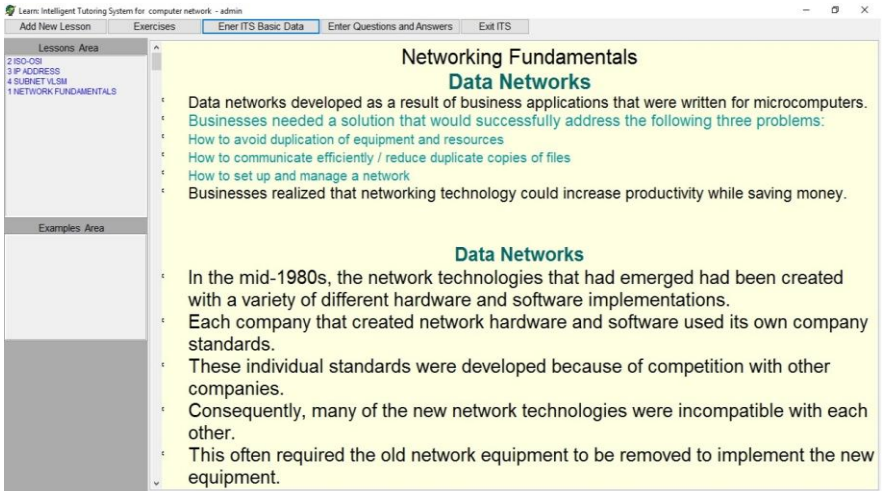

Fig 4: Interface used by user learn the lessons

4. Evaluation

The evaluation was conducted to test the intelligent tutoring system for teaching computer networks. Evaluation was to allow a group of students taking the course to try: lessons, examples, exercises and answers and train themselves on the network course using IT'S. The next step was to obtain the views of each student. Some of the students views of ITS was easy, efficient friendly, useful to learn another material using ITS.

5. Conclusion

This paper introduces the design and development of an ITS for teaching computer Networks. This paper also shows how the different emphases on the components of the ITS; It provides examples of different architectures to support ITS. It also reflects the different disciplines developed. Students read the problem and then begin to provide the answer in the form of multiple choices. Their solutions are automatically evaluated.

An evaluation of the intelligent tutoring system for teaching computer networks was carried out and the results were as expected.

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