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EDUCATION AND INTELLIGENT TUTOR SYSTEM IN TURKEY

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ABSTRACT

In this study, the educational system that is in the term of Republic of Turkey was analyzed and the periodic process of education systems all around the world was presented. Afterwards, the process and the method modules began to be used at education with the information technologies.

The Intelligent Tutor System is the application of A.I. and it is used for education and training. The aim of this study is to differentiate the Intelligent Tutor Systems in Turkey and all around the world, where suggested developing information and lists with dates are provided.

Keywords: Intelligent tutor systems, education, e-learning.

INTRODUCTION

As we all know education has the most dynamic and critic role during the changes of society. Therefore, education is “change of personal behavior process accomplished by experience or intention” (Erturk, 1977).

The changes occur at the structure of society, brought-out some of the philosophical currents. These currents affected the curriculum that constituted Philosophy of Education.

- Perrennialism is the oldest current of Philosophy of Education, based on realism and affected to idealism. According to this current, some of the knowledge and ideas are meaningful from the first day to the last; ever existed. So they must be the focus of education. Perrennialism has a very strict discipline of understanding that defends the teacher-center education (Sonmez, 1996).
- Essentialism is the most widely-used current of Philosophy of Education, which is mainly based on idealism. The traditional essential understanding considers that the personality development and quiddity of knowledge must be given to students. ”The aim of education dedicates basic training. The teacher must be the role model of field expert and good-citizen.

The powerful and smart student can improve own-self at school with this basic training” (Gutek, 1997). According to essentialism, the student is inactive and the teacher is in the center of education and can use force against learner.

- Progressivism is based on pragmatist current and it focuses on student and activity. The teacher is the guide and the supporter. The progressivist current accepts that the students are different than each

other by their interests and experiences. The teacher must plan the lessons as such that the students should suspect and turn to self-learning. According to progressivism, the school trips must be arranged for better understanding the nature and society. The tolerance and cooperating is the most important behavior at this current (Sahin, 2005).

- Reconstructionism is based on pragmatism. The goal of education is a re-arranged society and it is emphasized that the school's fundamental duties are to renovate. According to Reconstructionism, the schools should not be a place where issues analyzed or problem of society evaluated, on the contrary they should be a place where generating solutions are suggested. The teachers and the students should become the leaders who come into action of solutions (Varis, 1998).

THE SYSTEM OF EDUCATION AT TURKEY

Republic of Turkey was established in 1923. At that time, the purpose of education was "to create new citizens and institutions that understands the issues of renovation and narrates from one generation to another" (Eskicumali, 2003). Thus the essentialism was used at education. However, the school was revising in the direction of pragmatism in the USA which Philosophy of Education was presented by John Dewey.

The first reform was "Tevhid-i Tedrisat" (the law of the union of education and teaching) at March 3rd, 1924 in Republic of Turkey. After this law taking place, all the religious education institutions and the elementary schools combined, and the government took full control. During that period, the idea of centralized structure of school management gave place to territorialization which meant that the planning and financing of the school depended on the area. Mustafa Kemal Ataturk; who established Republic of Turkey was personally part of the process of education and gave lessons in New Latin Alphabet by the title of head-teacher (Sag, 2003).

The five year elementary school became mandatory by the 1924 Constitution. Around that time, John Dewey was invited to Republic of Turkey to evaluate the new education system, and his report stated "the education must transfer the culture of society within frame of pragmatism" but the report did not get used because of the purpose of creating new society with new culture. Around 1926, education expenses were voided and boarding schools opened to public free of charge.

The Turkish middle teaching institutes comprised of the three year secondary and three year high school. Istanbul Technical Schools transformed into Istanbul Technical Universities. A few schools in Ankara were combined as Ankara University in 1933 (Arslan, 2005). From this time and on, the new approach to education began to be called Distance-Learning in the U.S.A. IOWA University was put into service where the first television broadcaster for education was used between 1932-1937 (Gulbahar, 2009).

The universities accepted candidates without any eliminations because of lack of high school graduations in 1960s (Erdem, 1993). Due to increasing number of candidates, an examination was essential, thus, the Center of Student Elimination and Placement (USYM) was established in 1974. The Computer Supporting Education accelerated at universities and the computers started actively being used in the classes in Europe (Kuzu, 2007).

In the developing history of Turkish education, a lot of attempts of reformist progresses brought out and some of them were used for temporarily.

The Country Institutions

The Country's Institution was the most systematic educational Project of the history of Republic of Turkey. It was created to consider the educational needs of the country and based on a part of the report which was built by J. Dewey. This Special training system educated the teachers but turned to teacher's school of Education in 1952 (Geray, 1969).

The Applications of Open Education

The application of open education started, firstly, at middle level of technical subjects in 1960 in Republic of Turkey. The base of open education began to be published at Boston Newspaper in 1728. British Open University was the first university where the application of open education was used in 1960 (Hakan, 1991).

Class Succeeding and Credit System

The application of credit system based on 8th National Education Council in 1970 but the system started to be used in 1991 (Erdogan, 2001). At that time, The Pragmatism was developing in USA and it gave a new form to the school management; all depended on managers, teachers and parents of the school (Ari, 1999).

The Class Succeeding and Credit System was terminated in 1994, firstly, because it was not easily understood by students, not easily applicable, there were not enough staff members to proceed and at last it was diagnosed to cause domestic violence between students (Erdogan, 2001).

The Eight Year Continues Compulsory Education

The Government decided to the eight (8) year Continuous Compulsory Education starting at primary school (MEB, 2001). However, at the time The Compulsory Education was already implemented at least 9 to 12 years in the U.S.A. and Europe.

USING THE COMPUTERS IN EDUCATIONAL AREA IN TURKEY

Using the Computers in Formal Education

By the reason of developing “the new informatics and communicating Technologies”, the computer hardware started to be provided to some of the secondary schools in 1985-1986 educational years by National Education Ministry (MEB). In the aim of training efficiently, some of the teachers took computer courses from MEB (Arslan, 2003). The usage of computer in pre-school education was discussed for their domain of applicability and importance in European country. Especially Seymour Papert, who was the creator of LOGO programming language, and Piaget, who made studies of cognitive theory understood children and proved that some of the studies can only succeed if the computer was used in pre-school education (Ari, 1999).

In late 1991 the computer laboratories were built in more than 400 schools (Ozel, 2004). In 1995 the amount of computer was approximately 5.8 million in the U.S.A. (Demirci, 2007).

Distance Learning

The Distance Learning is the model of education, which carried out by using communication technologies, post office and students can study in their own time, at the place of their choice (home, work, learning center, etc.) with-out a face-to-face contact with a teacher. In other words, the distance learning is consisted of special organization, application required a different lesson plan and special tutoring whether using an electronic system or not.

The distance learning started to establish Tutoring Centre by post mailing in 1961 in Turkey. The first Open University was established with the idea of Anadolu University in 1982, but it was actually established in 1993 (Gulbahar, 2009). In USA and Europe, the distance learning was started in 1728. The letter, the radio and the television were used in distance learning as the way of education and the universities were established where used to this way in 1960s. The high school, where was trained with letter, was built at 1923 in USA.

E-learning

E-learning, is an effective method, which uses the internet and multimedia systems and provides to the different information sources and interactive learning (Yavuz, 2003).

Table 1
The E-Learning programs on universities in Turkey

UNIVERSITY	THE NAME OF PROGRAM
Sakarya University	Associate Degree Program 5 Computer Programming,, Knowledge Management, Business Management, Industrial Electronic, Mechatronics Degree: 3 (Blended Education Method) Computer Programming, Human Resources Management, Industrial Engineering Post Graduate: 3 e-Information Technologies, e-Business Management, e-Engineering Management Certificate: 2 Certificate programming (16 Lesson Computer Programming, Knowledge Management
Anadolu University	E-MBA
Anadolu Univ. Open Learning Faculty	Associate Degree Programming Knowledge Management
ITU	UZEM
METU-IDEA	Asynchronous Internet Education
METU-Online	METU Online
METU-DIL	DIL(Distance Interactive Learning)
Istanbul Bilgi University	E-MBA

E-Learning consists of web and computer based education, virtual classes, digital cooperation and their process. According to this method, the student is the center of education and learns independently of time or place (Gezer, 2008). E-Learning programs are used most universities in the lots of countries and of course in Turkey. Table 1 illustrates them with which universities are used.

Computer Based Learning

Computer-based learning, sometimes abbreviated to CBL, refers to the use of computers as a key component of the educational environment. While this can refer to the use of computers in a classroom, the term more broadly refers to a structured environment in which computers are used for teaching purposes.

The concept is generally seen as being distinct from the use of computers in ways where learning is at least a peripheral element of the experience (Balaban, 1998).

Computer-based learning was started with "Computer-Based Learning Project" between years of 1988 and 1989 in Turkey (Simsek, 1997). Nowadays, Anadolu high schools and private schools use this kind of applications.

Intelligent Tutoring System

An intelligent tutoring system (ITS) is any computer system that provides direct customized instruction or feedback to students, i.e. without the intervention of human beings, whilst performing a task.

Thus, ITS reaches the goal of high quality and effective education (Dogan, 2008). An ITS may employ a range of different technologies. However, usually such systems are more narrowly conceived of as artificial intelligence systems, more specifically expert systems made to simulate aspects of a human tutor.

Intelligent Tutor Systems have been around since the late 1970s, but increased in popularity in the 1990s. Many of them were piloted in high schools and colleges. The producers and the environments of them are illustrated Table 2.

Table 2
Intelligent tutoring systems in the world

Name of ITS	Owner of ITS	The Environment of ITS
WEST 1960	Computer Development Corporation	WEST is a coaching program designed to teach the appropriate manipulation of arithmetic expressions in a computer gaming environment (Burton, 1979).
SCHOLAR 1970	Jaime R. Carbonell	SCHOLAR attempted to engage the student in a mixed initiative dialogue on South American geography. The program and student communicated through a sequence of natural language questions and answers. The tutor could both ask and answer questions and keep track of the ongoing dialogue structure (Nwana, 1990).
BUGGY 1975	J.S. Brown and R.R. Burton	The BUGGY program provides a mechanism for explaining why a student is making an arithmetic mistake, as opposed to simply identifying the mistake, It allows teachers to practice diagnosing the underlying causes of student's errors by presenting examples of systematic, incorrect behavior
The Geometry Proof Tutor (GPT) 1984	Kenneth R. Koedinger, Albert T. Corbett, John R. Anderson and R. Pelletier	The Geometry Proof Tutor (GPT) developed to support students in completing Euclidean proofs (Anderson, 1985).
PROUST 1985	Spohrer and Soloway	PROUST does on-line analysis and understanding of Pascal written by novice programmers. It takes as input a program and a non-algorithmic description of the program requirements, and finds the most likely mapping between the requirements and the code (Johnson, 1985).
LISP Tutor 1986	Carnegie Mellon University Anderson and Skwarecki	The Lisp Tutor is a model tracing tutor that assists students is completing short Lisp programming problems. This tutor was employed in a study of feedback timing and control with four feedback conditions. One was a standard immediate feedback condition in which the tutor provides

		feedback on each symbol. A second, error flagging condition, flagged errors immediately, but did not require correction. Students could correct errors when they chose. In a third condition, feedback-on-demand, the tutor provided no assistance until requested by the student. In the fourth condition, students completed programming exercises in the same problem solving environment, but without any tutorial assistance. (Corbett and Anderson, 1991).
ANGLE 1986	Kenneth Koedinger	ANGLE provides such a special environment that students build a proof graph rather than a two column proof. Students construct each statement in the proof by selecting an icon from the set of icons on the left side of the screen that reify the types of visual patterns the experts detect (Anderson, Boyle and Reiser, 1985).
Pump Algebra Tutor 1992	Kenneth R. Koedinger, Albert T. Corbett and John R. Anderson	PAT is an algebraic problem solving environment. Each task presents a problem solving situation that describes the relationships among two or three quantities and presents from three to six specific questions to answer. The students are asked to represent the quantities as spreadsheet columns, answer the questions in the spreadsheet rows, induce an algebraic description of the relationships and graph these relationships (Koedinger, 1997).
Cognitive Tutor Algebra I 1993	Carnegie Learning Inc.	Cognitive Tutor Algebra I program is designed to provide students with an opportunity to learn Algebra I in both classroom and computer lab settings. Students spend about forty percent of instructional time in their algebra classes interacting with the Cognitive Tutor software. The software is designed to "understand" the methods a student may use to solve a problem and to offer individualized assistance to the student. The computer program adapts to the student by pacing the curriculum and by selecting problems according to the student's needs (Shneyderman, 2001).
Advanced Geometry Tutor(AGT) 2005	Noboru Matsuda and Kurt VanLehn	AGT based on the student's competence level for a step, the tutor selects one of three types of proactive scaffolding: Show tells: the tutor tells students what to do and actually performs the step. Tell: the tutor tells students what to do, but asks the student to perform the step. Prompt: the tutor only prompts the student to perform the step (Matsuda, 2005).

Unfortunately there are not lots of ITS systems in Turkey, but the researches are continued. Intelligent tutoring systems consist of four different subsystems or modules: the interface module, the expert module, the student module, and the tutor module. Table 3 illustrates models of an ITS that were produced in Turkey with their owners.

Table 3
The produced model of intelligent tutoring system in Turkey

Name of Model	Owner of Module	Recommended Module
Evaluation Machine 2003	Çukurova University Ugur YAVUZ - Selcuk KARAMAN	Fuzzy-Evaluation Module (Yavuz, 2003).
Excel TUTOR 2004	Ahi Evran University Sinan KAYA - Özgen KORKMAZ	Content Module Rule Based (Kaya, 2007).

An Intelligent Tutor System Based of Visual Prolog 2004	Kocaeli University Kadir ERKAN - Funda DAG	User Interface Module User Module Domain Expert Module (Dag, 2004).
Defining The Situation of the Student with Suggested Model (2008)	Fırat University Mehmet GÜROL-Ferhat BAGCACI	Evaluation Module (Gurol, 2008).
The new Component for ITS 2008	Gazi University Nurettin DOGAN- Betul KUBAT	Organizer Module (Dogan, 2008).

INTELLIGENT TUTOR SYSTEM AT TURKEY

Excel Tutor

The Excel tutor software was written by Microsoft Visual Basic 6.0. It is special intelligent tutoring software to teach about the cell concept, operators, formulas and functions at the well-known Excel program.

Field knowledge and rule based are the two components of the Excel Tutor expert knowledge module.

Field knowledge was designed such as a textbook to teach, it includes; chapters, chapter subjects, practices and tests. Base rule is designed as a list of rules to provide student error detection, giving tips and explanations if preferred and personalized feedbacks.

Excel Tutor Program can control the answers of user (student), if the answer of the question is wrong than the system sends some hints or explanations.

Figure 1 illustrates the explanation of a mistake about functions are made by the user. When the answer was true, Excel Tutor Program asks another question, which is depending on its containing.

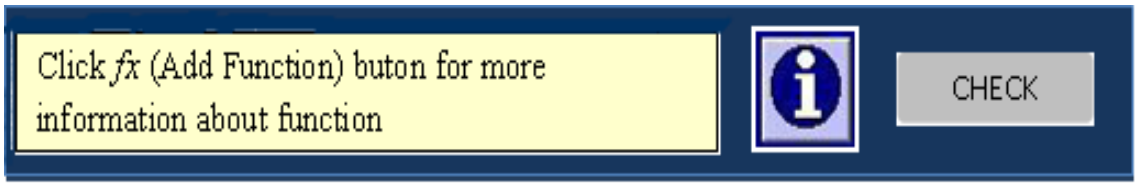

Figure 1
The explanation of a mistake about functions are made by user

Excel Tutor System allows making suggestions according to reviewing performances of a user.

Figure 2 illustrates the self-assessment of a user, which is sent from the system. However, the knowledge extraction algorithm which belongs to the expert system, is used to create the program algorithm which for the structure.

The student model which is produced to base stratification model, is comprised of comparing and equalizing the user's knowledge to content model.

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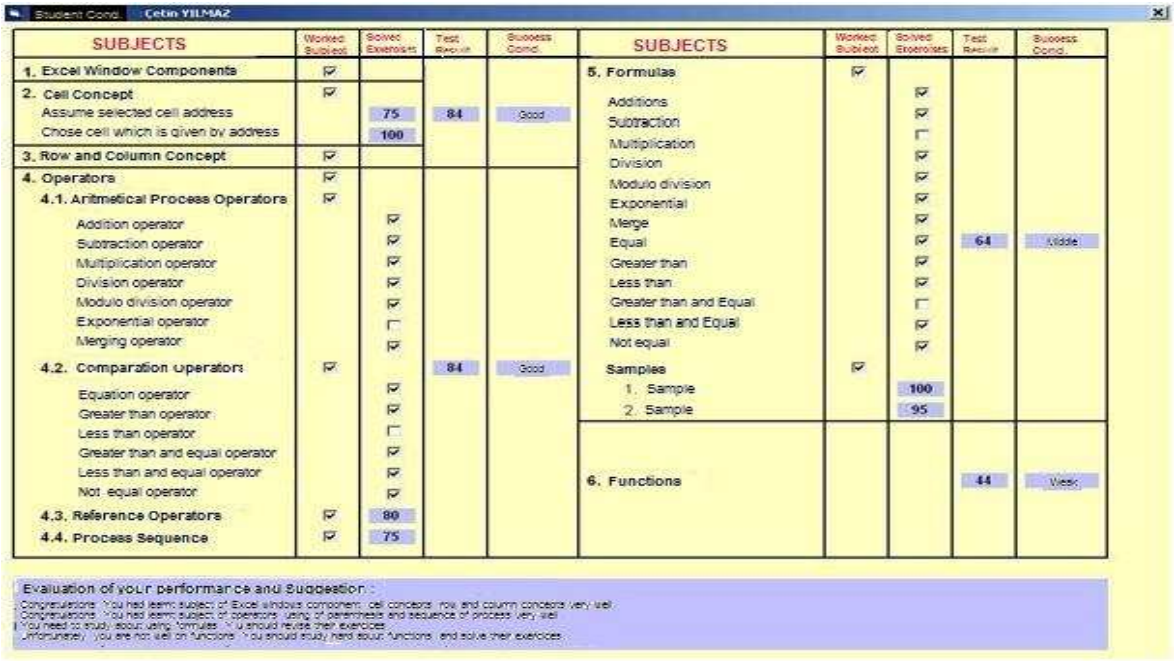

Figure 2
The self-assessment of a user which is sent from system

The student (user) and the teacher access to the system with user name and password, thus every student could display to own personal circumstance and choose the issues or the contents which her/she wants. Every activity is recorded to student model, so the teacher could reach the case of user, despite designing a user interface module which is constituted a student interface and teacher interface model.

Excel Tutor System uses to interactive problem solving, gives intelligent helping support step by step and feeds back every mistake with a personal explanation. The student (user) realizes that the subject which is well-known or not and the questions which are answered or not by reason of recording performances and user's case. The system provides to teacher with an opportunity that ascertaining and evaluating the performance.

Excel Tutor Program was carried out the students of a department of social sciences teaching at Gazi University by Sinan Kaya and Ozgen Korkmaz at Ahi Evran University at 2004-2005 educational years. Consequently, according to analysis of numeric data which was obtained the tutoring by the Excel tutor Program more successful than the traditional education (Kaya, 2007).

An Intelligent Tutor System based of Visual Prolog

Component of the intelligent tutoring system which is web-based, general purposed (ITS) has been carried out by using Visual Prolog. A frame work of the system has been constructed to apply various lessons by Kadir Erkan and Funda Dag at Kocaeli University in 2004. An ITS actually consists of four (4) fundamental modules which are; domain expert module, user model, instruction model and user interface model.

However, the ITS based of Visual Prolog has the only domain expert model, user module and user interface model, that they build up the architecture of ITS which are illustrated in Figure 3.

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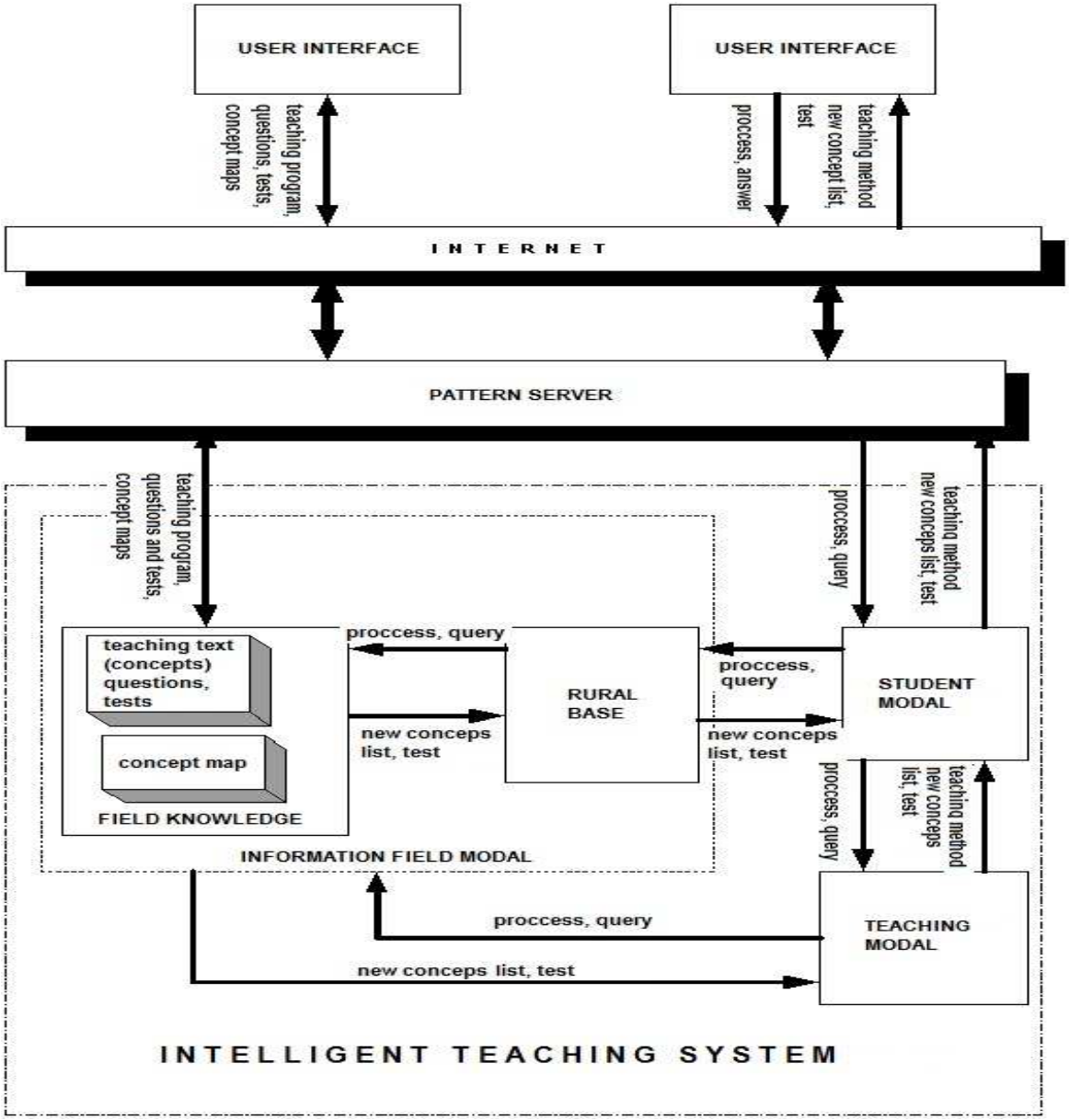

Figure 3
Architecture of the Visual Prolog based ITS

The user interface module consists of an author model and a student model. The author module consists of a lesson of subject, questions, tests and etc. information, which are illustrated in Figure 4. The student module consists of selecting preferred lesson and presents subjects suitable for student's level.

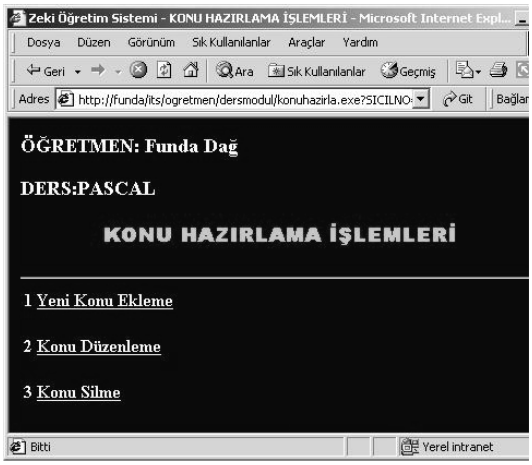

Figure 4
The author interface from Visual Prolog based ITS

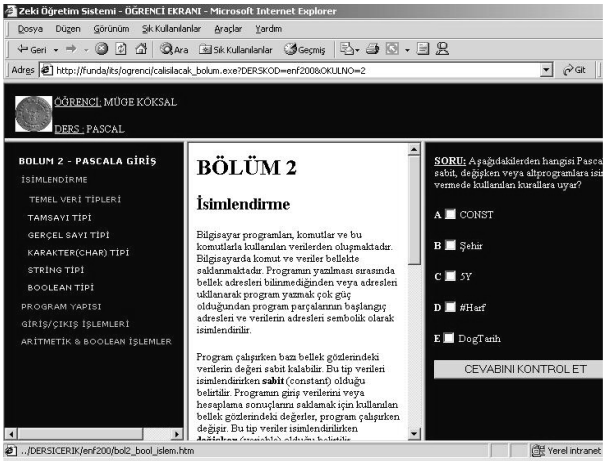

Figure 5
Content module as an example from Visual Prolog based ITS

User module was created as if the knowledge of student is a very small part of the content module. The purpose here is; to balance the knowledge of student and the content module. To create the user module for system, the student knowledge must be verified as measurable. Domain expert module consists of a content module and rule-based module. The content module is designed as small, explanatory information pieces such as a textbook. It includes sections of subjects, concepts and tests, which are illustrated in figure 5. The rule-based is designed as a list of rules which instructs the student from beginning to the very end within the concept map. Using the author user face, a teacher may create a new class and its concept. Using the student interface, a student may choose the classes he/she prefers, and may follow the suitable concept for own level.

The main purpose of this study in Turkey is to construct a frame work of the system to apply various lessons. In this ITS out of 4 modules only 3 of them have been completely constructed and they operate basically just yet. 4th component of the module does not operate yet. The studies are continued to do so (Dag, 2004).

D.U.Y.G.U. As An Intelligent Tutor System

D.U.Y.G.U is a special project which is designed and managed by Devrim, Camoglu. (Graduated from Department of Industrial Design at Mimar Sinan University, Istanbul Turkey) consists more than one research subject in the area of Natural Language Processing.

Combining different parts of intelligence, such as mental alertness, chariness, consciousness and perception-pattern analysis center in a main module provides the project, namely D.U.Y.G.U. (Dil Uzam Yapay Gerçek Uslamlayici-Language Based Artificial Reality and Reasoning), an artificial form.(The “Artificial Reality” emphasizes not only communication but also all of the cognitive systems and reacting physically) In spite of the fact that the project was started as a research of Natural Language Processing at the beginning, it is designed as an interpreter of Turkish Artificial Intelligence Markup Language (T.Y.I.D) so as to improve the goal of syntactic pattern analysis.

D.U.Y.G.U. fulfills some of the important cognitive functions, such as plural concept connecting, communicating, judging and creating behavior, which require to Artificial Intelligence. In addition to the systems of Artificial Intelligence Dialog which was produced before and globally announced with Loebner Prize, D.U.Y.G.U. has additional specialties. It can connect audio-visual concepts, code linguistic and gain meaning. It

can also show the emotional processes such as sadness, happiness and worriment by sending orders to muscle motor system.

It has been decided that the project D.U.Y.G.U must be associated with the Humanoid Project in order to get rid of the desktops, to be an autonomous artificial intelligence and to provide the expected mental functions. Therefore, it will be able to learn, decide, react physically and move autonomously.

In order to understand the stage of the project D.U.Y.G.U and its application, the following questions were asked to Devrim Camoglu and answered by him.

1. What is the Project D.U.Y.G.U.? Could you give us some information about it?
   It is clear from its name, D.U.Y.G.U. that the initial idea was to model emotions and thoughts in a mathematical and algorithmical way. I partially fulfilled my aim. Frankly, it needs some more work to be completed. Additionally, I can say that if I can accomplish my aim, everybody will be astonished.
2. Was this project developed by support of a team or your own effort?
   Up to now, The Project has been completely developed by my personal effort and there has been no team behind the project except me. There may be a project group if there is an appropriate offer. Also, it yields a better performance of the project. Additionally, accompany with fresh ideas will make me happy.
3. What kind of contribution is expected for the project D.U.Y.G.U. by the robotic project, which you stated that you are working on?
   In my opinion, a robotic structure will provide an autonomous system, in other words, it will provide physical movement and make its own decision. It looks like a little bit terrifying even though there are so many ethical and legal issues that we must discuss. My opinion is that humanity will not escape from this progression.
4. Did you have any opportunity to perform the D.U.Y.G.U. Project? If there was, could you give us some information about the consequences?

As I said before, D.U.Y.G.U. has not been used in a commercial area, yet. Of course, it could be a personal informative with the communication module. But I don't want to waste this Project by using as a net-bots, because D.U.Y.G.U is more than it. That kind of projects have been already made by software developers, but all of those are the programmed answers, which related to specific sentence patterns. Those answers are not created by an artificial intelligence or recreate of speaking with a syntactic analysis.

The Linguistic, which is consists communication and thoughts at the same time, is just a part of the Project. The goal is to understand of subconscious, conscious, judging making decision, emotion etc. by analyzing modeling and artificially reconstituting them.

Therefore, some parts of project are the subjects of cognitive science and some parts of the project are the subject of cybernetic. Thus, cognitive and artificial system which can be called as artificial mind works on a TYID and its descriptor main software by a symbolic method. Besides, a social robot project has been performed as an application of artificial intelligence into the real world.

CONCLUSION

In this study, the educational system that is in the term of Republic of Turkey was analyzed and the periodic process of education systems all around the world was presented. Afterwards, the process and the method modules began to be used at education with the information technologies.

The Artificial intelligence (A.I.) was present in the earlier 1920 but; the first scientific applications were made in 1950's.The idea of A.I. may accept as a result of developing of computers. Natural language processing,

robotics, neural networks, expert systems, fuzzy logic etc. are the application area of A.I. from The DENDRAL to the BLUEBRAIN project, which is the one of the first inventions at the expert system, produced neural networks, the A.I. took a great developing.

The first Intelligent Tutoring System (ITS) which is SCHOLAR was carried out in 1970. After that time the application area of A.I. was used for education such as expert system, fuzzy logic and neural networks. The aim of this study is the Intelligent Tutor System, which is the application of A.I, it is used for education and training. To differentiate the Intelligent Tutor Systems in Turkey and all around the world; that suggested developing information and lists with dates are provided.

Although ITS has four components, the applications, were presented in Turkey, show that if the purpose is to evaluate a student in the learning process from beginning to the end, then, “an evaluator module” or “fuzzy evaluator module” should be inserted to ITS. If the purpose is evaluating to change the connection between instruction module and student by considering the level of student, than, “the organizer module” should be inserted to ITS.

ITS is a new researching area in Turkey but the applications are considerably insufficient, when the applications are examined; the following reasons are presented;

- The exiguity of the scientists and researchers who study on ITS
- The non-solicitation of the students at higher education
- Not to organize researching teams
- If the researching teams were organized, the exiguity of sources cause not to continue the application or suggest a module and the exiguity of the ITS laboratory in Universities.

By these results, the effects of application is not obtaining as aspect, and not continuing. Thus the exiguity of success impulsion will prevent to find out the new enterprise. The reaching of applications of ITS in the world, the obstacles, is exposed, should abrogate in Turkey. By this purpose;

- The sources that are needed should be arranged such as financial support, staff, and workplace.
- Supporting the researcher of ITS.
- To provide the students interests at higher education, ITS lessons, laboratories and applications should increase.
- ITS Lessons should implicate in the other department’s educational program, as elective courses.

Consequently, the culture of ITS is introduced and comprehended, so, the new researchers of ITS will come forward.

Acknowledgement
We thank to Devrim Camoglu, because of illuminating us by giving details about D.U.Y.G.U. Project and because of the contribution by completing about Intelligent Tutoring System at Turkey.

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