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**DEVELOPMENT OF A WEB-BASED ASSESSMENT
SYSTEM**

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In this paper a Web-based approach for a knowledge assessment is proposed. Using a web browser to prepare and to fill in tests educators and students are given the efficiency to score and generate reports according to their current needs. We describe the system architecture and the corresponding delivered services. The underlying database is also briefly presented.

I. Introduction. The new information society imposes to turn in information into knowledge. In this way the information can be used effectively especially in education and training communities. Data interchange between students and teachers becomes very important. However, the amounts of information that is generated, archived, reviewed, processed and shared are enormous. That's why the management and use of this information to support a more effective learning process represent a significant research topic.

Using computers for education is not a new idea nevertheless many efforts being directed toward stand-alone, context specific applications. The developed networks, in particular the Internet, permits to use computers as environment for learning. Networking computers enable sharing the learning experience among students. At the same time the Internet is a global and platform-independent network for supporting education through creation, sharing, and distribution of information. The process of the assessment of knowledge also gains from the application of this high-speed computer technology. Recently, there is a growing trend toward using World Wide Web for the development of web-based assessment environments.

Using this technology the conventional test is performed on screen rather than through paper and pencil. The advantage lies in the efficiency of scoring, report generation, using a web browser to prepare and to fill in tests.

The main goal of our paper is to develop a Web-based approach for the knowledge assessment. DidaktaTest 2.0 represents a further improvement of our computer-based system for test generation, presented in [4].

Our approach consists of applying relational database systems for a remote Internet/Intranet student assessment through a Web-based interface. Although the core concept behind the Web, the hypertext is not a pure relational one, the relational model is dominating. A strong trend of bringing relational database systems to the Web via Open Database Connectivity (ODBC) middleware exists. For this reason, Microsoft (MS) Access 97 has been used to implement the underlying database. The Web itself can be

considered as a flexible three-layer client-server model. The user is connected to a Web server that executes the submitted tasks. For the needs of Internet/Intranet management we take advantage of MS Active Server Page (ASP) technology for MS Web servers.

The paper is organized as follows. Section II discusses some approaches for development of interactive web-based applications. In Section III the general architecture of DidaktaTest 2.0 and the delivered services are presented. In Section IV an E-R model of the assessment system's database is proposed. We also give the corresponding MS Access tables obtained by transforming this E-R model. This section deals with system implementation and database re-organization. Finally we summarize the results achieved up to now and present our future work.

II. Technologies for development of Web-based information systems. The extent of interactivity on the Web was initially limited to surfing through documents or filling out simple forms [2]. Many interactive technologies to increase some typical HyperText Markup Language (HTML) possibilities, such as Java, ActiveX, JavaBeans, JavaScript, dynamic HTML and eXtensible Markup Language (XML) have been developed. Nowadays, there are several initiatives for developing and sharing interactive content. Many powerful database management systems such as Oracle, Informics, Sybase, MS SQL Server etc. can be used to store, organize and manage these contents. On-line learning environments including online assessment tools apply these technologies to provide an efficiency level of interactive experience.

ASP is one of the powerful Web development technologies available now. This is a server-side technology i.e. ASP scripts run entirely on server. This technology enables easy generation of dynamic HTML. The following advantages over standard Web application development can be summarized:

- ASPs combine HTML with script in the same file for a better application flow.
- The scripts are processed on the server, so data sources become easily available through standard Web browsers.
- ASPs provide state management.
- ASPs enable Visual Basic developers to perform functions that previously required CGI or ISAPI programming.
- ASPs provide easy access to databases via ADO.
- ASPs integrate ActiveX server components.

III. DidaktaTest 2.0 system architecture and the corresponding delivered services. The Web-based assessment system DidaktaTest 2.0 consists of two main components (Fig. 1.):

- a MS Web server with ASP
- a database managed with MS Access 97.

The first component handles users requests, executes system tasks, sends queries to the database and returns results in HTML format to the users. The second one manage all the data concerning students, teachers, subjects, test items, scores, etc. [4]

Three type of users – administrator, teacher and student – can access the DidaktaTest 2.0 system with a standard Web browser.

The administrator registers subjects, teachers and students, grants permissions to different users and accesses the whole database.

Teachers have access to test items related to courses they deliver only. They can choose the subject, chapter, topic or several topics in order to generate a test or include new items into the database. During the test generation process the teacher can choose items and objectives types. At the end of testing the results are summarized and reported in an easy way.

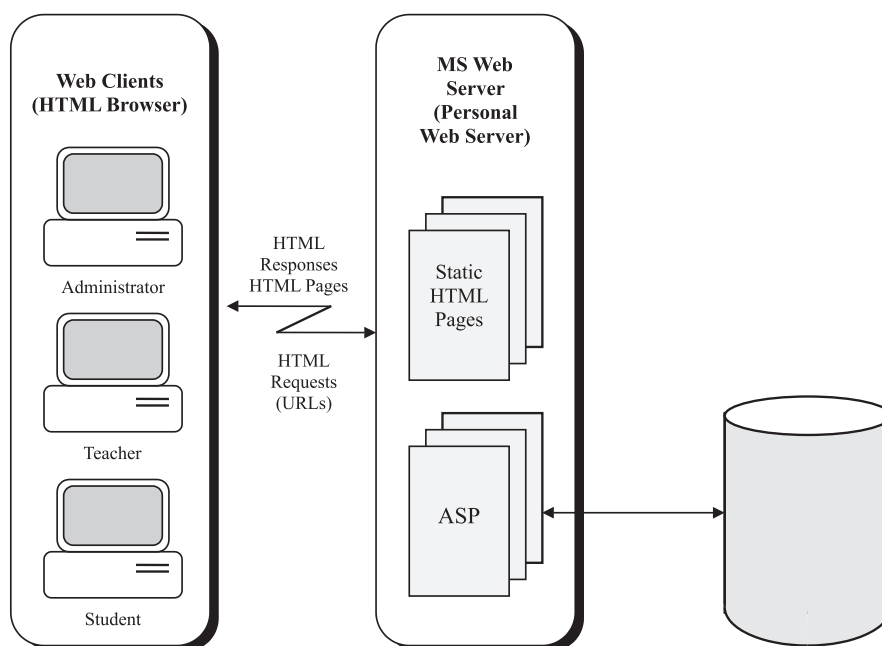


Fig. 1

Students are permitted to use specific subject tests only. They can choose a subject, type of testing and a test. There are two ways of testing:

- assessment
- self assessment

The students receive the test score or the correct answers in the case of self-assessment testing.

IV. E-R model of the assessment database and system implementation. The E-R model of the underlying database is presented on Fig. 2. Objects are depicted as rectangles while relations – as rhombs [3]. The database is implemented with MS Access 97. We employ several techniques to achieve good performance and to tune the database properly. In our opinion, achieving system performance is crucial being at the same time a very difficult task. The corresponding relational tables are given on Fig. 3.

DidaktaTest 2.0 represents an enhancement of the first version of the assessment system DidaktaTest 1.0 [4]. The improvements are:

- Database unification. Tests concerning different subjects are stored in a single database. In this way efficient query processing and disk space optimization have been achieved.
- Web-based user-friendly interface. Our approach needs no special client software. A standard Web browser is the only tool to use the system. Moreover there are no constraints to access DidaktaTest 2.0 through Internet/Intranet.
- Authorized data access. DidaktaTest 2.0 is an open system due to Internet/Intranet access by any Web browser. This fact imposes a severe protection policy because the system is developed for the student assessment. For this reason system security includes three levels of user's access – administrator, teacher and ordinary users – students. Administrator is granted full access to the overall system and the database. He is responsible to ensure the database security.
- Multimedia data objects. DidaktaTest 2.0 allows multimedia data such as pictures, sounds, video, etc. to be handled in test items.
- Enlarged set of test items The previous version of the system provided multiple choice with one right answer, true-, false- and short- answer items. In DidaktaTest 2.0 multiple choice items with more than one right answer and matching items have been added. The matching item is simply a modification of the multiple choice form. Instead of listing the possible responses underneath each individual stem, a series of stems, called premises, is listed in one column and the responses are listed in another [1].

V. Conclusions. The combination “assessment of knowledge– network– Web” leads to a new way of organizing assessment system. This way enables educators and students a virtual access to data sources according to their educational needs and current access rights. Using the World Wide Web the teachers can easily prepare or edit the necessary test and quickly receive the information of students achievement. The students can also check their knowledge in different subjects.

In this paper we present a Web-based approach for the knowledge assessment. A significant advantage of DidaktaTest 2.0 lies on the efficiency of scoring, report generation, using a web browser to prepare and to fill in tests. The interface is developed by tools allowing to query the database with simple Web browsers, that the users are acquainted with. So, very easy access through the manner 'point-and-click' becomes actuality. Our further work consist of:

- statistical analysis of test data;
- achieving database portability.

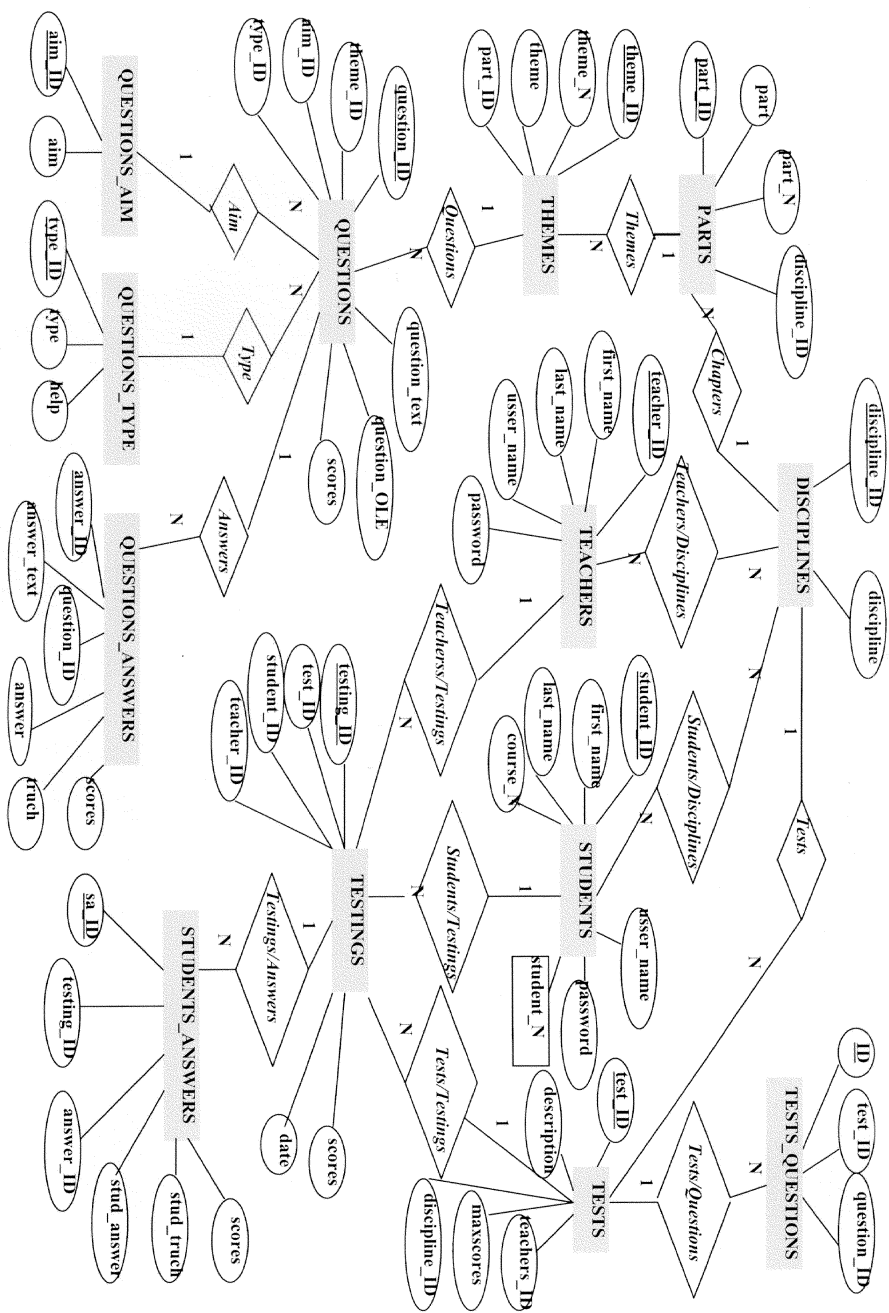


Fig. 2

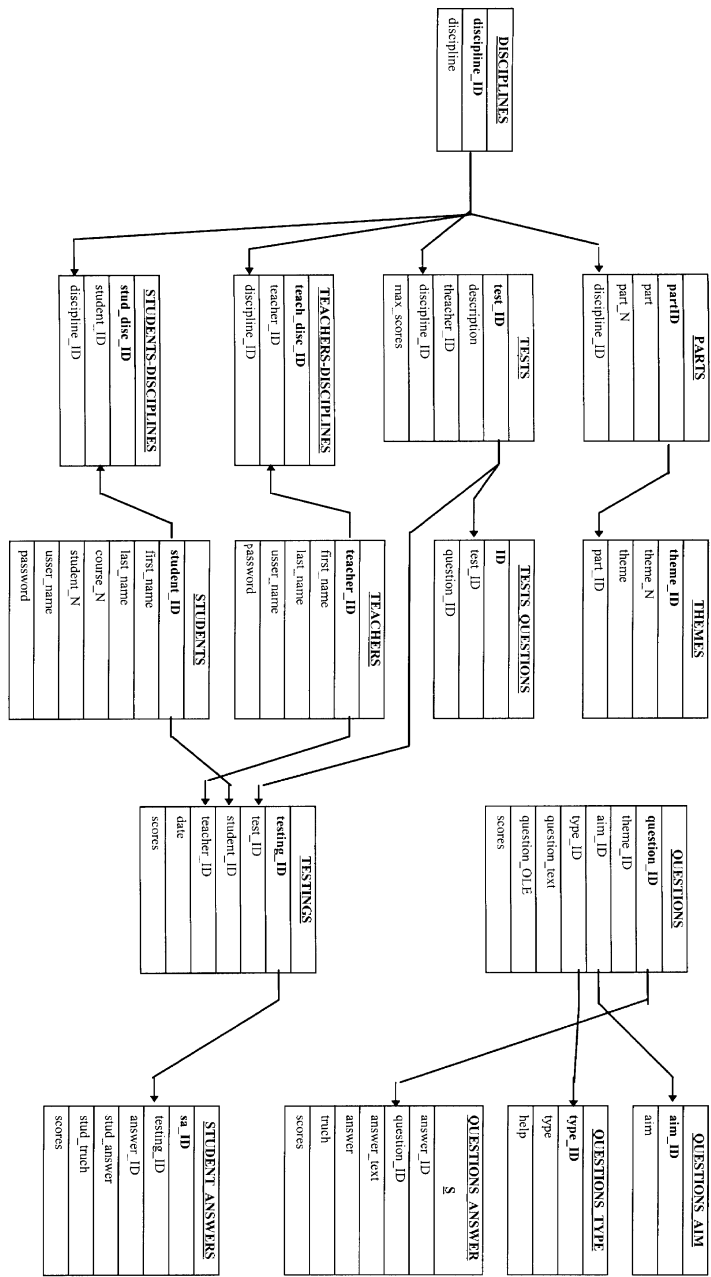


Fig. 3

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WEB-БАЗИРАНА СИСТЕМА ЗА ПРОВЕРКА И ОЦЕНКА НА ЗНАНИЯ

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С развитието на информационните и комуникационни технологии и предлаганите от тях възможности за комуникации и предаване на данни, се развиват и технологиите, прилагани в областта на образованието. Съществува определен интерес към използването на тестове за проверка и оценка на знанията, в частност компютърно-базираното им създаване и провеждане.

В настоящата статия се описва автоматизирана система “Дидактатест 2.0”, използваща Web-базиран подход за генериране и провеждане на дидактически тестове. Разгледана е архитектурата на системата и услугите, които тя предоставя. Системата съхранява информация за учебни предмети, преподаватели, учащи, тестови задачи и др., и е реализирана чрез MS Access 97. Интерфейсът е разработен чрез технологията Active Server Pages (ASP), позволяваща бързо публикуване на бази от данни върху Web и осигуряваща връзки с базата на стандартни Web браузери.

“Дидактатест 2.0.” може да бъде използвана във всички степени на българската образователна система – от началното до висшето образование, включително и за нуждите на дистанционното обучение.