

which have not chosen the subject of Internet technologies. Auxiliary hypotheses, "Selection of the study program affects the efficiency of computer usage" have been proven based on the data shown in Fig. 11.

The Polytechnical Engineering College in Subotica has three study courses: electrical engineering, mechanical engineering and information technology. It can be assumed that students of informatics should have more informatics precognition from other students when they chose the course of information technology. If this is true the data obtained after taking the courses confirms this assumption

Auxiliary hypothesis "Using e-learning service contributes to the automation process of testing tasks" is correct, because the results appear immediately after the completion of the test. All results are archived and can be searched by various criteria.

6 Improvement of existing system

At the end of the semester, additional students interviewing was carried out.

To the question "Would you use e-learning services in further education?" the students said the following:

Yes 83%
No 17%

To the question "Would you use e-learning services in combination with the traditional way of learning?," students said the following:

Yes 72%
No 28%

To the question "Would you have used only traditional way of learning?," students said the following:

Yes 17%
No 83%

These answers give great contribution to the daily use of e-learning service in the teaching process.

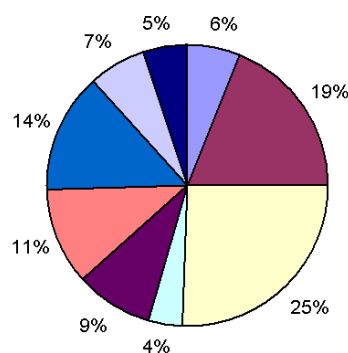


Fig.12 The results of survey conducted after the use of the web service

- higher level of interactivity (4%)
- remove the pop-up window (5%)
- more practical examples (6%)
- search based on keywords (7%)
- changes in service design (9%)
- providing comments and rating (11%)
- inserting the key words for each lesson (14%)
- use of video materials (tutorials) within lessons (19%)
- allow an unlimited number of test (25%)

The results of the survey conducted after the use of the web service are shown in the Fig. 12, the user can see the desire to increase the level of interactivity and the manner of distribution of information. The greatest number of proposals relate to the testing limit (25% of the total proposals), because the existing system users have a limit on the duration of 24 hours if they did not pass the test.

Following the trends in web service development and the results of students' survey, it was decided to improve system with further functions: video tutorials, lecture marking, giving suggests, comments and critics, keywords related lectures with tag cloud and make learning more adaptive. For programming improvements it is necessary to bundle pop-up windows because they reduce usability of web site. Also the use of AJAX technique is suggested for getting faster interactivity, and to made possible to enter questions and answers in XML format. We are also thinking of the implementation of a desktop application in Python programming language that communicates with web application using XML-RPC web service.

With this application the administrator could be able to access information on the web server in the environment desktop applications without the need to directly visit the web page.

In order to maximize the easiness of distribution of material in the way to be the platform independent we decided to enable the creation of questions in the XML format. System on the basis of the formats will make the inputs in database. Some of the queries would be compliant with the assistance of a Xquery.

All lectures are written in Serbian language, thus the decision was made to change name of existing service (E-xpert) to Web profa. In Serbian the word 'profa' is the short form of the word 'profesor'. A new logo was designed for this service (Fig.13) [3].



Fig.13 The new logo of service

Most of the lectures will have video tutorials. They are very suitable for visual representation of some material.

All registered and logged users should have an option to rate each lecture, to give their own comments or suggestions. This way we could have more information for future development of system.

A tag cloud or word cloud (or weighted list in visual design) is a visual depiction of user-generated tags, or simply the word content of a site, used typically to describe the content of web sites. Tags are usually single words and are typically listed alphabetically, and the importance of a tag is shown with font size or color.

We will enter the changes in the testing and monitoring the level of knowledge of users. After finishing the test, the system will assign a new level of knowledge based on the results of all tests that the user had. In the case that the level of user has increased, in the next test that user will get questions that matches his new level. In the case that a user showed very low success on tests in the long term, the system would warn the user that his level of knowledge is very low.

6.1 Development process

The most important tool for getting helpful information is a survey. An anonymous survey was made for the students who used this distance learning system. Based on the collected and analyzed answers it was concluded that students have similar or same requests for the improvement of system.

The implementation of this service emphasizes two very important items, security and user-friendly interface. The system is secured. Every web form is secure from web robots. During the test process there is no possibility to refresh the time left for solving. For security of web forms we will use Captcha method.

This information system is developed by use of following techniques: XHTML, CSS, JavaScript, PHP, AJAX, MySQL, XML and Python. For object oriented modeling UML is used. For the needs of web server Apache is used.

6.2 Web services

The definition of web service - According to the W3C web service is a software system that is designed to enable interoperable interaction between computers in the network, such as. Internet. It has a strong interface in a format understandable to a computer (eg WDSL - Web Service Definition Language).

Web services use XML technology as a presentation layer data for all protocols and technologies. Web services are loosely coupled. User of web service does not directly depending on the web service. Web service interface can be changed, and that when this does not affect the ability of the client to communicate with service

XML-RPC - is a protocol for remote procedure call (RPC) that uses XML to encode its calls and HTTP as a transfer mechanism. It is a simple protocol that defines the only useful types of data and commands the entire description can print on two pages of paper. This is the opposite in relation to most RPC systems, where the standard documentation, and extends to hundreds of pages and require considerable support for the software to be used. XML-RPC was created in 1998. by the Dave Winer-a (UserLand Software) and Microsoft. So the new functionality is shown, a standard evaluate in what is now called SOAP. Some users prefer the XML-RPC and SOAP-due to its simplicity, minimalism and ease of use, and JSON-RPC is similar to him. XML is widely used and understood, and can be interpreted by most programming languages. This makes it a good and solid choice for the use of the data type for the web service, which can be used by different users and platforms [6].

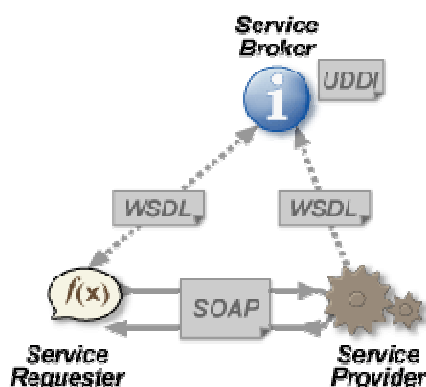


Fig.14 The architecture of web services

6.3 Desktop application

As we previously said, we will create a desktop application that would allow easier access to the information in the desktop environment. Web service will allow communication between Web and desktop applications.

For the server of web service we chose Zend_XmlRpc_Server component from a very powerful framework PHP: Zend Framework. Using these components, creating a server for Web service is reduced to only a few lines of code.

```

1  <?php
2  require_once("Zend/XmlRpc/Server.php");
3
4  class Calculator
5  {
6      /**
7       * Return the result of addition of two numbers
8       *
9       * @param int $x
10      * @param int $y
11      * @return int
12      */
13      public function add($x, $y)
14      {
15          return $x + $y;
16      }
17  }
18
19  $server = new Zend_XmlRpc_Server();
20  // Indicate what functionality is available:
21  $server->setClass('Calculator', 'calculator');
22  // Handle the request:
23  echo $server->handle();

```

Fig.15 Example of a web server service - this is all that is needed, the whole process from the server side is concerned about Zend Framework

6.4 AJAX

AJAX (Asynchronous JavaScript and XML) is not a new programming language, but a technique for creating better, faster, and more interactive web applications.

With AJAX, your JavaScript can communicate directly with the server, using the JavaScript

XMLHttpRequest object. With this object, your JavaScript can trade data with a web server, without reloading the page.

AJAX uses asynchronous data transfer (HTTP requests) between the browser and the web server, allowing web pages to request small bits of information from the server instead of whole pages.

The AJAX technique makes Internet applications smaller, faster and more user-friendly.

AJAX is based on the following web standards: JavaScript, XML, HTML and CSS [3].

6.5 PYTHON

Python is a dynamic object-oriented programming language that can be used for many kinds of software development. It offers strong support for integration with other languages and tools, comes with extensive standard libraries, and can be learned in a few days. Many Python programmers report substantial productivity gains and feel the language encourages the development of higher quality, more maintainable code.

Python runs on Windows, Linux/Unix, Mac OS X, OS/2, Amiga, Palm Handhelds, and Nokia mobile phones. Python has also been ported to the Java and .NET virtual machines.

Python is a remarkably powerful dynamic programming language that is used in a wide variety of application domains.

The language itself is a flexible powerhouse that can handle practically any problem domain [4].

6.6 XML

Recently the XML has increasingly been treated as a data model that the system as a set of mutually related types of documents, a database as a collection of inter related documents that appear defined types.

Differences between XML and relational data model are as follows:

XML data model

- data are stored in one hierarchy structure
- nodes have elements and / or attributes
- elements can be nested
- elements have a defined order
- cheme is optional

Relation data model

- data are stored in multiple tables
- characteristics have a value
- value of characteristics are indivisible

- the order of tuples is not defined
- scheme is required

Systems for managing data according to the way we treat the XML data model, can be divided into two groups:

- XML-enabled - systems that map the XML data model in a classic model, the most frequent relation, and so it is stored in a database. At the entrance and exit of such systems are XML data. From the well-known systems that are MS SQL Server, Oracle;
- Native XML (XML source) - systems that use XML data model in its original form

A query language that intelligently uses the structure of XML can be used for a query of any kind of data, whether the data is saved as XML documents or in another data model transformed into XML. This standard prescribes the XQuery XML query language, and the XQuery with the XPath language that is used for addressing parts of XML documents, which is built into XQuery, is dealt with below.

7 Modularity of system

The new created system is a modular. Existing modules are the module for learning lessons and testing module. The module for learning the lessons contain video tutorials as well as the code editor. Each of these modules can be accessed separately, as they are independent of one another. They can be excluded or included as needed.

8 Conclusion

This paper presents the development of web based modular information system for the needs of distance learning, describes the reasons why distance learning is so important. Also some information is given on the self made e-learning system and their possibilities.

An anonymous survey was made with students. Based on the collected and analyzed answers it was concluded that students have similar or the same requests for the improvement of the system. With the use of AJAX, XML and Python technologies the system will be improved with some new functions.

After finishing the new version of this system it is hoped that the number of internet service users in Serbia will increase. The second aim that is to be realized is to make other areas available for learning and testing via the internet.

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