

A New Computer Programming Course Enriched With Advanced Technologies

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Abstract— The same page content and the same connections in a standard Learning Management System (LMS), could not meet the needs of users because of their individual differences and different learning styles. Adaptive learning technologies which are thought as a solution of these kind of problems give users available environments that go-ahead by their own speed. Adaptive navigation which is an adaptation technique, helps users to find their optimal pathway in a web based platform. In this study the link generation method which is an adaptive navigation method has been used. A quiz which is named as QuizLMS module has been developed by using this method and has been published on the cloud computing platform. The scope of this work is to give the advantages of using the link generation technique and shows the benefits of publishing it through the cloud computing environment.

Keywords-learning management systems; adaptive learning environments; adaptive navigation support;link generation;cloud computing

I. INTRODUCTION

Nowadays information access and information sharing have become effortless due to rapid improvements in web based technologies. For this reason designing online environments and using internet technologies are important where the information is transferred also in educational field. Today, most of the universities provide the web-based education to their students. Due to the insufficient architect of hyper platforms, the adaptive learning environments are developed as a new approach in order to provide a learning environment suitable for students' learning requirements (Somyürek, 2009).

According to Brusilovsky (2007), there are two adaptation techniques. Adaptive navigation which is one of these techniques helps users to find their suitable way in the learning platform. There are several methods in this technique such as direct guidance, link ordering, link hiding, link annotation and link generation. Link generation is the newest and popular navigation technique which allows the new links that are not shown in the page before. These links created dynamically and direct the user to available pages or used for to give alert.E-learning is a learning process which supports the tutoring and is created digitally in interaction with the content network-based services. During the last years, academic institutions widely prefer to use e-learning platforms (Koutsabasis, Stavarakis, Spyrou, and Darzentas, 2011; Márkus, 2011). In e-learning platforms, the dynamic educational content and instructional methods are provided via WWW (World Wide Web). E-learning allows obtaining the information and skill in order to enhance the learning quality. It involves the learning technologies and learning strategies such as CD-ROMs, videoconference, TV lectures and virtual education work

(Pange and Pange, 2011; Samsuzzaman, Islam, Rashid, Ahmed, and Khan, 2012). Claroline, Moodle, and Blackboard Learning known as web-based e-learning platforms for distance education. Thanks to such platforms, the unsynchronized accession can be provided to many learning content types, real-time conference, online student assessment (Koutsabasis, Stavarakis, Spyrou, and Darzentas, 2011). Critical component in higher education is the web-based education. On-line courses are taken gradually by many students all over the world (Fuentes, Ramírez-Gómez, García, and Ayuga, 2012). Because of the principles from different disciplines such as pedagogy, psychology, software engineering and Information and Communication Technologies (ICT) included, it is difficult to develop a successful web-based learning environment (Pange and Pange, 2011). E-learning may include the activities from ICT-supported learning via traditional learning. Many academic institutions use the learning which includes the traditional education together with e-learning platforms. Various types of interactions are supported by these e-learning platforms between students and teachers (Koutsabasis, Stavarakis, Spyrou, and Darzentas, 2011; Márkus, 2011). E-learning skill takes place at the core of Learning Management Systems (LMS). They are also called as Virtual Learning Environments (VLE). There are many commercial LMSs. Most used LMS systems are the BlackBoard, WebCT, FirstClass (Selimi and Veliu, 2012). Virtual Learning Environment includes some different types of solutions as open source platforms. Some of these platforms are Blackboard, WebCT and e-College. The most popular Virtual Learning Environments are Moodle, Dokeos, Claroline, ILIAS, dotLRN or Sakai (Fuentes, Ramírez-Gómez, García, and Ayuga, 2012).

Adaptive hypermedia systems use the benefits of virtual learning environments mentioned above and provide the interaction of adaptation with the user needs. The adaptive hypermedia may be beneficial to the people who have the different goals and information. Education is one of the most widespread application areas for the adaptive hypermedia systems. The adaptive hypermedia systems allow the adaption of current information to the student's current information level, provide the navigation support and guiding the student during the learning process (Brusilovsky, 1998). Link generation which is one of the adaptation technique, is generally used in many adaptive Web-based systems now (Brusilovsky, 2007). Three link generation types are as follows;

- EExploring the new, beneficial links between the documents and adding the current link set permanently to them
- GGeneration of links for similarity-based navigation between the items
- DDynamic recommendation of links which are beneficial in the current context for the existing user such as current goal, knowledge or interest as reflected in the user model

By using link generation, navigation systems focus on helping users to find their way through hyperspace by adapting links on a page. In this way the user can find the correct way easily. To find the correct way faster interrupts losing between pages. At that point the system speed becomes important also. Cloud computing is one of the best way for the system to gain faster time.

According to Jadeja and Modi (2012), there are some advantages of using cloud computing like Windows Azure;

- Easy management: Due to less problem to IT team, the infrastructure, hardware or software maintenance is simplified. It is easy to use the applications in cloud environment. At the same time, it provides a simple web browser with internet connection at the user level.
- Cost reduction
- Uninterrupted services (Jadeja and Modi, 2012).
- Faster time to market due to usage of existing .NET skills
- Increased scalability
- More flexibility and creativity
- The natural choice for institutions moving forward

Cloud computing is a model which is suitable for configurable computing resources such as networks, servers, storage applications and services and provides network access. There are cloud computing platforms such as Amazon EC2, Google App Engine, IBM blue Cloud and Microsoft Azure (Liu, Ma, and Chang, 2012).

The firm Nasuni, which is a service provider in cloud computing technology sector, issued a report, " The State of

Cloud Storage 2013 Industry Report, A Benchmark Comparison of Performance, Availability, and Scalability". This report consists of the firm and tests of this study in order to make the evaluation (Yıldırım and Öney, 2013). Nasuni also issued a report for 2015. Microsoft is the top CSP for public cloud storage according to NASUNI (2015). According to result of benchmark tests, Microsoft out-performed Amazon in 2015 (NASUNI, 2015).

This study is about Learning Management System (QuizLMS) which includes adaptive navigation support technique (adaptive link generation) and Microsoft Azure Platform that is a cloud computing platform. The purpose of the study is to create a learning environment which includes a link generation adaptation module and use the advantages of the cloud computing environment.

II. ADAPTATION MODEL

Related Methods and Techniques for Application Process with QuizLMS which have been used for this study shown in Figure1.

Adaptation model (AM) includes the answers to the below questions and explained in detail for QuizLMS below.

The answers are sought for the following questions during the QuizLMS adaptation process.

- What can we adapt it?
 - We can adapt the user features. QuizLMS contains the quiz application in order to measure the student's knowledge level individually.
- To what will we adapt it?
 - We will adapt it to the system. We will adapt it to QuizLMS.
- Why will we adapt it?
 - We will adapt it for better learning performance. In order that the students learn the topics better, it allowed the students to access to the topics which they have insufficient knowledge directly through the links using the link generation technique in QuizLMS.
- Where will we adapt it?
 - At which phase or in which sections of system will we make the adaption? Link generation technique, the adaptation technique, is used in the quiz application (phase) of QuizLMS.
- When will we adapt it?
 - We will adapt it to the relevant topics, when the students give the wrong answers to the questions in QuizLMS and when they are

directed to the relevant chapter in 60% wrong answers to the questions.

- How will we adapt it?
 - It will be adapted using the link generation technique which is the adaptive navigation technology in QuizLMS (Menzi-Çetin and Altun, 2014).

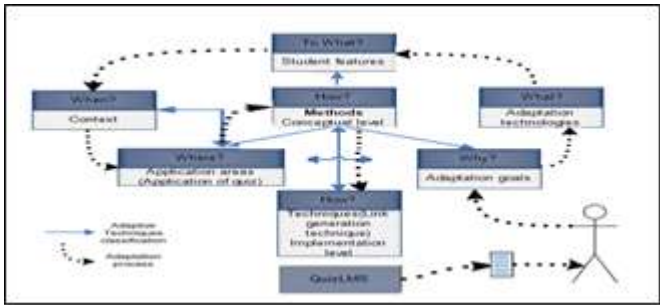


Figure 1. Related Methods and Techniques for Application Process with QuizLMS (Knutov, De Bra, and Pechenizkiy, 2011)

III. DEVELOPMENT PROCESS

Software process models have been applied for many years to provide order and structure to software development. Each of these models shows some different process flow. However, all of them apply the same set of framework activities as Communication, Planning, Modelling, Construction and Deployment (Eryılmaz, 2008). The software life cycle model covers phases and products of these phases. There are different life cycle models as waterfall model, incremental development model, prototyping model, reusable model, automated software synthesis model, and spiral model (Chantatub, 1995; Gröner, 2002). There are seven products of software life cycle as Software requirements specification (SRS), Acceptance test document, Software design specification (SDS), System test document, Integration test document, Unit test document, Programs (Chantatub, 1995). The use case diagram (Figure2) that have been used in the system for the student as shown below

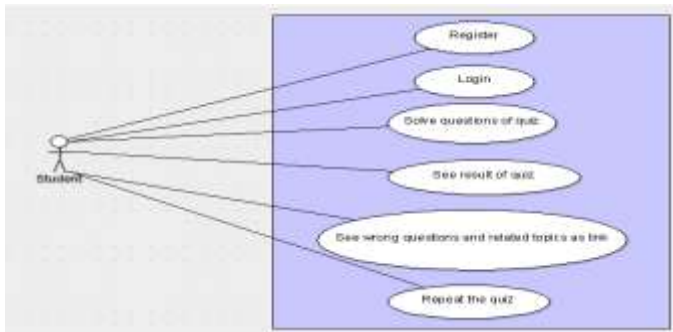


Figure 2. Use case diagram for student

A. System Features

QuizLMS’s entry page includes some pictures of Atılım University and gives information about Atılım University.

QuizLMS includes “STUDENT MENU” and “TEACHER MENU”. As shown in Figure 5, the students click the “STUDENT MENU”, and then they will direct their Quiz page. Figure 6 shows, if the students do not choose any options, the system will give a warning as “Please make a selection”. Figure 7 shows; if the students give a correct answer to the question, the system will give an alert dialog as “Correct answer! Your score is 1”. Also, if students give a wrong answer to the question, the system will give an alert dialog as “Wrong answer”. At the end of the quiz, the system gives the percentage of correct answers. In this way, QuizLMS generates the link which is an example of link generation such as “See Section 2 Topic 2” with the related section and topic under the question that student gives each wrong answer. If the wrong answer is higher than 60%, the system generates a link as the related section under the question detail. By this way, it is determined that the student is insufficient in the related section. This is an example of an adaptive navigation technique which uses link generation method. Also, if the wrong answer is not higher than 60%, the system will not generate a link as “See Section 2”. When the students click the links of the courses, the system direct the student to the course pages. There are links for course pages. If the students click the links, details of the courses will appear. These details include section and topics of the courses.

IV. METHOD

A. Research Model

In the study, the likert-type multiple-choice survey has been applied to 50 students to get an opinion about satisfaction .

B. Population and Sampling

The study was executed on the students of Faculty of Arts & Sciences and Faculty of Engineering in a private university. An educational software, including the quiz application, has been developed in web-based QuizLMS (Quiz Learning Management System). The main reason of developing the quiz application is to determine the effects of the link generation technique which is the adaptive navigation technique for the students.

50 students participated in the survey. The participants’ distribution according to their genders is given in the Table 1

TABLE I. THE PARTICIPANTS’ DISTIRIBUTION

Gender	Statistics	
	N	%
Female	32	64
Male	18	36

As shown in Table 1, 32 participants (64%) are female, and 18 (36%) are male.

C.Data Analysis

SPSS (The Statistical Package for the Social Sciences) statistics program has been used for the data obtained during the research, %, arithmetic mean, standard deviation have been used as the descriptive statistics in data analysis.

D.Data Collection

The data, obtained as a result of the survey has been performed in order to determine the impressions of the students on the system, and the benefits of them have been analyzed. The arithmetical mean has been used for each item in the data, obtained from 50 students. 5-grading scale, consisting of “None (1)”, “Less (2)”, “Partially (3)”, “Almost (4)” and “Very (5)”, have been used in the assessment instrument. The arithmetic mean, standard deviation and variance have been calculated for each item.

V. FINDINGS

According to the findings, the mean, standard deviation and variance of the survey questions have been calculated according to the grades of the students gave to the survey questions. Results show that totaly %82 of students think that the system provided contribution to their individual learnings. %52 of the students strongly agree and %38 of them agree that after they completed the quiz, the links generating the result allowed them to understand the topics which they were insufficient. %46 of students agree and %40 of them strongly agree that after they completed the quiz, the links, generated in the conclusion section, allowed them to reach to the relevant topics easier. %46 of students strongly agree that the generated notes, provided in each question during the quiz, informed them about the relevant question.

Also %58 of them agree that their achievement were positively affected by which they were oriented to the topics that they were insufficient through the links, generated at the end of the quiz.%48 of the students strongly agree that the links, provided in the page, prevented them from getting lost.The values have been calculated considering each degree of questions in the survey.

According to the statistical results, it was found that the option “Almost (4)” has the highest rate. it was observed that the students were satisfied from the QuizLMS application.

VI. CONCLUSION AND FUTURE WORK

In this study, application of QuizLMS is developed by using Microsoft SQL Server 2012, Visual Studio 2012, .NET, C#, Javascript, AJAX, CSS, and HTML. It contains a development process of this project and an adaptive navigation support technique, which is link generation. Users can achieve

their goals faster, reduce navigational overhead, and increase satisfaction due to adaptive navigation technologies. The importance of the study is to show the benefits of combining the link generation which is an adaptive navigation support method and cloud computing environment. The quiz module has been developed in the system. Using an adaptive navigation technique supply to student to find the suitable way easily. According to survey results, it can be conclude that students highly satisfy to use link generation adaptive navigation method. Another result of this study is, publishing this system into Azure Cloud Computing platform supply more speed. In the future work, different modules can be developed by adding more specifications and the results of its impacts on the students may be examined using the other adaptive navigation techniques. The systems, in which some adaptation techniques are either used or not, may be compared at the future phase. It may be developed QuizLMS by adding the different models to the models that QuizLMS contains in order to meet the different requirements. The benefits of such developed systems may be used in same processes by using cloud computing technologies, such as, publishing in Microsoft Azure Platform. The advantages and disadvantages of Adaptive Learning Management Systems in different cloud computing platforms may be tested.

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