

Development of the Interactive Multimedia Learning Systems and its Implementation

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One of the most noble professions of all the times is teaching. The rapid expansion of computer technology brought many changes in all areas of our lives, as well as in the teaching process. Actually, today every child uses the computer for fun and entertainment, so why not for learning his lessons too. The Interactive multimedia learning systems connect classroom curricula with real world situations so students are stimulated by enrichment and inspired to learn. The idea of this project is to prepare a multimedia educational software for IT skills. The disk would include materials for hardware and Microsoft Office. It would be primarily dedicated for students and teachers of the primary and secondary schools. As we mentioned above the target group of this project are high school and primary school students and teachers. Since the educational process in our country is organized mainly in Macedonian and Albanian language, the project meets this criteria as well. Thus, the materials offered in this disk will be presented in both Macedonian and Albanian language. The project is scheduled to be implemented in three stages: the conceptual design, the logical and the physical design.

Lastly, we would emphasize a very crucial part of this project, that this IT educational software represents a pilot project which will later lead us in preparing educational software in other teaching areas.

Keywords Multimedia, Education, Learning, Interactive, Distance Learning, e-Learning.

1. Introduction

We have all experienced periods of optimal learning when we are so focused on what we are learning that nothing else matters to us. The repetition of such a period of optimal learning is a task for the teachers in all environments, such as in the schools, the work place, in the army etc. To achieve such periods of optimal learning, the theoreticians constantly insist on greater use of technology, and especially the use of computers in the learning process. With the help of the computer technology different learning systems are developed, and the multimedia learning systems are among the most popular ones.

2. Learning Theories

Interventions in the learning process can have an effect on many different things. The intervention levels that depend on someone or something and on how things are done, are defining factors of the learning theories. These factors help to extract many different theories that evolve and change as we discover new ways in approaching the human cognitivity. The spectrum extremes of the learning theories consist of the behaviorists' and constructivists' studies. According to [5] today's learning processes, one can summarize them in eight points:

1. From linear toward hypermedia;
2. From instruction toward construction and discovery;
3. From teacher focused education toward student focused education;
4. From learning through material absorption toward learning how to find things out and how to learn;

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5. From learning at school toward global learning that lasts the whole life;
6. From one way of learning which is the same for everyone toward an adaptable way of learning;
7. From learning as a torture toward learning as fun;
8. From the teacher as a transmitter of knowledge toward the teacher as a person who facilitates and makes the learning process easier.

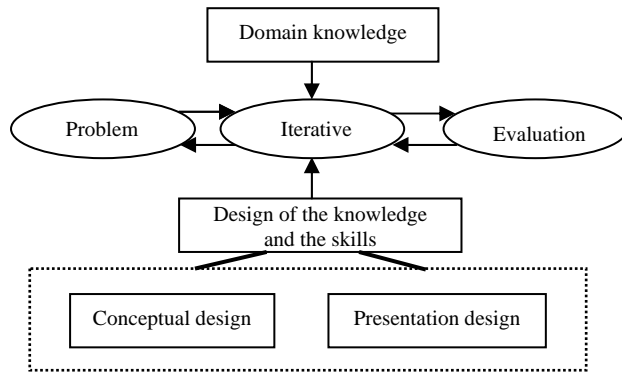


Fig. 2.1. Schematics of the IMLE development

3. Multimedia Learning

The development of the multimedia learning depends mostly on the development of the information technology. Contemporary technological capabilities of the multimedia are in the true meaning of the word – amazing. Learning is most efficient when it is interactive. Therefore, an interactive multimedia learning environment (IMLE) has to be created. Figure 2.1 shows the schematics of the main components included in the IMLE development. The knowledge and the skills during the designing process are divided in two parts: conceptual design and the presentation design. The conceptual design includes the creation of a learning architecture. It consists of constructing interactive options for the student, consultations with experts and constructions of the knowledge in that field. The presentation design refers to the realization of the system, in which the screen positioning, the colors and the usage of individual media are of greatest importance.

4. Multimedia Learning System in Computer Science

The main emphasis of this chapter is put on the description of the procedure regarding the development of this educational software. It deals with the way the concept of the contents, design and the acquisition methods of multimedia elements are made. It also deals with the realization of the interaction with the user and the way of uniting all these elements as an entity.

4.1 Phases and Procedures in the System Development

Following the principles, the technological capabilities and the methodology previously described, the development of the multimedia system was realized in several phases and sub phases. They were realized in parallel or consecutively, and also with some interconnections and overlapping. The subject group has been defined – primary and higher school students. In general, the whole implementation part can be divided in two phases:

- Phase I – preparation of the scenario and creation of the multimedia components
- Phase II – creation of an applicative solution, integration of the components in a functional entity

4.2 Learning System Architecture

The multimedia learning system of the subject Computer Science is based on Web technology. The basic concept is shown in figure 4.2.

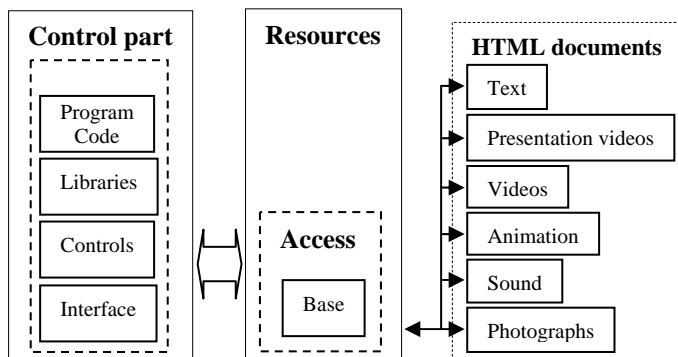


Fig. 4.2 Learning system architecture

4.2.1 Index Creation

The use of indexes in computer systems dates back to the early beginnings of computer systems' usage. By using the indexes, one has direct access to the data. All one has to do is use a key word that is placed in some kind of order (i.e. alphabetical). This way of accessing the contents is implemented in the multimedia learning system. A process that consists of several stages precedes the realization of the index system in the learning system:

1. Determination of the key words that will enable access to the contents of the system;
2. Finding out the contents by using key words.
3. Linking the first two attributes in the data base.

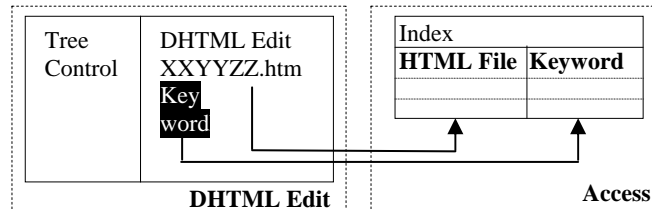


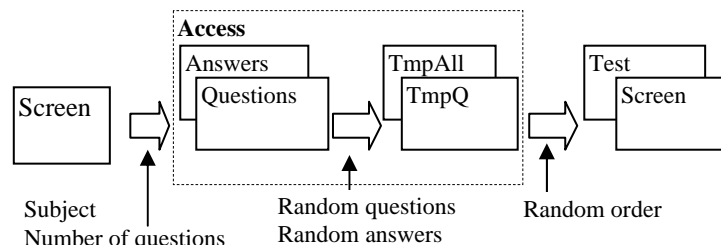
Fig. 4.2.1 Index creation procedure

The whole procedure is realized with the help of the service application DHTML Editor in similar way as the hyperlinks were added to the multimedia contents. By using the Tree control, all the HTML files have been analyzed. A selection is performed in each one of them, after finding out a significant term – key word or several words. After this, the right mouse button is used, and from the menu that appears, the 'Add Index' option is selected. By doing this, a connection is established between the key word and HTML file in which it is located. Figure 4.2.1 illustrates the principles of creation of the index base.

4.2.2 Testing and Evaluation System

For wider range of users of the learning system, the basic criterion for defining what has been learnt would be the capability of the user to use the applications that are studied. In the case of the learning system for the subject Computer Science, there is a need for formal evaluation. Such evaluations are socially acceptable quantified values of the student's knowledge. After defining the topics and the number of questions for each topic, questions are selected at random and together with the possible answers they are placed into the table TmpQ in the base AlfaBit. The students' answers are placed in the table TmpAll. Then, depending on the type of the test (written or interactive), the questions appear on the screen or in a Word document in random order. If the testing is interactive, a report is generated. The logics of generating the tests is presented on the diagram (figure 4.2.2). Fig. 4.2.2. Test generation logic

During the learning process, students can interactively test themselves on each topic.



4.2.3 Database

The data describing the educational contents are stored in the appropriate multimedia files. They are integrated in artifacts in a HTML document form and as such are saved into different files. They refer to, for eg., the relation among the titles and artifacts and the names of the HTML files in which the appropriate content is set, to the questions and answers from the testing system, etc. As a most appropriate way for storing and using such data, an Access base has been chosen due to the following reasons:

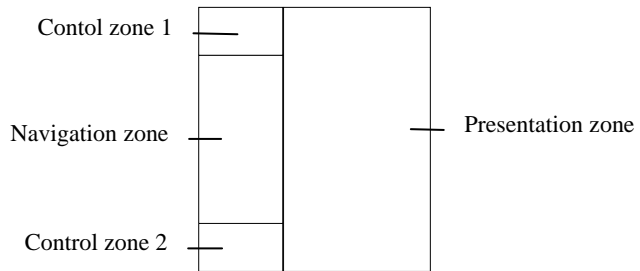
- Access base is relational, and as such offers more advantages: the possibility for creating relations among tables of the base, securing the redundancy of the data that enables easy manipulation with the base;
- Access base uses indexing as a way of having direct access to the data in the tables;

- Access base is well integrated and has good communication with the program language Visual Basic;
- all data are integrated in one common file which is copied during the system installation phase.

4.2.4 User Interface

The realization of the user interface has two phases:

- analysis of the system from the aspect of its function, by which all necessary elements for the user interaction with application are defined. The aim of this analysis is to obtain maximal usage of the current information. Based on this analysis, elements of user interface and their layout are defined. When these elements have been defined, a test of the functionality of the interface is administered.
- The second phase begins when the functionality of the user interface has been tested and when the results have been collected. In this phase the design and the disposal of the interface elements is made. In this way, one defines the appearance of the application.



The concept of the interface is shown on the figure 4.2.4.

Fig. 4.2.4. Concept of interface

In different situations, different elements are shown on the screen. The display of these elements, as well as the common behavior of the system will be controlled by a program code. Giving the final look of the interface in runtime goes through the following process:

1. display of the background
2. display of the interaction buttons
3. display of the content of the system
4. display of the additional elements depending on the content that is presented and the user actions.

4.2.5 Applicative Solution

The multimedia application is a product of a combination of several technologies. There are 2 types of navigation. The first one is the so-called TAB control. It serves for choosing the themes from the content. The second one is subclassed Tree View control (SubTree.ocx) and is control based on 'MS Common Control Tree View' control to which some features (such as background picture, different colors of text, etc.) are added. The whole application with DAO (Data Access Object) leads to a database that consists of several tables. The most important table is the table 'Topics', which incorporates the whole content displayed with TopicID, Version, Title, HTML File. The Tree View control uses the same table to extract information. In the database there is a table (Index) that incorporates all indexes. In this way, one can search the content. The Index table contains IndexID, TopicID, Index and BookmarkID (the last entity serves for the application to know in what part of the text it should position itself).

5. Analysis of the Learning System

As previously mentioned, this learning system is similar to an electronic book. To be more precise, the system for multimedia learning is an electronic Handbook. Its interactivity is close to an electronic encyclopedia, while the documents are connect with hypertext links. The content of the system has a hierarchic structure which originates from the formal analysis of the Computer Science field. In relation to the possibilities that this system offers to the users for interaction, it is based on a free approach (browsing). The user can freely access every single teaching unit. This is a direct consequence from the

concept of this multimedia system, which is produced as an electronic book. Within the teaching units, there are different types of multimedia elements which contribute to the interactivity with the user. Due to the fact that the interaction with the student is based mainly on reviewing the material, that means that there is initiation of the construction of student's knowledge. This software can be classified as teacher-type computer, mentioned above. From the aspect of classification by the educational scheme, Computer Science cannot be classified strictly into one type. The completed software has instructional features due to the structuring of the content. At the same time, the software has features of exploration, because the user can independently explore the content of the system. And finally, the main aim for the creation of this system is for the system to be used as a resource that will supplement the conventional teaching method. This is partially in accordance with the mentioned theory for essential learning, according to which it is important to have a personal involvement of the student.

6. Conclusion

The spectrum of the learning theories is fairly big and it consists of many approaches or methods of explanation of the way people learn. Mainly these theories either belong to the behaviorist or to the constructive concept, or they are theories in which the emphasis is not on learning. However, their implications directly refer to this issue. The behaviorist and constructive concepts are bipolar in many ways – the main difference of both concepts lays in the assumption that deals with the way of acquiring knowledge. According to the behaviorist concept, knowledge exists independently of the student, and this provokes the concept of imposed instruction. These two concepts have their own implications in the design techniques of the multimedia environment for learning. When talking about the conceptual design of these environments, Gagne's instructional design has proved to be suitable for the computer and this in turn is compatible with the behaviorism. At the same time there is a constructivist conceptual design in which, as a main principle, besides the individual's construction of knowledge by the student, one also has to take into account the social context in the education. Nevertheless, the realistic solutions for the creation of the multimedia environment for learning are not black and white- in some segments they are close to constructivism, but in the others to the behaviorism. Therefore, the designer of the multimedia environments for learning can choose from a large amount of options in the segments of structuring the content, interactions with the user and the context. Finally, the main idea that leads us to the creation of this system is: the system to be used as a resource that will supplement the conventional teaching method. By making such resources available for learning, one provokes the personal involvement of the student and his control over the acquiring process. This, in turn, is in accordance with the theories for learning from the constructivist tradition.

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