

Multimedia Training Course on C++

Evgenia Georgieva, Margarita Teodosieva, Tsvetozar Georgiev, Stoyanka Smrikarova

Abstract: *This paper describes a multimedia educational course about C++ programming. The main purpose of this product is to support and increase the quality of education of students from specialities "Pedagogic of Mathematics and Informatics Education" and "Industrial Engineering" in the course "Programming and computers" by the use of interactive and attractive working method. In the application are included resources for students' self testing and text information searching.*

Key words: *Computer Systems and Technologies, Multimedia, Education, C++ Programming.*

INTRODUCTION

The multimedia is interactive use and interaction with different types of media information: sound, text, static and animated graphics and video. The development of multimedia applications combining all types of media sources is one of the most interesting tendencies of the progress of computer technologies.

One of the most important applications of modern multimedia technologies is in the education. Using them in the educational process increases the students' activity and motivation and this also increases the quality of education.

Today there are many books about C++ programming. Some of them are paper based and the others are web based [5, 6, 7, 8]. Unfortunately there are not so much courses about C++ programming on Bulgarian language which actively to use the multimedia. The main purpose of the authors was to develop such course and to fill this educational gap.

LAYOUT

In this paper is described multimedia training course on C++ object-oriented programming language. The main purpose of this product was from one side to increase the effectiveness and quality of education and to make the educational process more easy and pleasant, from the other side to demonstrate how to create and use multimedia technologies in education to the students from speciality "Pedagogic of Mathematics and Informatics Education". The developed multimedia application can be used from the beginners and advanced beginners users. It can be used as interactive help material to the textbook [2] or as self learning package. The course has mainly practical purpose to master C++ programming and guides students step by step, from simple topics to more complex topics, from main language definitions to objects and classes use. Any educational unit is attended by help information and example programs.

An authoring system SimTotal version 8.0 is used to develop this multimedia application. One of the reasons to use this authoring system is that it has many abilities for multimedia applications dissemination – by CD/DVD disks, over local area network or over Internet [1, 3]. The other reason for our choice is that it has powerful tools for test and simulation creation. ToolBook uses book authoring metaphor. In this metaphor in authoring mode all multimedia elements are visually arranged over pages and every object can be programmed using ToolBook program language OpenScript. In the "reader" mode user can interact with the multimedia objects and to pass over the pages using application's navigational elements. The authoring system catches all the communications between the application and operation system such as mouse movements, buttons clicks and so on.

The content of multimedia training course cover all the material presented in the textbook "Informatics – C++ programming" [2]. The application has ten units like this textbook. These units include main topics, subtopics and example programs.

Multimedia training course can be distributed as CD/DVD self running application or over local area network. It also can be used as distance training course over Internet if the

user has the plug-in Neuron (which can be downloading free of charge from the web site of SimTotal company) [4].

The general hierarchical structure scheme of this multimedia training application is given on fig.1. There are presented mainly the connections between the main menu and the units.

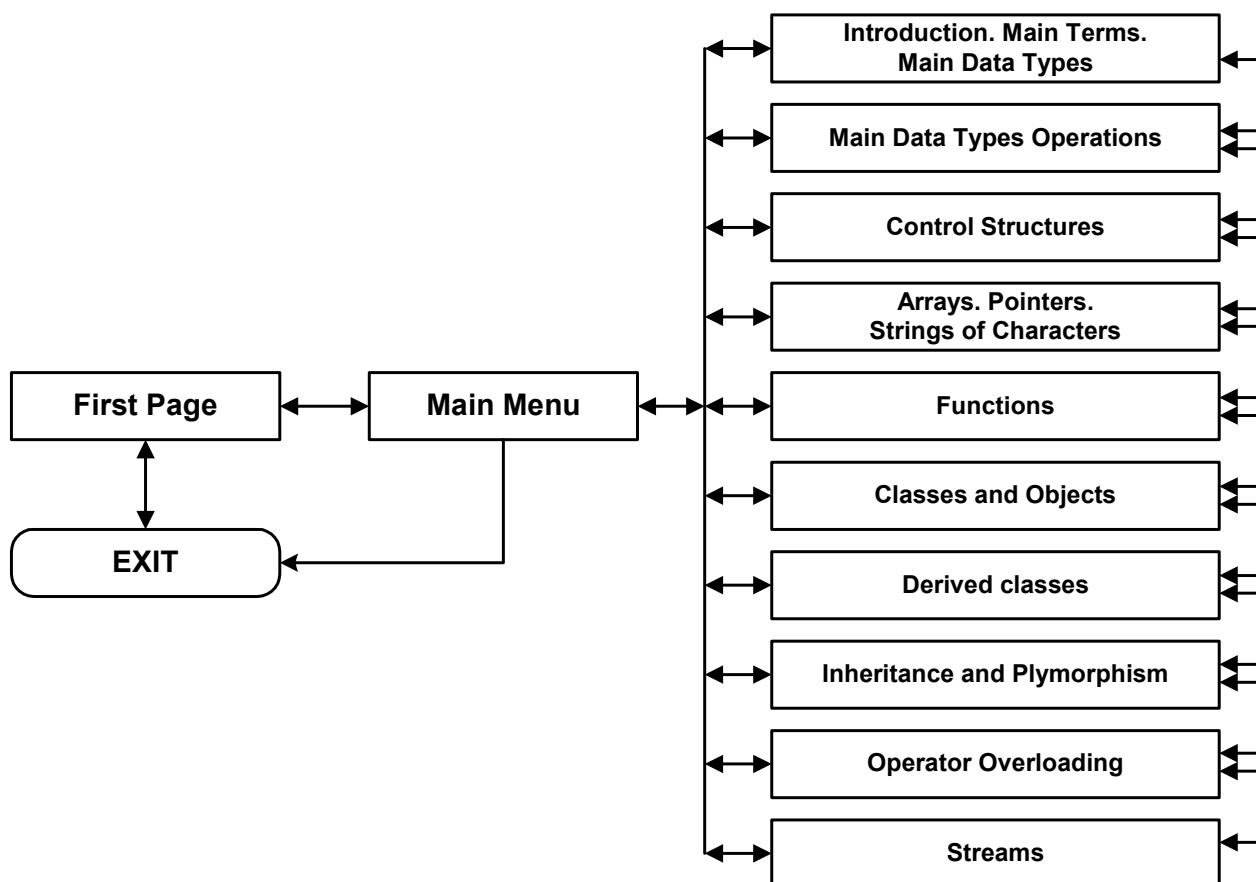


Fig.1. The application general hierarchical structure scheme

The realisation of the application imitates book, which first page (fig.2) is appeared on the computer's screen when the multimedia course is launched. A hierarchical navigational structure scheme is used. The user has abilities to access the units from the second application page (screen) "Main menu" (fig.3). From this page students can go to any unit page, for example "Functions" (fig.4). There is another menu with subtopics of the unit. The pages of the unit use the same graphical background and have the hyperlinks to their unit page menu and to "Main menu". From any page of the application there is ability to exit.

The navigation between the pages is realised by graphical buttons. Any navigational object has the behaviors written on OpenScript language. The main used behaviors are: to change the shape of the mouse cursor; to pass to another page; to show or hide the help fields and the example programs; to play and stop sound and video files. The students can use buttons named "Forward" and "Backward" to navigate to the next or to the previous page of the application. The navigational button "Menu" returns the control to the corresponding unit menu page. Button "Main menu" is used to go to the main menu screen.

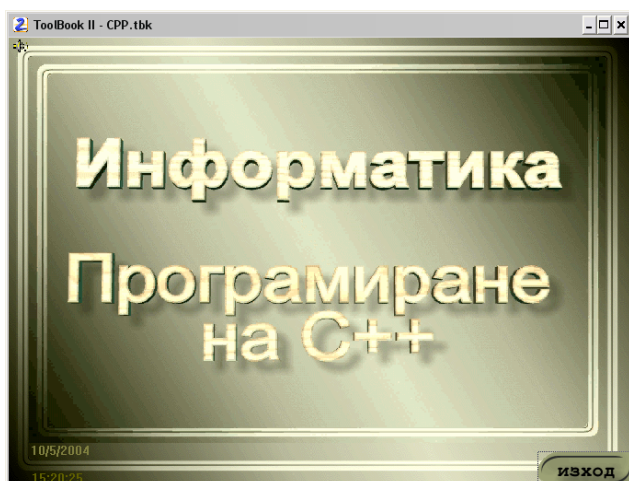


Fig.2. First screen of the application

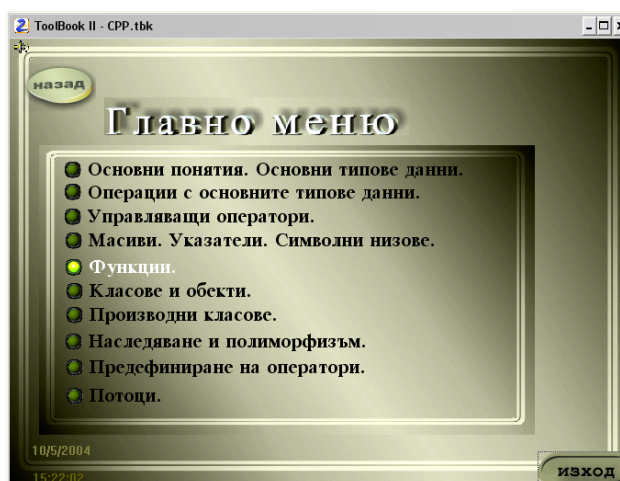


Fig.3. Main menu screen

In the application are widely used “hot words” objects. Their color is red to distinguish them from the ordinary text. The students can click on them to show text fields with help information. As there are recommendations to avoid use of long text the presented information is separated on many text fields. These fields can be shown or hidden using corresponding buttons. Many example programs (fig.5) are added to the application. They are connected closely to the theoretical material and illustrate it.

Edgar Dale's "Cone of Experience" suggests that people remember 10% of what they read, 20% of what they hear, 30% of what they see, 50% of what they hear and see, 70% of what they say and write, and 90% of what they say and perform at a task [10]. In this connection to improve the students' level of memorising there are sound representation of the teaching materials to some of the application's units. The audio files are recorded and edited using sound editor Wave Editor. The sound file format is wav.

The authoring system has the abilities to use video materials and animation in different file formats – AVI, MPG, RealVideo, animated GIF, etc. The titles of the first page and the main menu page are realised in AVI format. They are created using software Xara 3D 4.0, which has functions to export information as animated GIF or as AVI file. We used non-compressed AVI format to achieve higher quality and compatibility.

To the any application unit there is abilities to test the students' knowledge. The tests are in the form of two pages each of them containing five multiple choice questions (fig.7). The main purpose for this part of multimedia course is to give the students ability to self test. To any question there is immediate feedback with the appropriate information about the student's answers.

The multimedia course includes high volume of text information. To make students' work easier a full text search option is provided. The creators of the authoring system ToolBook removed the tool for full text search from the last versions. There are commercial extension modules which can be used to do such task. The main problem is that they cost more than 100 USD [9]. Authors solved this problem by creating a special OpenScript procedure.

We developed viewer object, which contains a page with text fields “TextSearch” and “FeedBack”, and buttons “Search” and “Close”. These objects are used in the text searching process. The user must input the desired text information in the text field “TextSerach” and to click on the button “Search”, which contains the program code realising the search. If there is correspondence between the user text and text in some page the program automatically opens that page or field and the find text is marked.

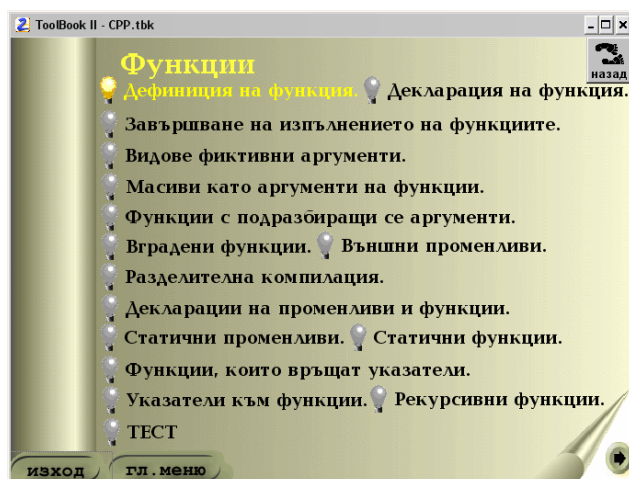


Fig.4. Unit "Functions" screen

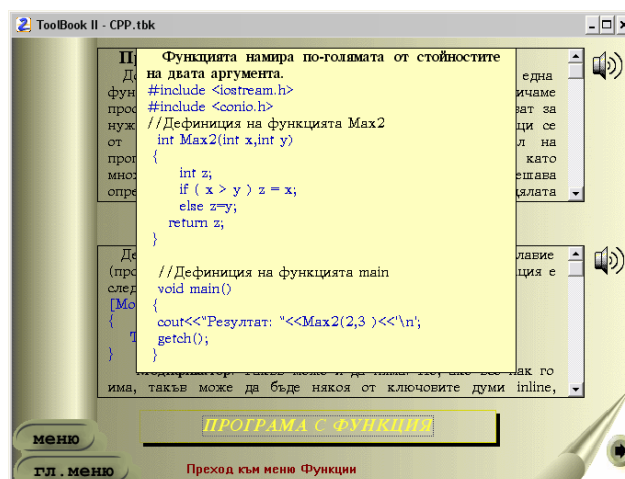


Fig.5. Screen with an example C++ program

The next click on the button "Search" makes another search. If the search procedure reaches the end of the application it automatically begins with the first page. In the field "FeedBack" a help message is brought out if during the search process there is no concurrence. The user has the ability to show and to hide the viewer. By default, when ToolBook finds text during a search, it navigates to the page where the text is and highlights the text. This makes the recurrent call of the viewer. During the programming was solved the problem by using the OpenScript search function without option of automatically navigation. After that the identification number of the page is check and accordance of the results the program code for navigation and mark of text is executed or not.



Fig.7. A screen for self test

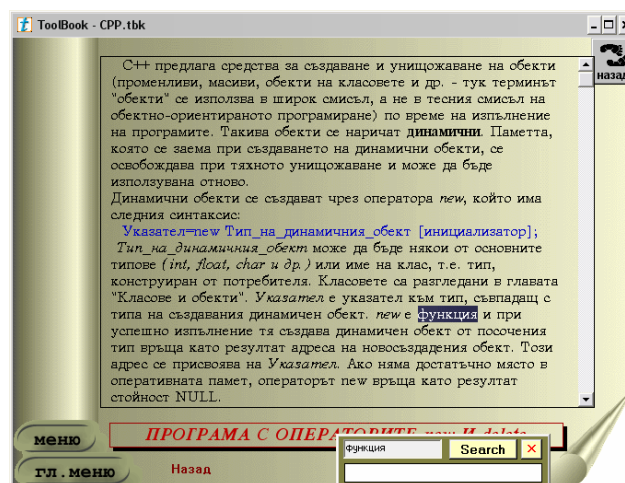


Fig.8. Screen with search window and the result of the search

The system requirements for this multimedia application are not high: a personal computer with at least 233 MHz processor, 64 MB RAM, CD/DVD drive, sound card, Windows operating system. This multimedia course can be used also in local area network or can be installed on the personal computer hard disk.

CONCLUSIONS AND FUTURE WORK

The material, which is presented in this multimedia application is used in the educational process of the course "Programming and Computers" in the Department of Informatics at the University of Rousse. Our impressions are that it assists for easily learn C++ programming and makes the students knowledge steadily. The students are oriented easy how to use it and there is no need for a special course or user guide.

The future work of the authors will be to improve the interaction and attraction of the course by including the simulation of the Borland C++ programming environment.

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ABOUT THE AUTHORS

Evgenia Georgieva, MSc, Department of Computing, University of Rousse, Phone: +359 82 888 577, E-mail: EGeorgieva@ecs.ru.acad.bg

Assoc. Prof. Margarita Teodosieva, PhD, Department of Informatics, University of Rousse, Phone: +359 82 888 214, E-mail: mst@ami.ru.acad.bg

Principal Lecturer Tsvetozar Georgiev, PhD, Department of Computing, University of Rousse, Phone: +359 82 888 276, E-mail: TGeorgiev@ecs.ru.acad.bg

Principal Lecturer Stoyanka Smrikarova, MSc, Department of Computing, University of Rousse, Phone: +359 82 888734, E-mail: SSmrikarova@ecs.ru.acad.bg