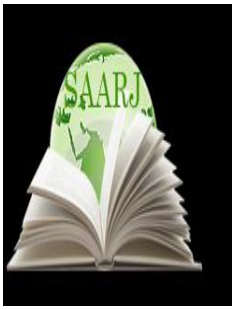

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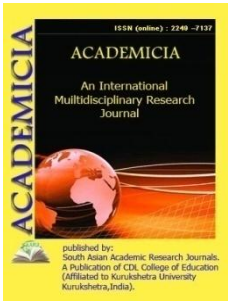

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NEW APPROACHES TO ENSURING QUALITY EDUCATION ON THE EXAMPLE OF LASER PHYSICS

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ABSTRACT

The organization of the educational process using Multimedia technologies opens up new opportunities for the development of students ' creative abilities. With the joint efforts of employees of the educational sphere, scientists, programmers, multimedia educational devices manufacturers and teachers-practitioners, a new information and educational environment is created, in which the integration of educational and information approaches to the content, methods and technologies of teaching is crucial. In this article, Laser Physics is an application in the form of interactive Java applets; the concept of designers and its implementation are considered. The electronic designers and models created with their help allow simple operation both on personal computers and in network mode, including remote access through the Internet.

KEYWORDS: *Laser Physics; Multimedia Technologies; Teaching Methods; Digital Modeling; Individualized Education; Adobe Flash CS3 Professional Portable; 3ds-Max; Java Programs.*

1. INTRODUCTION

A new level of quality has emerged in the opportunities offered to a wide range of users by modern computer technologies, and new, very attractive prospects for the use of information and communication technologies in education have opened up. Information, digital and multimedia technologies can be used in its teaching in the most natural way [1,2].

New technologies that are of interest in the study of laser physics include computers and multimedia projectors, high-quality audio and video editing software, image editing and animation, remote access technology, and video conferencing support. As a result of the

introduction of these technologies in the educational process, there is a need to develop new approaches to the creation of e-learning products based on them.

The development of methods for the introduction of multimedia technologies in education, the use of which in education can make a significant contribution to the effectiveness of knowledge has become relevant [3,4].

One of the most interesting and demanding tasks at the current stage of computerization of physical education is the transition to maximum individualization of education, which is not possible in the mass version. It encourages learners to offer individual learning trajectories that are characterized by a high level of preparation, skills, and motivation, as well as a degree of complexity, speed of development, and a share of independent creative work. In the future, students or their small groups will have the opportunity to choose the teacher who best suits their personal characteristics and intentions.

The task that has been formed today is no longer imaginary, because many of the problems that make it up today have their own technical and organizational solutions. Many of the professionally designed systems for e-learning that have already been proposed [5] are primarily aimed at mass individualized learning and include the ability to create individual lesson plans, formulate individual tasks, and account for their performance. The main challenge in realizing these opportunities is to change the way teachers work and to produce large amounts of person-centered learning materials.

2. MAIN PART

Teaching methods are the most important components of the pedagogical process, which include the goals and objectives of teaching, the content, the forms of organization of training and its results. The role of methods in teaching is determined by their types and functions, so the main didactic problem is the classification of teaching methods. There is no single classification of teaching methods, but the consideration of different approaches to differentiating teaching methods is the basis for systematizing them as didactic tools.

The use of multimedia technologies means that graduates of pedagogical and higher education institutions have special information training, skills in the mechanisms of information retrieval, collection and analysis, visual perception of the expression of ideas, concepts, processes and implies that they can implement their ideas through the use of a variety of information.

The introduction of multimedia technologies requires constant updating of the idea and content of university education and the training of new teachers capable of studying and implementing these technologies [3,4].

Features of multimedia technologies serves as a basis for the development of information direction. By introducing and using new technologies, this field means creating a product that informs the audience of a set of images, texts and data, along with sound, video, animation and other visual effects.

Multimedia technologies include interactive interfaces and other controls. To better understand what types of multimedia technologies are available, it is necessary to identify and highlight the main directions of their use. This is really important.

Today, multimedia technology is one of the most promising areas of informatization of the educational process. We see the prospects for the successful use of modern information technologies in education in improving the software, material base, as well as mandatory training of teachers.

Digital modeling is one of the most popular uses of computers in the teaching of laser physics. This type of learning material serves to develop individual forms of learning: independent research of virtual physical systems, development of new models and demonstrations, analysis of complex systems and their evolution is a logical continuation of traditional processes for studying laser physics [6-9]. These types of e-learning products should not be seen as an alternative to actual demonstration experiments and laboratory practices. Computer modeling, on the other hand, is an adjunct to the teaching techniques of the theoretical part of the course, and the creation and analysis of models significantly expands traditional teaching methods. The possibility of creating interactive modeling programs in terms of solving the problems of individualized learning and the development of its forms, aimed at the active mastering of the material, varies.

A distinctive feature of the approach considered in this study provides maximum ease of working with designers;

2) Provide the ability to build, model, and visualize its results for three-dimensional systems;

3) Any that can be done from a CD or remote server access to applet-Designer functions at a time.

3. RESULTS AND DISCUSSIONS

Despite the popularity of Internet video packages, it is very difficult for a wide audience to access these types of resources without problems, due to the relatively large flow of transmitted data. For example, in the context of self-study (connecting a computer to a network via a mobile phone), it is not possible to view almost any of these resources without pre-loading. However, in the latter, the presentation is usually accompanied by slides of presentations. The proposed alternative is to use audio recordings that are used as electronic analogues of traditional speeches. The Adobe Flash CS3 Professional Portable [11] environment is recognized as the most suitable environment for developing the proposed resource type, which is represented by drawings and formulas with a high quality audio line. A useful feature of the suggested resource is to draw the audience's attention to the material presented by the teacher. A very short format (10-20 minutes) was chosen for the electronic analogues of each of the 80-minute lectures. The focus of the resource development was not only on the selection of materials and the preparation of meaningful texts, but also on their audio recordings and the formation of the attached video layout. Graphic images with traditional calculations and drawings for video conferencing have been replaced by high-quality electronic analogues created by computer graphics methods.

Modern technology for creating very high quality short videos on a computer is well developed and today requires almost no significant changes and optimizations. The combination of 3d animations developed on the platform of the 3ds-Max [12] collection with real-time video recordings on real equipment was a major innovation in the creation of the new video library. The use of such videos with elements of technology allows to solve many interesting new educational and methodological problems. These include the ability to demonstrate a step-by-

step transition from a simplified idea of experiment to real experimental equipment and the phenomenon under study (Figure 1). The practice of creating hybrid video images described shows that using modern software packages allows you to create them without resorting to the services of video creation specialists.

Since modern Java versions of electronic constructors used in multimedia packages are based on the original development ideology created for the DOS operating system, it is appropriate to briefly discuss the main ideas and technical solutions used in them.

Figure 1. Application of 3D models (example: experiment with lasers and laser systems).

The Windows interface and design of the Java version of the designer were close to the standard available in the Windows environment (Figure 2). The features of 3D animated windows are complemented by three-dimensional scrolling capabilities and the placement of a graphic background from an external file. Added the ability to assign any graphic image, including animated images, to _particle-type objects. required expansion.

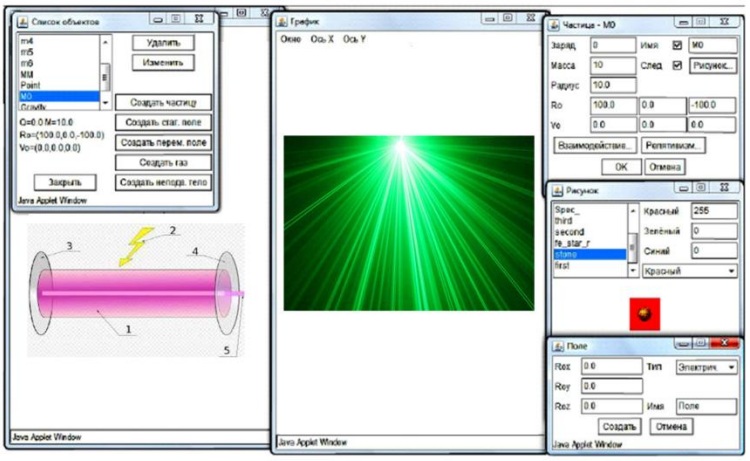
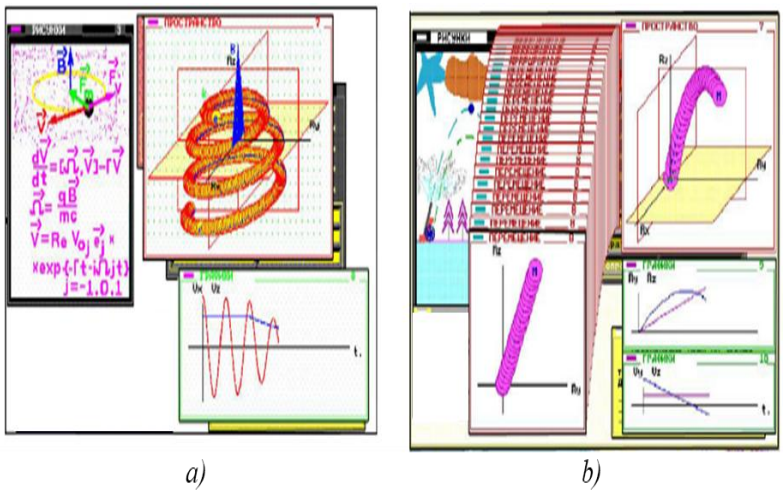


Figure 2 The interface and design of the main designer's animation and dialog windows, implemented in the form of a Java applet

We know that particle motion is very important in laser physics. Since the standard multi-window Windows standard did not yet exist during the creation of the first version of the designer, the DOS version of the designer program was implemented in a multi-window interface to simulate the motion of particles in constant fields (Figure 3 a, b). It provides access to a package of 50 ready-made models, and has the service of adjusting the work screen according to the specifics of the task.



a) b)

Figure 3. The interface of the first version of the interactive program is the designers of particle motion models in power fields (there is a non-traditional object designed to demonstrate the effects of switching between moving reference systems between windows for different purposes).

The algorithm of the created program objects (Figure 4) is based on the _something class, which is a moving area of the screen workspace containing a specific graphic image and stores information about the image in the closed part of the screen. At its base were built the main branches of the virtual designer: _particle, _field and _window.

Based on the program, _window has built many branches of text and dialog boxes that perform many types of service functions: (_phys_text) output and (_picture), physics and application interface (_help), user interaction (_menu) and others_space3 three-dimensional graphs (representing a modeled system in three-dimensional coordinate space, velocities, accelerations, etc.) and two-dimensional graphs _space2 (interdependence of different kinematic and dynamic properties at different times).

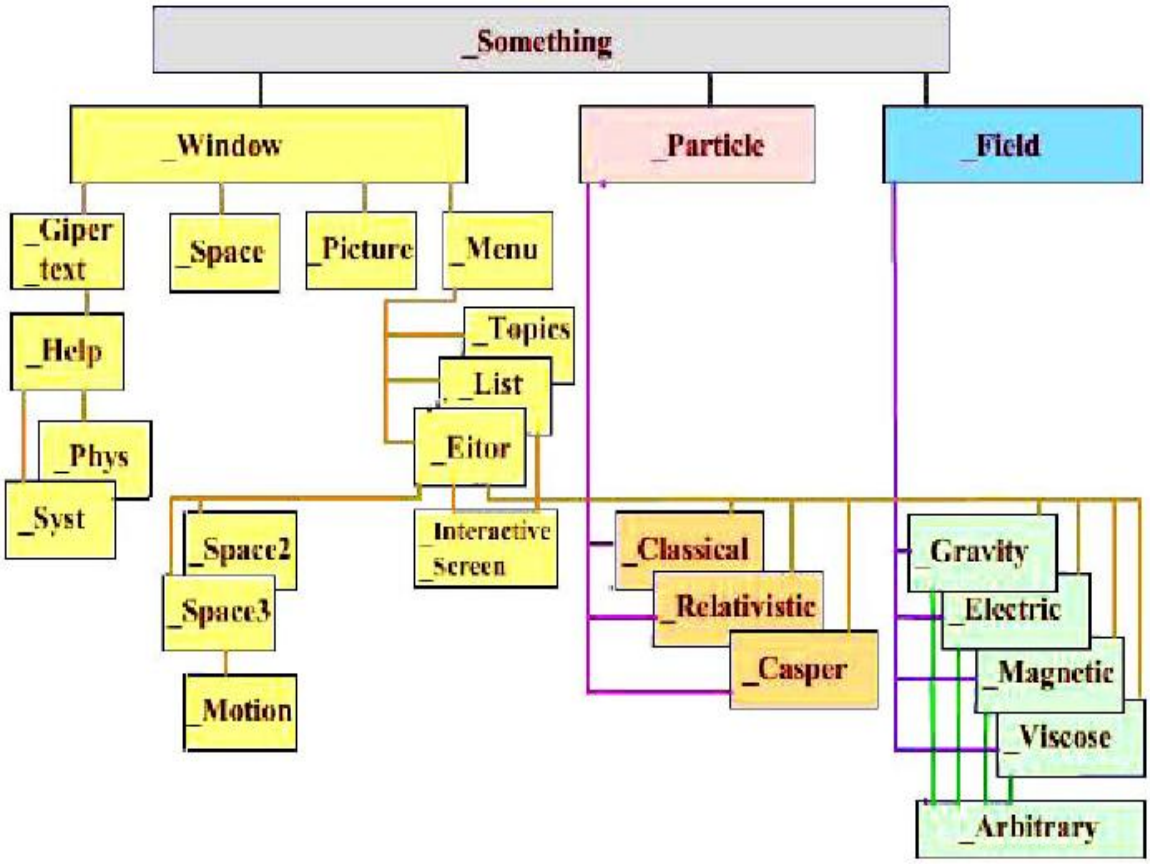


Figure 4. Classes algorithm of the first version of the program.

The program _particle is used to describe particles with initial properties (mass, charge, initial state, graphic image) and variable kinematic properties. Programming methods allow you to retrieve data from fields (objects in the _field class) and deliver their kinematic properties to the animation windows upon their request.

Our approach to the creation of test original versions of interactive simulators of laser physics laboratory complexes is a simpler multimedia explanation of laboratory rooms equipped with very sophisticated equipment. Take, for example, the work on the reconstruction and control of femtosecond lasers. As part of this, a technology for the development of electronic simulators based on the creation of a copier or a 3D model of the device was proposed and implemented. This model can be used to create static and dynamic images in different operating modes (regular and non-standard). These images form the basis for creating an interactive animated model in the

Macromedia Flash environment (Figure 5), which is controlled by the user by “clicking with the mouse” across the screen areas containing the controls.

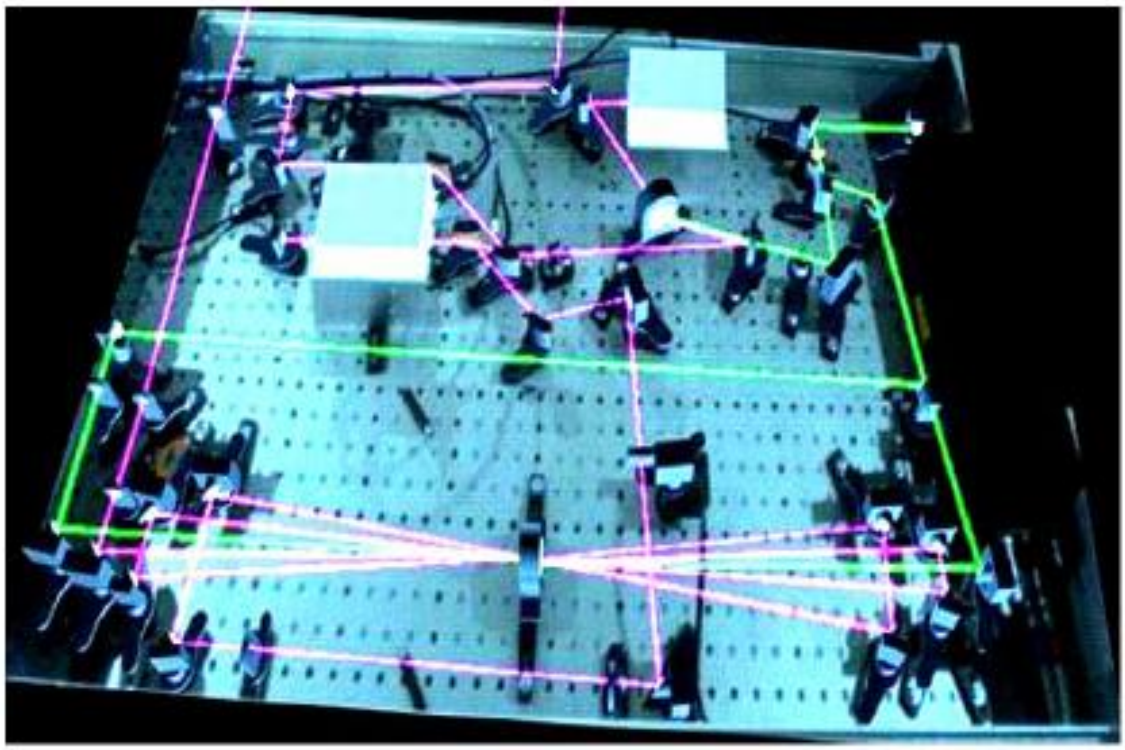


Figure 5. Interface and design of interactive computer simulators used to organize the preparation of students for laboratory work "Fem to second laser use and device."

The decision to respond to the user's actions in the model is made on the basis of digital modeling of physical processes that determine the state of the device. These simulators used the built-in Macromedia Flash programming language [13], the capabilities of which were sufficient to provide accurate digital simulation that met the requirements for proper operation of the simulator. Sophisticated equipment models developed in the 3ds Max environment are also used to create multimedia descriptions of laboratory work. The second is in the form of virtual tours of the device under study, and the main methods of working with them on a regular basis include video recordings.

Includes multimedia descriptions of laboratory work, interactive computer simulators, and reworked audio instructions for working with equipment, as well as a set of video graphics demonstrating the basic methods of working with equipment with very little textual description;

4. CONCLUSION

The above practice of creating video images shows that creating video using modern software packages allows you to create them without resorting to the services of specialists.

Many interactive demonstrations and computer problems are being developed based on a series of physical system model designers described in the form of Java applets. This was an important part of the collection of multimedia resources for the study of laser physics. These are the

characteristics of the technical solutions used to create the original sources, and the descriptions of the laser physical ideas described by them.

The considered technical solutions have been successfully used in the creation of a number of electronic packages of multimedia resources to support the teaching of general physics block sciences for undergraduate students of physics departments of classical universities. This will make it possible to acquire a lot of knowledge in a simple and understandable way through e-learning, and at the same time make great strides in the future.

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