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INTERACTIVE VIRTUALIZATION IN THE ENVIRONMENT OF FLASH-CC, JAVA SCRIPT OF ALGORITHMS THE PHENOMENON OF THERMOPHYSICS AND MOLECULAR PHYSICS, AS ACHIEVEMENT OF HIGHLY EFFECTIVE TRAINING

Abstract. The training program assumes not only studying of theoretical material, but also performance of laboratory works. They are necessary for development of skills of measurement of physical quantities, performance of physical experiences, ability to draw the correct conclusions from the observations. Modern computer technologies allow to add this traditional scheme of training. The training programs modeling physical processes and the phenomena which not always manage to be shown "in live" in the training conditions can provide to pupil's substantial assistance. Processes of the phenomenon of molecular physics and thermophysics are visualized and online virtualized by means of the computer program environments Adobe Flash-CC, Java script. The made, laboratory work on a research of processes of the phenomenon of molecular physics and thermophysics is very effective at development of this course, and the technology of creation of the virtual and interactive laboratory described in this article is very relevant for creation of the similar virtual and interactive laboratories (VIL) in other objects. This virtual interactive laboratory development is introduced in educational process of the Eurasian technological university and is successfully applied in training.

Keywords: Algorithm, virtual interaktivization, heat conductivity, virtual and interactive laboratory (VIL), Flash technology, thermophysics and molecular physics.

Introduction. Physics - science experimental. Therefore, the training program assumes not only studying of theoretical material, but also performance of laboratory works. They are necessary for development of skills of measurement of physical quantities, performance of physical experiences, ability to draw the correct conclusions from the observations.

Modern computer technologies allow to add this traditional scheme of training. The training programs modeling physical processes and the phenomena which not always manage to be shown "in live" in classroom conditions can provide to pupil's substantial assistance. The value of such programs, however, should not be exaggerated. It is necessary to remember - nothing can replace a real physical experiment in which a part a natural phenomenon, but not the copy of "virtual reality" simulated by the person talks to the researcher. The program «Heatphysical Laboratory» can be used in the course of training differently.

First, with its help it is possible to show demonstrations during an explanation of new material. Such demonstrations are very evident, improve perception and awaken interest in a subject. Advantage of such demonstrations, in comparison with usual videos, also that the teacher can quickly, changing parameters in the program, to answer questions of pupils: "And what will be if …?" The answer is simple - let's make and we will look.

Secondly, the program can be used as a "laboratory" practical work. It is the best of all to give these classes in a computer class. In this case each pupil will be able to perform the laboratory work

independently. Preliminary preparation is usually necessary for such occupation - when the theory of the phenomenon is already known, then intelligent work with experimental installations can bring benefit in deeper understanding of a subject. A set of laboratory works and demonstrations offered by us far does not exhaust all opportunities of the program, and the teacher can always complement this list with own developments.

In the third, on the basis of the program it is possible to perform research works and projects. Within the opportunities, the program allows to conduct researches enough difficult heat physical processes and the phenomena which theory is beyond the program of training. Inquisitive pupils could open, for example, for themselves the law of a heat gives of Newton if to think over the scheme of an experiment and to take the corresponding measurements.

Below examples of laboratory works and demonstrations which can be used in the program are given. It must be kept in mind that the calculations which are carried out by our program for model of real gas have rather qualitative character, and do not apply for exact quantitative compliance. The list of laboratory works offered for performance on the computer on thermophysics and molecular physics.

Laboratory work No. 1 Studying of heat exchange of two bodies.
Laboratory work No. 2 Determination of specific heat of substance.
Laboratory work No. 3 – Melting ice.
Laboratory work No. 4 Boiling water.
Laboratory work No. 5-Isothermal rating of gas.
Laboratory work No. 6 Definition of a universal gas constant.
Laboratory work No. 7 Isoprocesses in gases.
Laboratory work No. 8 Studying of heat conductivity process.

Realization virtual- interaktivization stages of works in the program environments Adobe Flash-CC, Java script.

The present requirement of time for transfer big volume information on the Internet, including animation images in movements and work with them demands the large volume of memory. And for reduction of capacity of use of memory use for virtual – interaktivization of Flash technologies is very effective. [4,5]. From the basic vector – graphical format of Flash technologies was created Shore wave Flash (SWF) – a branch. But, it is not the first vector format, it is the Web broadcast mechanism – pages to SWF as finding of the graphic representation, the coordinating link of the tool equipment and the graphic representation. Advantage of SWF-of the application it easily shipping on other Wednesday, i.e. this format is used in different is information – the program platform (in the Mac OS Macintosh operating system, in OS - Windows OS). One more feature of SWF – the constructed main images not only accept animation but also in addition, an opportunity to create interactive elements and audio of installation. Besides, mathematical formula communications of physical processes can be turned into interactive elements, management of their changes give the chance, to carry out on the computer, interactive virtual researches. For example, as shown in the drawing that the mathematical dependences found Snellius for reflection and light refraction and to form interactive virtual laboratory, very conveniently the formats SWF, CC of them – the program Flash environment. For transfer on distances of interactive multimedia additions are carried out on the known SWF format – in the Web application for the Internet.

Why, to emergence of this application of this format in Macromedia, for browsers of two main networks of the Plug in component, and to distribution to Internet Explorer and Netscape Communicator the worldwide computer network affected. One more reason popularity of SWF – a format this very easy and convenient application instruments for other platforms development of Macromedia. For example: - use the program device to creation of the multimedia presentations – Macromedia Director Shockwave Studio, and are used the program device to creation of graphic images – Macromedia Author wave, Macromedia Course Builder. Therefore, among Web – the publication the most recognizable and easily applied publication is Macromedia Flash Web – gives the chance to decorate each website with animation and to collect the full page. Action Script Tools - allows to collect Web addition effectively and its modern languages similarly probably on the scenario Java Script, Action Script and by means of the editor of Devigger is the solution of often applied elements. When there is a work of Flash – Mx you can construct the collected clip or import graphics, later in process of work will be able to process and by

means of an assembly ruler use effect of revival (Time line) [5]. Such clip or the movie can be interactive, i.e. certain images can be changed at discretion and to influence events in the clip. You export it in the Flash format, adding the page, and transfer to the page as the Web – the server. Each clip or the movie collected by tools in the Flash system can change depending on a type of the carried-out tasks and it can be seen via the browser of the Internet.

Practically, for interactive visualization and management, on the computer, experimental installation and devices, set the object to carry out by means of computer programs in the environment of Flash. For example, for performance following operations, the computer program is written in the environment of Flash – CC:

General view a window of the program

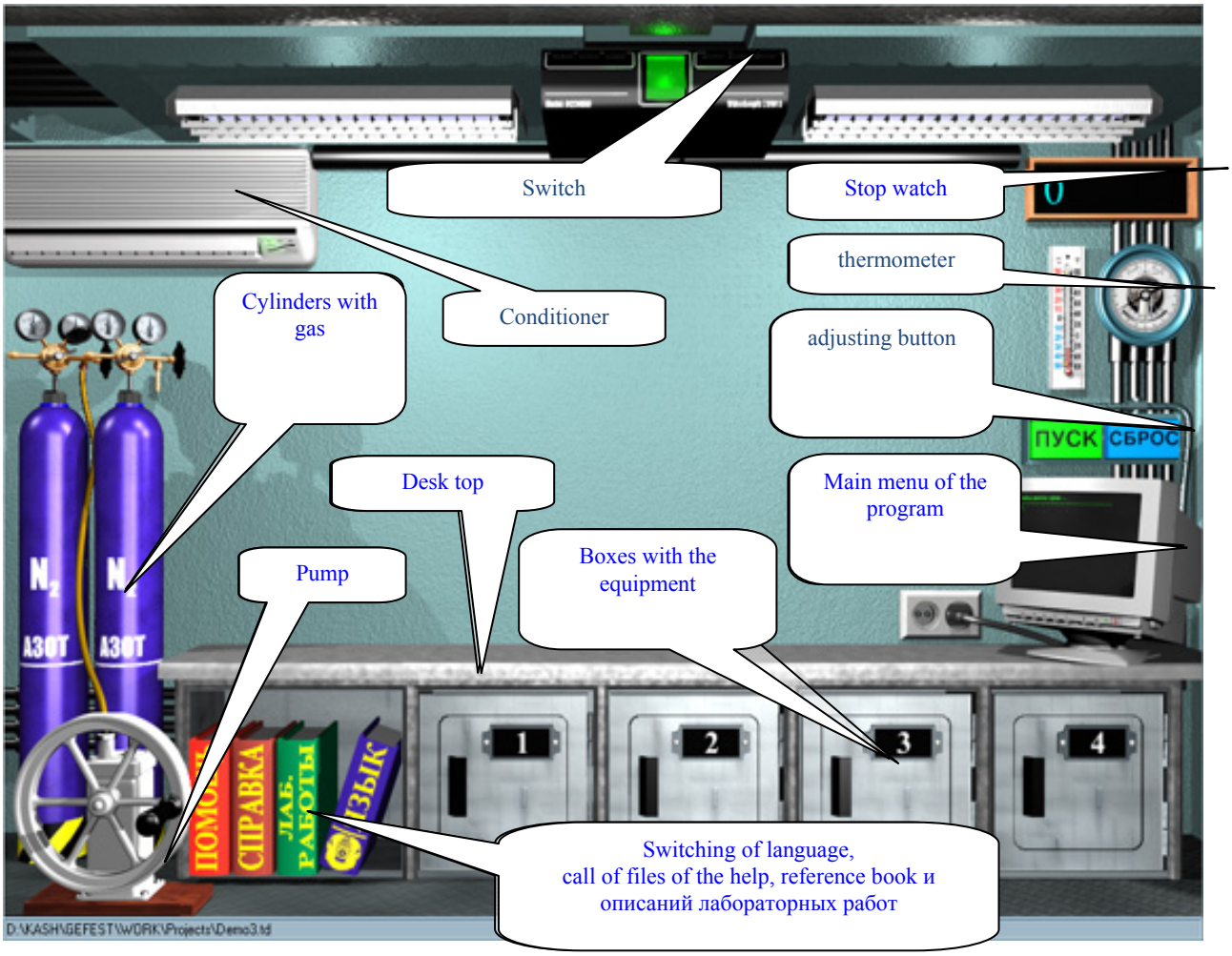


Figure 1 - General view a window of the program

On active elements the cursor of a mouse takes the hand form. Pressing of the left or right button of a mouse opens the corresponding window of parameters of an element or makes action.

Work with the equipment

The equipment is stored in desktop boxes.

In the first box there are vessels for gases. Their two views - a usual vessel and the heat-insulated vessel of the Dewar. As shown in figure 2, all vessels same, as in life:

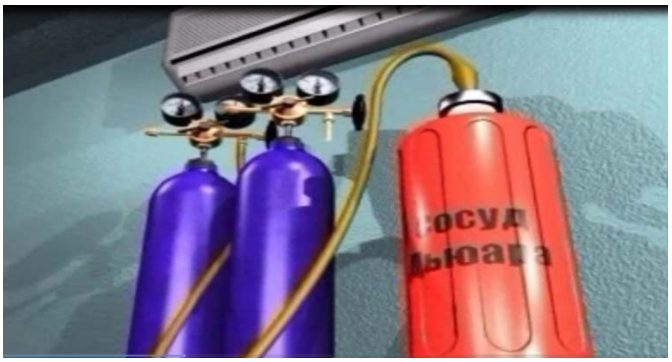


Figure 2 - A vessel of the Dewar and cylinders for gases

In the second box there are a thermoelement and a chemical glass.

In the third box are located: support, core and candle.

Are in the fourth box: a container with substance, bar of ice (blue), bar of copper or gold (golden), bar of other metals (gray).

Equipment installation on a desktop

1. The index of a mouse is brought on the necessary box of a table, and pressing of the left button of a mouse the corresponding door opens.

2. Further the index of a mouse is brought on the necessary device, the left button is pressed and keeps, and the device is transferred by the movement of a mouse above a desktop surface. After an otpuskaniye of the button of a mouse, the device will be installed on a desktop. It is also possible to transfer the devices which are already located on a desktop.

3. In certain cases one of devices is installed on another, for example a glass, on a heating element. It is possible to collect the whole pile of containers which will exchange heat among themselves if stand the friend on the friend.

4. If to put a vessel for gases on a desktop near cylinders of storage of gases, then he will unite a hose to the pump. In such situation (and only in it)is possible the rating and pumping of gases in a vessel .

5. The thermoelement established near the socket will be connected to it, and in this case becomes active, i.e. will heat or cool a container or a glass with substance which on it are installed.

6. The candle is intended only for heating of the core fixed in a support. Cores with various heat conductivity are fixed in a support. Distributions of temperatures on length of cores are automatically shown on graphics received experimentally, as shown in figure 3.

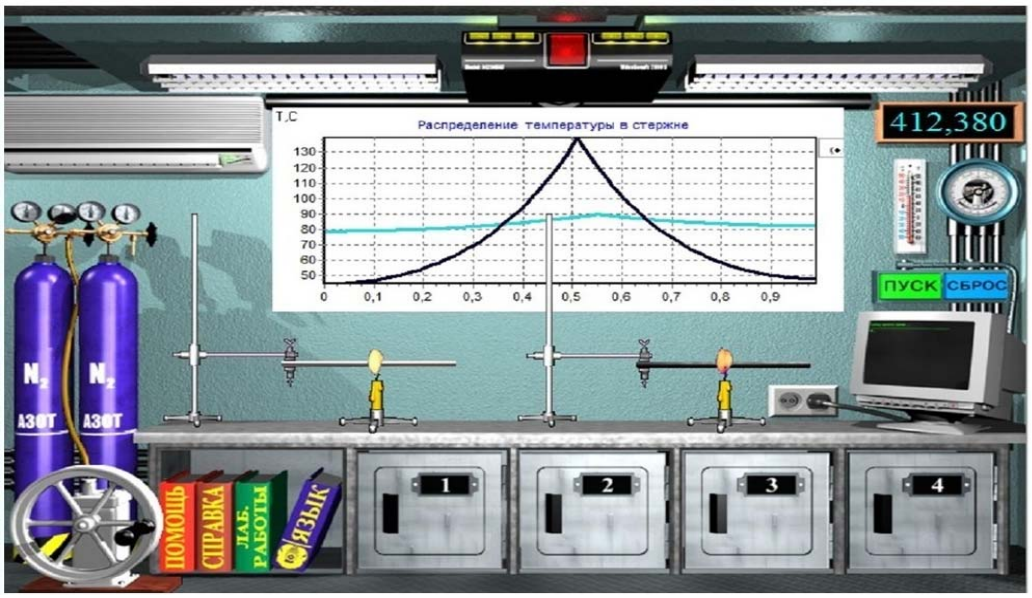


Figure 3 - Laboratory work on experimental distribution of temperatures in cores with various heat conductivity

Choice of language and reference

Having left-clicked a mouse on images of books, you can:

• To choose language (Russian or Kazakh);

• To open the file of the help in the corresponding language. In this file the description of working methods with the program, its opportunities and restrictions is given;

• To open the reference book on thermophysics with the short description of the theory of some phenomena which can be modelled in the program;

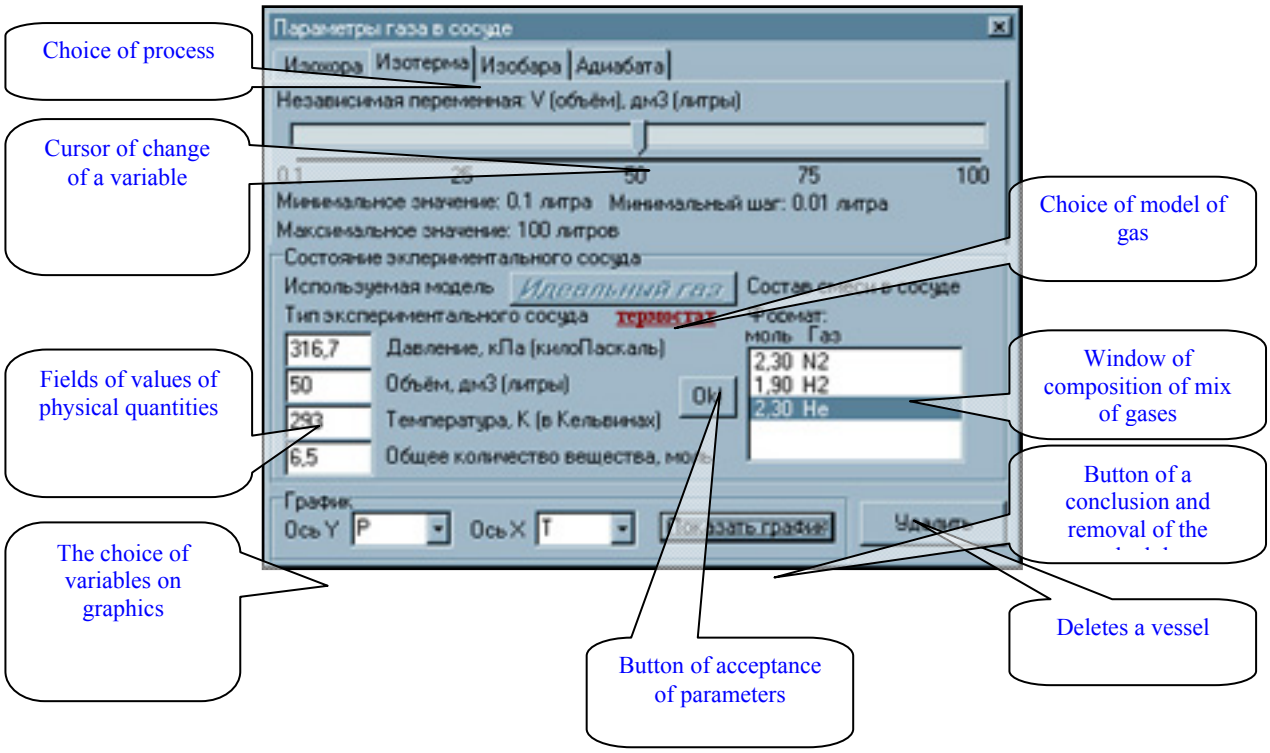
• To open the file containing descriptions of laboratory works and demonstrations.

It must be kept in mind that these files are written in the editor of Microsoft Word therefore they can be supplemented with the developments of laboratory works and the description of new demonstrations. However, in this case authors of the program do not bear maintenance responsibility of these additions by transfer them together with the program to the third parties.

Panels of parameters of details

Each detail of installation has the panel of parameters. This panel opens if to right-click a mouse on the image of a detail. All numerical values of parameters are given in the International System of Units of SI. Let's consider the main panels of parameters shown in figure 4.

Vessel with the ideal gas



Vessel with the real gas

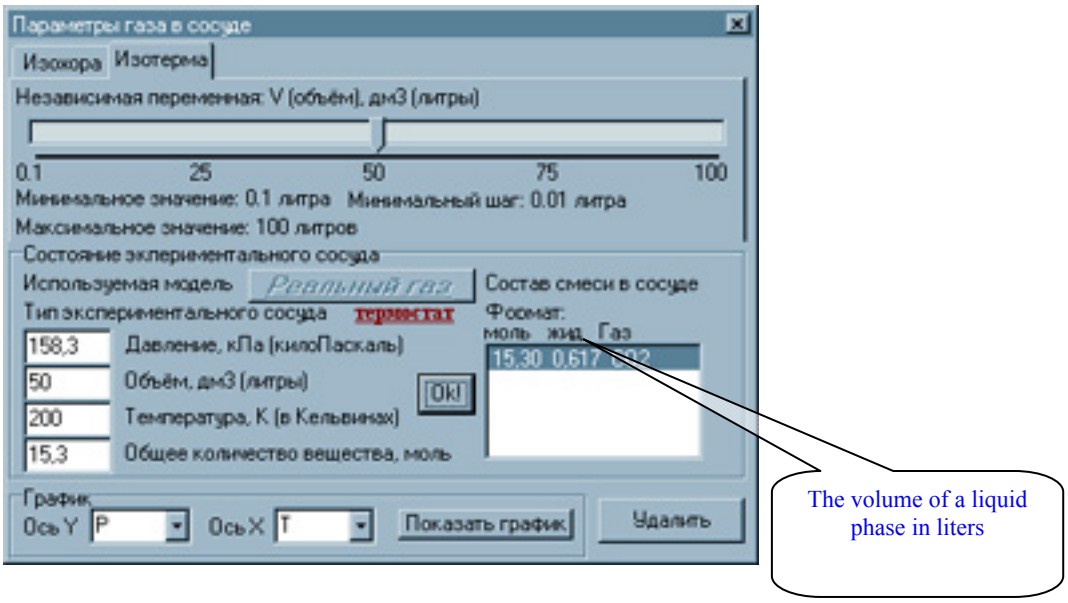


Figure 4 - Main panels of parameters of ideal and real gases.

Conclusion

As a part of information technologies the new industry develops - it is a virtual interaktivization and visualization of the hardly understood subjects of physics, chemistry, biology and other objects [5]. And creation is virtual – interactive laboratories in the called objects meet the operated measuring devices very seldom. Therefore, the technology of creation of the virtually-interactive laboratory (VIL) for the section of physics given in this work. "The thermophysics and molecular physics" will be very relevant to creators similar to VIL – at higher step in other objects of knowledge. Such VIL – on the computer are very effective for development of a certain course of knowledge and develop independent research skills and awaken to creative search of methods of a research. Given VIL on thermophysics and molecular physics, due to visually and interactive intervention in change process an experiment condition, it is very useful to fast development of a subject of physics by students and to development of skills a research. Brought VIL – on thermophysics and molecular physics are introduced in educational process of the Eurasian Technological University and are successfully applied.

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ОҚЫТУДАҒЫ ЖОҒАРЫ ТИІМДІЛІК ЖЕТІСТІКТЕРІ РЕТІНДЕ, ЖЫЛУ ФИЗИКАСЫ ЖӘНЕ МОЛЕКУЛАЛЫҚ ФИЗИКА ҚҰБЫЛЫСТАРЫНЫҢ АЛГОРИТМДЕРІН FLASH-CC, JAVA SCRIPT ОРТАЛАРЫНДА ИНТЕРАКТИВТІ ТҮРДЕ ВИРТУАЛДАУ

Аннотация. Ұсынылған оқыту-үйрету бағдарламасы тек теориялық материалдарды оқытумен шектелмейді, сонымен бірге мұнда, жылу физикасы және молекулалық физика бөлімінен зертханалық жұмыстарды орындауға болады. Олар физикалық шамаларды өлшеуге дағдылануға, физикалық тәжірибе жұмыстарын орындауға, өзінің зерттеу байқауларынан дұрыс қорытынды шығара білуге қажет. Қазіргі компьютерлік технологиялар осындай дәстүрлі оқыту схемасын толықтыруға мүмкіндік береді. Компьютерлік оқыту бағдарламалары, физикалық процесстерді және құбылыстарды модельдеп, «тірілей» көзге көрсетуге мүмкіндік болмаған кезде, компьютерлік көрсету арқылы, оқушыларға орасан зор көмегін

тигізеді. Молекулалық физика және жылу физикасының процесстері мен құбылыстары Adobe Flash-CC, Java script компьютерлік бағдарламалар ортасында интерактивті түрде, виртуалды зертхана жұмыстарына айналдырылды. Жасалған, жылу физикасы мен молекулалық физика құбылыстары мен процесстерін зерттейтін лабораториялық жұмыстар, физиканың осы аталған бөлігін меңгеруде өте тиімді, ал осы мақалада көрсетілгендей, виртуалды-интерактивті лабораторияларды жасап шығару технологиялары, басқа пәндерден болашақта жасалынатын виртуалды-интерактивті лабораторияларға көмек ретінде өте актуалды. Аталған виртуалды- интерактивті лабораториялық құрылым Евразия технологиялық университетінің оқу процессіне енгізіліп, оқыту барысында жетістікпен қолданыста.

Түйін сөздер: Алгоритм, виртуалды интерактивтендіру, жылу өткізгіштік, виртуалды-интерактивті лаборатория(ВИЛ), Flash технологиясы, жылу физикасы және молекулалық физика.

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ИНТЕРАКТИВНАЯ ВИРТУАЛИЗАЦИЯ В СРЕДЕ FLASH-CC, JAVA SCRIPT АЛГОРИТМОВ ЯВЛЕНИИ ТЕПЛОФИЗИКИ И МОЛЕКУЛЯРНОЙ ФИЗИКИ, КАК ДОСТИЖЕНИЕ ВЫСОКОЭФФЕКТИВНОГО ОБУЧЕНИЯ

Аннотация. Обучающая программа предполагает не только изучение теоретического материала, но и выполнение лабораторных работ по разделу теплофизика и молекулярная физика. Они необходимы для выработки навыков измерения физических величин, выполнения физических опытов, умения делать правильные выводы из своих наблюдений. Современные компьютерные технологии позволяют дополнить эту традиционную схему обучения. Обучающие программы, моделирующие физические процессы и явления, которые не всегда удается показать "в живую" в обучающих условиях, могут оказать учащимся существенную помощь. Процессы явления молекулярной физики и теплофизики визуализированы и интерактивно виртуализированы с помощью компьютерных программных сред Adobe Flash-CC, Java script**.** Сделанная, лабораторная работа по исследованию процессов явления молекулярной физики и теплофизики очень эффективна при освоении данного курса, а технология создания виртуально-интерактивной лаборатории описанной в данной статье, очень актуальна для создания аналогичных виртуально-интерактивных лаборатории(ВИЛ) по другим предметам. Данная виртуально- интерактивная лабораторная разработка внедрена в учебный процесс Евразийского технологического университета и успешно применяется в обучении.

Ключевые слова: Алгоритм, виртуальная интерактивизация, теплороводность, виртуально-интерактивная лаборатория (ВИЛ), технология Flash, теплофизика и молекулярная физика.

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