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INTERACTIVE VIRTUALIZATION IN THE ENVIRONMENT OF FLASH-CC, JAVA SCRIPT OF ALGORITHMS OF MATHEMATICAL COMMUNICATIONS THE PHENOMENON OF GEOMETRICAL OPTICS

Abstract. The geometrical optics – considers light distribution, by means of laws of geometry. A light beam is called the line along which light energy is transferred. The geometrical optics allows to formulate the theory of optical systems with relief. The geometrical optics, generally allows to find optical images, optical systems to calculate an aberration of beams, a beam of light in advanced methods, their adjustment, optical systems and their emergence which pass through the power relations. Nevertheless, qualities of the image, all wave phenomena by means of optical devices and also the size of the diffraction phenomenon are considered in optics. Many tasks of the theory of optical installations are based on laws of geometrical optics. In this work, algorithms of mathematical communications of geometrical optics, i.e. laws of reflection and refraction of light beams, are considered on the studied installation when passing light through the planes of border of two dielectric environments. Optical processes on border of these optical environments are visualized and online are virtualized by means of the computer program Adobe Flash-CC environments. The made, laboratory work on a research of processes of geometrical optics is very effective at development of this course. This virtual interactive laboratory development is introduced in educational process of the Eurasian technological university and is successfully applied in training.

Keywords: Algorithm, virtual integration, geometrical optics, turn, lens corners, dielectric, mathematical functions.

Introduction. Were not defined completely light nature yet, the following laws of optics were known: The law of rectilinear distribution of light – light rays in optically homogeneous environment extends on a straight line of lines. Light rays are lines on which light energy is transferred. In the homogeneous environment light rays provide themselves straight lines of lines. The law of independence of a light bunch – effect of a separate bunch of light rays, does not depend on effect of other bunches of light rays, i.e. bunches of light rays do not influence at each other. Concept of independence of distribution of light rays appeared in ancient science. Ancient Greek erudite Euclid formulated rectilinear distribution of light rays its laws of reflection from mirrors. In the 17th century the invention of a number of optical instruments as a long glass, a microscope, the telescope, etc. also their broad application was an incitement to development of ray optics. The Dutch mathematician V. Snell and Frenchman R. Dekart experimentally defined laws of distribution of light rays on a demarcation of two optical medium. Theoretical fundamentals of ray optics, at the end of 17th centuries located after opening of a Fermat's principle. Earlier opened laws of distribution of light on a straight line of lines, laws of reflection of beams were a consequence of this principle [1].

Many tasks of the theory of optical instruments and installations were tilled today based on laws of ray optics.

In this work, laws of reflection and refraction of light rays, algorithms of mathematical communications, are considered virtually on the computer on an optical bench, on border of the plane of the section of two dielectric environments. Optical processes on the plane of a demarcation of two environments are visualized and the virtual are carried interactively out on the computer by means of the computer program Adobe Flash environments – CC. The developed virtual laboratory works are very

effective when studying ray optics. The called virtual laboratory works are introduced in educational process and are successfully applied at the Eurasian Technological University.

Interactive tools and virtualization on the computer of laws of ray optics program is environment Flash-CC, Java - script.

The present requirement of time for transfer larger 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 the virtual – interactive tools of Flash technologies is very efficient. [3,4]. From the basic vector and graphical Flash format of technologies – a branch was created. 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 an instrumental inventory and the graphic representation. Advantage of SWF-of the application it is easily an acceptability on other place, 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 are padding, 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 Enternet Explorer and Nestcape Communicator the worldwide computer network affected. One more reason popularity of SWF – a format is very mild and convenient application instruments for other platforms development of Macromedia. For example creations of the multimedia presentations using the program device – Macromedia Director Shockwave Studio, - and applied the program device to creation of graphic images – Macromedia Authorwave, 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 complete page. Action Script Tools - allows to collect Web addition efficiently 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 – 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 to use effect of resuscitation (Time line) [4]. Such clip or the movie can be interactive, i.e. particular 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, the pilot unit and devices, set the object which is carried out by means of computer programs in the environment of Flash. For example, for realization of following operations, the computer program is written in the environment of Flash – CC:

- to install devices or to clean from devices. Pressing the left-hand button of a mouse, it is possible to open any door of a case with devices directing the cursor to devices and for the second time pressing the first button of a mouse, it is possible to install devices on an optical bench (figure 1). To clean an optical bench, to direct the cursor to devices, mice press the right button and once again the button - switch off window parameters. The button "Start-up" - is intended for switching off of consecration of laboratory and start-up of the pilot unit. The button "Feet " - switch off the pilot unit and includes consecration of laboratory. Directing the cursor to books, it is possible to obtain necessary information on laboratory work and to change language for choice.
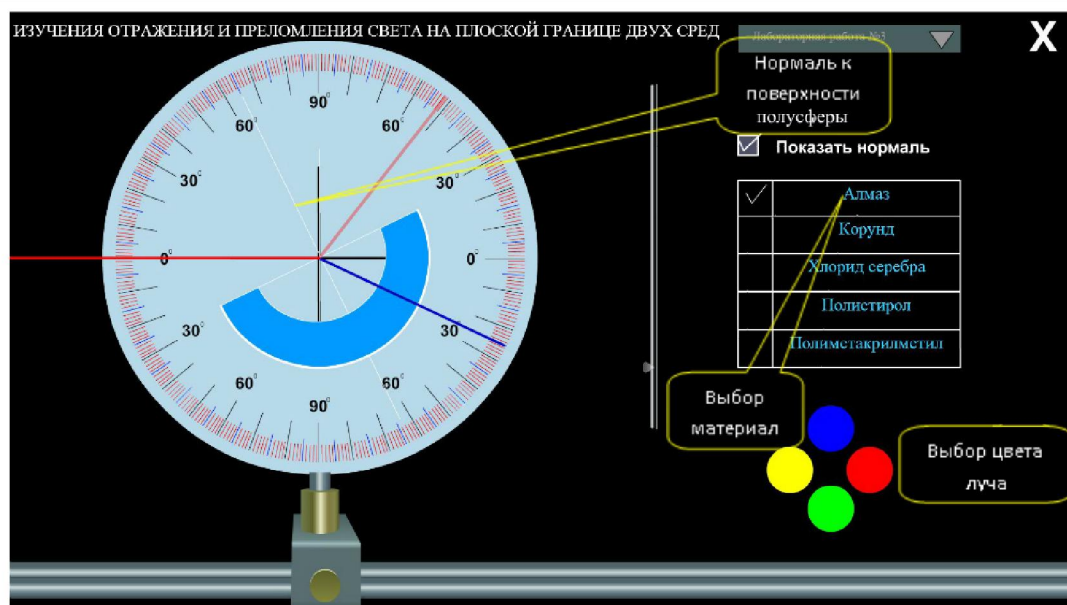
Figure 1 - Installation for a research of laws of reflection and refraction on flat limit of sections of two environments

Change of an angle of incidence of a light ray. As shown in the figure 1 to direct the cursor to the changeable site, pressing the left-hand button of a mouse, it is possible to change an angle of incidence and reflections of a beam concerning a perpendicular. Pressing the right button of a mouse, it is possible to change parameters of a light ray and material of the environment. Pressing two times in a row the left-hand button of a mouse it is possible to switch off installation. Installation for a research of distribution of a light ray in the environment with a changeable index of refraction. Here actions of management of measurement of parameters are also similar; it is possible to measure an angle of incidence of an emergent beam. Installation actions of management of measurement of parameters are also similar; it is possible to change an angle of incidence of the entering beam, to change the place of an entrance of an incident beam.
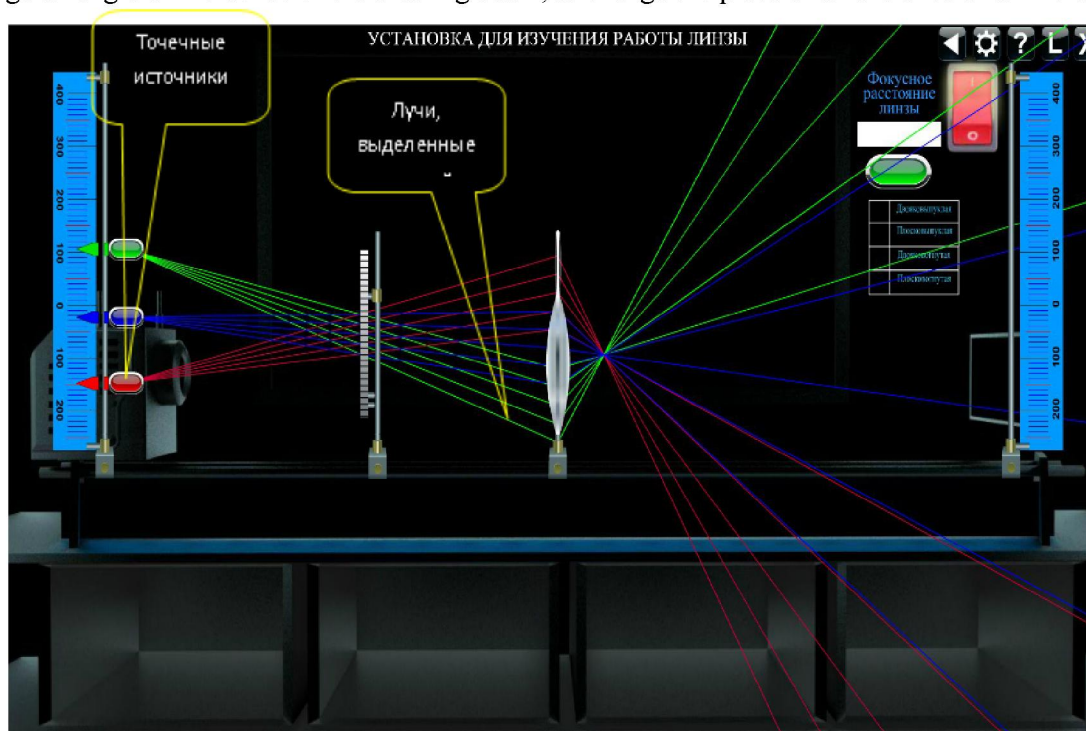

Figure 2 - Installation for a research of work of various lenses. Interactive tools of a research of an optical lens with various focal distances, and a research of parameters of a convex, seven convex, and dispersing lens.

Here are provided:

- changes of location of light sources of various lengths of waves across;
- change of location of light sources of various lengths of waves of a vertical;
- change of parameters of lenses (forms, focal distances, imaginary light sources and their beams).
- a research of the course of light rays of various wavelength in the collecting lens.

Conclusion.

As a part of informational technologies the new branch develops - it is the virtual interactive tools and visualization of the hardly understood subjects of physics, chemistry, biology and other objects [5]. And creation is virtual – interactive laboratories on called a subject meet the operated measuring apparatuses very seldom. Therefore the technology of creation of the virtually-interactive laboratory (VIL) for the section of physics given in this work. "The optics - ray optics" 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 particular course of knowledge and develop self-contained research skills and awaken to creative searching of research techniques. Given VIL on ray optics, due to rituality 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 researching it. Brought VIL – on ray optics are introduced in educational process of the Eurasian Technological University and are successfully applied there.

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ГЕОМЕТРИЯЛЫҚ ОПТИКА ҚҰБЫЛЫСТАРЫНЫҢ МАТЕМАТИКАЛЫҚ БАЙЛАНЫСТАР АЛГОРИТМІН FLASH-CC, JAVA SCRIPT-, БАҒДАРЛАУ ОРТАЛАРЫНДА ИНТЕРБЕЛСЕНДІ ВИРТУАЛДАУ

Аннотация. Геометриялық оптика- оптиканың жарықты геометрия сызық ретінде қарастыра отырып, жарықтың таралу заңдарын зерттейтін бөлімі. Сызық бойымен жарық энергиясы ағыны таралатын геометриялық сызық- жарық сәулесі деп аталады. Геометриялық оптика заңдары көп ретте оптикалық жүйелердің жеңілдетілген, бірақ көп жағдайда дәл теориясын жасауға мүмкіндік береді. Геометриялық оптика, негізінен, оптикалық кескіннің пайда болуын түсіндіреді, оптикалық жүйелер аберрацияларын есептеп шығаруға және оларды түзету әдістерін жетілдіруге, оптикалық жүйелер арқылы өтетін сәулелер шоғының энергетикалық қатысын табуға мүмкіндік береді. Дегенмен, барлық толқындық құбылыстар, сондай-ақ, кескіннің сапасына ықпал ететін және оптикалық приборлардың ажыратқыштық шамасын анықтайтын дифракциялық құбылыстар геометриялық оптикада қарастырылмайды.

Оптикалық құрылғылар теориясының көптеген есептері осы кезге дейін геометриялық оптикаға негізделген.

Бұл жұмыста, геометриялық оптиканың шағылу, сыну заңдарының математикалық байланыс алгоритмін, зерттеу қондырғысы екі диэлектірлік ортаның жазық шекарасында қарастырылады. Осы ортаның шекарасындағы оптикалық процестер Adobe Flash-CC- бағдарламалық ортасында іске асырылған.

Жасалынған зертханалық жұмыс геометриялық оптиканы игеру нәтижесінде зор пайда келтіреді. Аталынған зертханалық жұмыс Еуразия технологиялық университетінің оқу процесіне ендіріліп, қолданыста пайдаланылуда.

Тірек сөздер: Алгоритм, виртуалды интербелсенді, геометриялық оптика, сыну, шағылу бұрыштары, жұқа линзалар, диэлектрлік, математикалық функционалды байланыстар.

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ИНТЕРАКТИВНАЯ ВИРТУАЛИЗАЦИЯ В СРЕДЕ FLASH-CC, JAVA SCRIPT- АЛГОРИТМОВ МАТЕМАТИЧЕСКИХ СВЯЗЕЙ ЯВЛЕНИИ ГЕОМЕТРИЧЕСКОЙ ОПТИКИ

Аннотация. Геометрическая оптика – рассматривает распространение света, с помощью законов геометрии. Световым лучом называется линия, вдоль которой переносится световая энергия. Геометрическая оптика позволяет облегченно сформулировать теорию оптических систем. Геометрическая оптика, в основном, позволяет найти оптические изображения, оптические системы вычислить аберрацию лучей, пучка света в усовершенствованных методах, их корректировку, оптические системы и их возникновения, которые проходят через энергетические отношения. Тем не менее, рассматриваются в оптике, качества изображения, все волновые явления с помощью оптических приборов, а также величина дифракционного явления. Многие задачи теории оптических установок основаны на законах геометрической оптики. В данной работе, алгоритмы математических связей геометрической оптики, т.е. законов отражения и преломления световых лучей, рассматриваются на исследуемой установке при прохождении света через плоскости границы двух диэлектрических сред.

Оптические процессы на границе этих сред визуализированы и интерактивно виртуализированы с помощью компьютерных программных сред Adobe Flash-CC. Сделанная, лабораторная работа по исследованию процессов геометрической оптики очень эффективна при освоении данного курса, а технология создания ВИЛ описанной в данной статье, очень актуальна для создания аналогичных виртуально-интерактивных лаборатории по другим предметам.

Данная виртуально- интерактивная лабораторная разработка внедрена в учебный процесс Евразийского технологического университета и успешно применяется в обучении.

Ключевые слова: Алгоритм, виртуальное интегрирование , геометрическая оптика, поворот, углы линзы, диэлектрик, математические функции.

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