

## SPECIAL FEATURES OF COMPUTER MODELING OF PHYSICAL PROCESSES

*Nurkassymova Saule Nurlassimovna*  
*Doctor of pedagogical sciences, professor*  
*Nurgaliyeva Ulmeken Satymovna*  
*Candidate of Psychology, Professor*  
*Baigizova Aigulim Seisenbekovna*  
*Candidate of Physical and Mathematical Sciences, Associate Professor*  
*Zhanys Arai Boshankyzy*  
*candidate of pedagogical sciences, professor*

*LN Gumilyov Eurasian National University*  
*The city of Nur-Sultan, Republic of Kazakhstan, 01000*

**Аннотация.** Использование компьютерные моделирование в учебном процессе в ВУЗе можно понимать как для создания новых возможностей деятельности педагога, восприятия знаний обучаемого, оценки качества обучения. Цель компьютерной технологии состоит «в подготовке обучаемых к полноценному и эффективному участию в бытовой, общественной и профессиональной областях жизнедеятельности в условиях информационного общества»

**The Abstract.** Use computer modeling in scholastic process in HIGH SCHOOL possible to understand as for making the new possibilities to activity of the teacher, perceptions of the knowledges trained, estimations quality education. Purpose to computer technology consists "in preparation trained to full-fledged and efficient participation in home, public and professional area to vital activity in condition information society"

**Ключевые слова:** Использование компьютерной моделирование в учебном процессе в ВУЗе. Методы эффективного использования средств компьютерной технологии при обучении физике студентов ВУЗе

**Keywords:** Use computer modeling in scholastic process in HIGH SCHOOL. Methods of the efficient draft on funds computer technology when learning physicist student HIGH SCHOOL

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Elbacinin «Jaña älemdеgi jaña Qazaqтан» attı joldayında: «We are all elimiz boyınша ctandardtar television deñgeyinde capalı bery service of education körcetyge necessary jetkizyimiz» dece, ocı joldaydın III tarayı ten cegizını bağırtınin jetinši tarmaqşacında: «Aqparattıq texnologiyalar and the aqparattı taratydın jaña nıandarına bağıttalğan mamandandırılğan education is at stake» [1].

Nowadays, physics is widely used in modern computer and various special programming environments. Computer simulation of physical processes is the basis of scientific knowledge. Therefore, the role of real education and research is unique.

Computer modeling can show specific physical processes and phenomena. The main use of computer in physical research is the practice of managing and modeling the experiment [4].

In this direction, students of the Physics Department of the University will be able to take the course "Fundamentals of computer simulation of physical processes". The main objective of the course and the course is to familiarize students with the models of physical processes and phenomena and their research methods. During the study course, the future physicists are encouraged to pursue scientific research and to make their first steps towards science. The practicality not only helps to recognize the theory and practice, but also increases students' interest in the subject and science. Computer simulation of physical processes, in particular, is a replacement of the mathematical model, which is realized by means of computers using computational algorithms, where it is impossible to study in practice. Simulation of physical processes by computer can control not only in formulas, but in graphics. Decision-making in the form of graphs brings closer theories and experiences. Computer modeling is used to control and investigate complex processes that are difficult to practice. Modeling of physical processes is carried out with special computer software environment. In our case, computer simulation is carried out by the MATLAB ("Matrix Laboratory") software package for solving technical calculations. The MATLAB system is simultaneously a programming language and an operating environment. Students are not familiar with MATLAB and are familiar with this system. The main feature of the system is that it is able to write programs for multiple use in MATLAB. MATLAB is a highly descriptive programming language. It features matrix-based data structures, a wide range of functions, integrated processing environments, object-oriented capabilities and interfaces with other programming languages. The MATLAB package contains many functions needed to build graphs. They allow you to create two or three dimensional graphs, visualize the data, and create animated clips. The main feature of the system is that even though there is no full system knowledge of the system, it is enough to know only the information needed to solve the problem. During the lecture, students will get acquainted with the launch of the MATLAB system, the teams needed to create a new program. Prior to computer simulation of physical processes, it is necessary to work in advance in the command window of MATLAB system, write programs, build two and three-dimensional graphs, calculate the

calculated integral, etc. learn to read. Computer modeling should be constrained in a particular order. The purpose of the assignment is to define a conceptual model. Then the model implementation software will be created. The program is typed and summarized after the previous items have been executed. Here is some of the work to be done in the workbook.

Simulation of body movement by pitching horizons

Let's look at the body movement (without friction) pushed to the horizons just under the influence of gravity. In this case, one coordinate is insufficient to describe the motion. It is necessary to enter the coordinate system  $xOy$  and the  $ax$  axis horizontally, the vertical axis should be oriented upright or vertical. We assume that the location of the body is given by two coordinates  $x$  and  $y$ , which change over time. The law of coordinate change is assigned.

Under the conditions of the report, if the body does not have any force other than gravity  $Ox$  the motion will be uniform, and the body along the abscissa will be:

$$x = \mathcal{G}_x \cdot t$$

where it changes,  $\mathcal{G}_x = \mathcal{G}_{0x} = \text{const}$  velocity is projected to the  $ax$  axis. Gravity is directed straight down to the body  $\vec{g}$  accelerates, so,  $Oy$  projection velocity:

$$\mathcal{G}_y = \mathcal{G}_{0y} + g_y t$$

law, here  $v_{0y}$ ,  $g_y$  - the projection of the initial velocity and the acceleration velocity to that axis, and the body's ordinate changes as time passes:

$$y = y_0 + \mathcal{G}_y t + \frac{g_y t^2}{2}$$

The equation of trajectories, that is,  $y(x)$  can be found by removing the dependency from the last formula. Let's look at the time using the abscissa:

$$t = \frac{x}{\mathcal{G}_{0x}}$$

and put it on ordinata:

$$y = y_0 + \mathcal{G}_y \frac{x}{\mathcal{G}_{0x}} + \frac{g_y x^2}{2\mathcal{G}_{0x}^2}$$

here  $\mathcal{G}_{0x}$ ,  $\mathcal{G}_{0y}$ ,  $g_y$  the projection symbols depend on the direction of the coordinate axes. At each point of the trajectory, the speed of the body is indirectly directed to it and can be classified into two components:

$$\mathcal{G} = \sqrt{\mathcal{G}_x^2 + \mathcal{G}_y^2}$$

In this work you should observe the interconnection of the following values:  $x$ ,  $t$ ,  $y$  and  $t$ ,  $y$  and  $x$ , as well as the dependence of the flight distance on the throw angle and the initial speed.

Calculated formulas:

$$v = v_x + v_y;$$

$$v_{0x} = v_0 \cdot \cos(\alpha)$$

$$v_{0y} = v_0 \cdot \sin(\alpha)$$

$$v_x = v_{0x} + g_x t;$$

$$v = \sqrt{v_x^2 + v_y^2};$$

$$x = v_x t;$$

$$y = y_0 + v_{0y} t + \frac{g_y t^2}{2};$$

$$y = y_0 + v_{0y} x / v_{0x} + \frac{g_y x^2}{2v_{0x}^2};$$

Between the initial speed and the angle (degrees)  $v_0$  and  $Ox$  axes

$$f_1=36;$$

$$f_2=45;$$

$$f_3=60;$$

The angle between the initial velocity (radians)  $v_0$  and  $Ox$  axes

$$\text{rad}_1 = \pi \cdot f_1 / 180;$$

$$\text{rad}_2 = \pi \cdot f_2 / 180;$$

$$\text{rad}_3 = \pi \cdot f_3 / 180;$$

$$v_0=100; \text{ initial speed}$$

$$y_0=0; \text{ initial coordinate}$$

$$t_{\text{min}}=0; \text{ initial time period}$$

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tmax=12; the last moment
dt=0.2; step
g=10; free flow acceleration
Initial velocity Ox projection on the axis
vox1=v0*cos(rad1); 1 situation
vox2=v0*cos(rad2); 2 situation
vox3=v0*cos(rad3); 3 situation
Initial velocity Oy projection on the axis
voy1=v0*sin(rad1); 1 situation
voy2=v0*sin(rad2); 2 situation
voy3=v0*sin(rad3); 3 situation
t=[0];t(1)=0;x1=[0];y1=[0];x2=[0];y2=[0];x3=[0];y3=[0];
for i=1:50
t(i+1)=t(i)+dt;
x1(i+1)=vox1*t(i);
y1(i+1)=voy1*t(i)-g*t(i)*t(i)/2;
x2(i+1)=vox2*t(i);
y2(i+1)=voy2*t(i)-g*t(i)*t(i)/2;
x3(i+1)=vox3*t(i);
y3(i+1)=voy3*t(i)-g*t(i)*t(i)/2;
end;
plot(x1,y1)
grid on
hold on
plot(x2,y2,'r')
hold on
plot(x3,y3,'g')
title 'Traumatic body trajectory'
ylabe l 'Ordinate, m'
xlabel 'Abcisse x, m'

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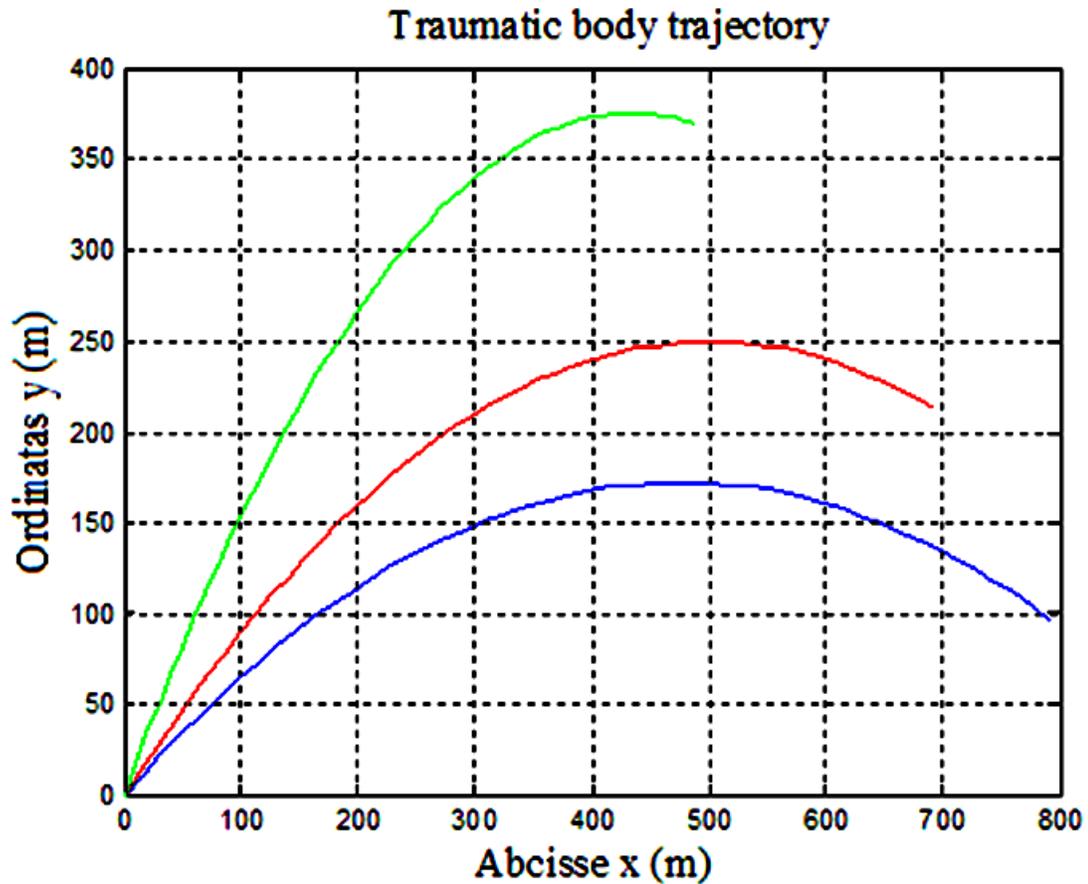


Figure 1. Trajectory of the body movement, pushed to the horizon

#### Release of Lissajo Figures

$$x = a_1 \cos(\omega_1 t)$$

$$y = a_2 \cos(\omega_2 t)$$

Set the graph of the function given in the form.  $\omega_1/\omega_2$  - If the ratio is rational, such curves are called the Lissage Figures.

$\omega_1/\omega_2$  - different values of relationships  $a_1$  and  $a_2$  place the different Lisseus Figures on the same page, using different matrices according to different values of amplitudes [2].

Source:

$a_1=1.2$ ;

$a_2=1.0$ ;

$w_2=1.0$ ;

$t=0:0.1:15$ ;

$x=a_1*\cos(w_2*t)$ ;

$w_1=1.25:0.25:2.0$ ;

for  $k=1:4$ ;

$y=a_2*\cos(w_1(k)*t)$ ;

$s=['w_1/w_2=' \text{num2str}(w_1(k))]$ ;

$s_2=\text{num2str}(w_1(k))$ ;

$\text{subplot}(2,2,k)$ ;  $\text{plot}(x,y)$ ;  $\text{title}(s)$ ;

end;

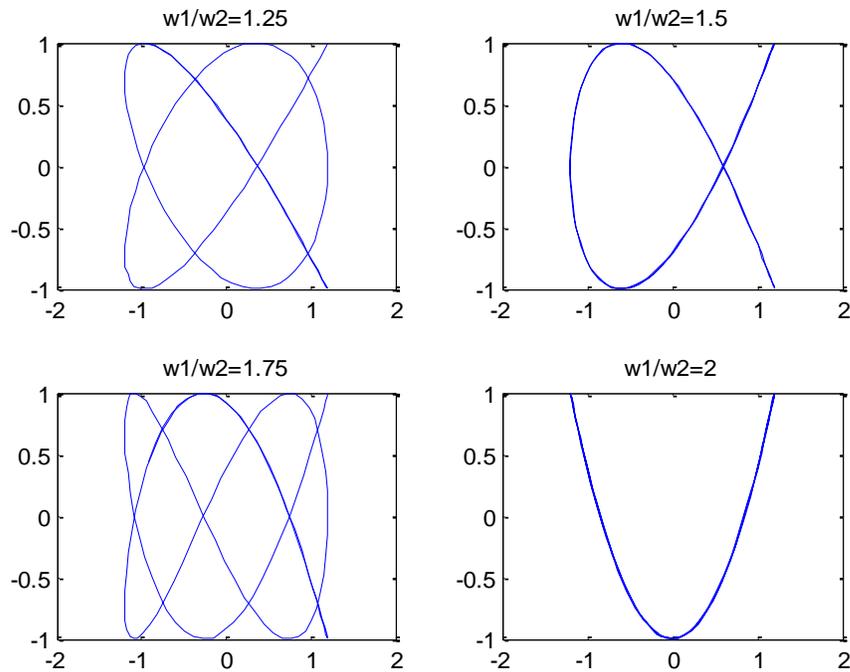


Figure 2. Simultaneously bring 4 Lissajou figures to one page. The result of the given report appears as shown in the picture. Subplot - divides the graphic window into small windows  $n \times m$ .

In the end, students who master computer modeling programs will not only be able to get acquainted with a new method of computer modeling, but will also be able to work creatively in the field of science in the future. The use of computer technology is not limited to examining the examples necessary for study, but also allows solving real practical problems. The MATLAB system shows the basic physical laws and phenomena that are clearly visible, which helps the student to master the material.

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