MODERN METHODS OF THE SOLVING OF PHYSICAL TASKS WITH USE OF INFORMATION TECHNOLOGIES

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Maqolada fizika masalalarini komputerda yechishning zamonaviy usullari va ularga oid animatsiyalar bayon qilingan.

В статье описываются современные методы решения физических задач на компьютере и анимации к этим методам.

As it is known, now computers have occupied all sphere of human life. Especially, in physics there is no limit on their use. Without the help of computer s today it is impossible to present information processing, which was transferred by Earth satellite, management of movement of elementary components in accelerators, realization of various most tricky experiments on various branches of physics, the solving of complex tasks of theoretical physics, modeling of physical processes, creation of virtual laboratory stands of the electronic books and etc.

Among them the special place takes place the solving of physical tasks on the computer and use them for teaching physics. As it is known, in general course of physics tasks are picked up so that they could be solved by an analytical way and size with rounded up meanings. For gaining the first

skills of the decision of tasks on physics it is completely necessary. However, in real life we come across with such kind of tasks, which cannot be solved by an analytical way. For example, if to take into account resistance of air, the movement of a body by gravity thrown with angles to horizon it is cannot be solved by an analytical way.

Therefore every physician should be able to solve physical tasks independently on the computer with the use of numerical methods. Capacity, the speed, graphic and other opportunities of modern computers made this problem one of urgent problems in learning and teaching physics.

The computer modeling, realization of computing experiment is one of modern methods of research of the physical phenomena. It has its own features, advantages and lacks in comparison with other methods of study of physical systems. It is obviously clear, that the students of higher educational institutions should have notion of computer models, numerical methods of study of various objects of cognition, be guided freely enough in modern software. The modern personal computer allows solving complex system of the equations, constructing the diagram of investigated dependence in some seconds.

The main standard of mastering methods of calculus mathematics and physics is the independent writing by the students of the various computer programs on algorithmic languages of programming Basic, Pascal, Visual Basic, Delphi. Creating similar computer models "from zero", working with an initial code of the program, the student understands more deeply the concrete ways of information processing, methods of programming, as well.

The Visual Basic is fairly enough widespread modern programming language in which the editor of the documents, system integrator, center of resources, electronic books, help system, browser of the Internet are incorporated. It has the powerful mathematical device allowing to carry out of symbolical calculation, to solve systems of algebraic and differential equations, operation with vectors and matrixes, to write programs, to build diagrams and surfaces, etc.

In this given work it is offered to apply the following algorithm to solving tasks on physics:

1. Making physical sizes in identical system of measurement.
2. Observing animation of this or that physical process.
3. Presence of the basic laws and formulas.
4. Reception of final formula or equations.
5. Choosing of a numerical method.
6. Including designations.
7. Making up programs.
8. Doing accounts.
9. Checking results.
10. Conclusion.

The solution of physical tasks on used numerical methods can be classified as follows:

1. Tasks with the use of numerous calculations under the same formula.
2. Tasks on constructions of the diagrams.
3. Tasks on presence of roots transcendental equations.
4. Tasks on the decisions of the algebraic equations.
5. Tasks on calculations of the certain integrals.
6. Tasks on the decisions of the differential equations.
7. Tasks on the spectral analysis.
8. Tasks on finding of the sizes with the use of a method of the smallest squares.

In the collection of tasks on physics most frequently there are tasks concerning to 1 and 2 items. And in real tasks mostly used the tasks to the solving of the differential equations of the second order, law that is the second law of Newton.

We've created a program - product for modeling various processes and phenomena on all sections of physics, which can be observed and used in solving of tasks.

To these processes belong:

1. Movement by gravity:

a) It is possible to see movement of a body thrown with an angle to horizon, from which, that

with increase of initial speed range, height and the time of flight grows;

with increase of an angle of throwing height and the time of flight grows, and the range has a maximum at 45^{o}; if to take into account air resistance , the range of flight decreases.

b) The movement on an inclined plane, from which is possible to see, that acceleration is increased with increase of an angle of an inclination and decreases with increase of factor of friction.

c) Movement on the block, from which it is possible to see, that the acceleration of bodies is directly proportional to the weight of the first body and in inverse proportion to the weight of the second body.

d) A mathematical pendulum, from which it is possible to see, that the period of fluctuation depends only on length of a string.

e) A spring pendulum, from which it is possible to see, that the period of fluctuation is directly proportional to factor of elasticity and in inverse proportion to weight of a cargo.

f) A task of Kepler, from which it is possible to see, that the trajectory of movement of a particle in the central field depends on speed, i.e. at e=0 there will be a circle, at e < 1 will be an ellipse, at e > 1 will be a parabola, at e=0 will be hyperbola.

2. Laws of ideal gas:
a) Isothermal process.
b) Isobaric process.
c) Isochoric process.
d) Adiabatic process.
3. Modeling an electrical field:
a) Dependence on quantity of charges.
b) Dependence on value of charges.
c) Dependence on a mark of charges.
d) Dependence on distance between charges.
4. Movement of the charged particle:
a) In a homogeneous electrical field.
b) In a periodic field.
c) In a field of a dot charge.
d) In a field of the charged wire.
e) In a homogeneous magnetic field.
5. Wave properties of light:
a) Dispersion of light.
b) Rings of Newton.
c) The Young experience.
d) The diffraction in a crack.
e) The diffraction lattice.
6. Oscillatory phenomena:
a) Mathematical pendulum.
b) Spring pendulum.
c) The Lissaju figure.
d) The harmonic fluctuation.
e) Fading fluctuations.
7. The Rezerford experience:
a) Dependence on speed of a particle.
b) Dependence on aim distance.
8. Structure of atoms:
a) Dependence on serial numbers.
b) Dependence on nuclear weights.
c) Dependence on group of elements.
9. The effect of a Hall:
a) Dependence the factor of Hall from magnetic field.
b) Dependence the factor of Hall from thickness of a plate.
c) Dependence the factor of Hall from voltage.
d) Dependence the factor of Hall from force of a current.
10. Semi-conductor diode:
a) General structure of p-n transition.
b) Methods of reception of technologies of p-n transition.
c) Various types of diodes.

So, in this presented article there have been observed some of the methods of solving tasks on physics with the help of a computer, and there is shown methods of calculation. We have chosen tasks on physics concerning these processes and worked with students on the computer. The experience showed, that the application of information technologies at teaching physics helped to raise students' interest in subject and developed their intellectual ability.

The tasks, submitted in the given work, and programs of their solutions, can be used by the students and teachers in studying bases of computer modeling, methods of mathematical physics, and also in solving tasks of general course of physics, electrical engineers and etc.

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