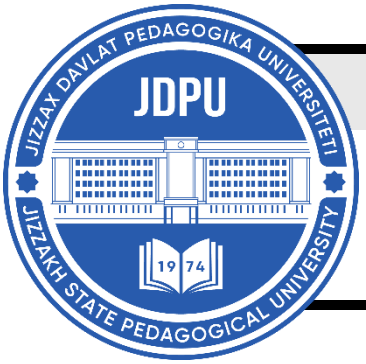
DOI: https://doi.org/10.37547/mesmj-V4-I4-10 Pages: 56-63

MENTAL ENLIGHTENMENT SCIENTIFIC – METHODOLOGICAL JOURNAL



MENTAL ENLIGHTENMENT SCIENTIFIC – METHODOLOGICAL JOURNAL

http://mentaljournal-jspu.uz/index.php/mesmj/index

CREATING COMPUTER MODELS AND USING THEM IN THE EDUCATIONAL PROCESS

Nurbek F. Isaev
Jizzakh State Pedagogical University
Jizzakh, Uzbekistan
E-mail: isayev.nurbek@mail.ru

ABOUT ARTICLE

Key words: formalized problems, modeling, computer modeling, experiment, computer experiment, algorithm, object, program, programming algorithm, software.

Received: 11.08.23
Accepted: 13.08.23
Published: 15.08.23

Abstract: This article is intended for lectures on mathematics and computer modeling taught in higher education institutions, and is written on the basis of the sample subject program of this subject. In the article, the concept of a mathematical model, the concept of a computer model, the creation of a mathematical model of a given problem and the identification of errors, the construction of a mathematical model of linear and non-linear processes, the conduct of their computer experiment, and the presentation of the results in a numerical way and the presentation of graphs, are related to modeling. instructions are provided. The article can be used by students who are studying in the fields of master's degree and applied mathematics of the physics-mathematics faculty of higher educational institutions.

INTRODUCTION

At present, the level of development of information technology is growing rapidly. Every day there are new, more advanced methods of studying existing processes. Information technology is becoming more and more integral to our lives. In this regard, it is impossible to provide a high level of education, using only traditional teaching methods. Today, methods are needed that would allow the most rational use of

Student's study time, would speed up the process of transferring knowledge, help to understand the educational material faster and easier. The use of information technology in education is one of the most common and productive methods that make it possible to educate a competent, competitive specialist.

The inclusion of technology in the educational process can be implemented in various ways. One of them is the use of dynamic visual information.

So, for example, you can explain any phenomena by creating video clips of experiments or research. This presentation of information is more visual, and therefore allows you to make the learning process more informative.

But such a method cannot explain the process at the smallest, perhaps even molecular level.

The solution to this problem is the creation of animation models of real processes. Such use of modern technologies allows us to show and explain in detail, step by step, the smallest, invisible processes in ordinary life [1].

An effective way to study environmental phenomena is to study natural phenomena under controlled conditions of scientific experiment. However, experimentation is often not possible or required. This can lead to high economic costs and undesirable consequences. In this case, the studied object is replaced by a computer-based model and its behavior is studied for various external effects.

The rapidity of personal computers, information technologies, the creation of supercomputers, computer modeling is one of the most effective methods of studying physical, technical, biological, economic and other systems. Often, computer models are easier and more convenient to study, they allow to determine the main factors that determine the properties of the studied objects, which are difficult to install or give unpredictable results.

Computer modeling first requires abstraction of phenomena to create a qualitative and then mathematical model. This is followed by a series of calculations, that is, computer experiments, interpretation of results, clarification of the object being studied, etc. The calculation experiment is carried out with the help of a computer through the mathematical model of the studied object [3].

Creating a computer program (software package) that describes the essence of simulating the system on a computer, taking into account the interaction between the elements of the studied system and the external environment, conducting a number of computational experiments during its operation consists of transferring.

MATERIALS AND METHODS

The use of computer programming languages has made a significant turn in the way of mathematical modeling. On computers with a high-power Pentium processor created at the end of the 20th century, it is possible to create various views of the studied process models (graphs, diagrams, animations, multiplications, etc.) on the computer screen. There are options for moving the model on the screen (for example, a thumbnail) at different levels (plane, space). The model created on the screen can be saved as a file in the computer memory and used several times.

In general, the following directions can be distinguished in the methodology of computer modeling:

1. The organization of experiments in the geometric direction is carried out on the coordinate plane. The computer is used as a tool for viewing models and researching the properties of geometric objects and checking mathematical hypotheses.

2. The second direction is related to the modeling of various actions. Various motion problems can be solved by computer models. This leads to a deeper and wider feeling of the nature of the processes taking place, a real evaluation of the obtained results, and an expansion of imagination about the possibilities of computer modeling.

3. The third direction - modeling of function graphs on the computer screen - is widely used in professional computer systems. For example, the Logo program allows you to graph functions, solve equations and systems of equations, and obtain their results. The most important thing is that the use of computer modeling technology plays the role of a new stage in the realization of real reality and the realization of the cognitive process [2].

Data models, regardless of their form, must fulfill the following requirements:

1. Simplicity. The data model should have a small number of related structure types.

2. Clarity. The data model should be visual.

3. Division into parts. The data model should be able to be easily replaced in the data warehouse.

4. Change of place. The data model should be able to be replaced by similar models.

5. Freedom. The data model should not contain only specific fragments. The above-mentioned requirements cannot ensure the ideality of the created models. Because only some important features of the real object are involved in modeling.

A computer (numerical) experiment is a numerical experiment in ECC conducted to study the mathematical model of the research object, that is, to determine other parameters of the model using one parameter and draw conclusions based on this.

The technology of solving the problem on a computer is carried out in the following stages:

- Putting the issue;
- Create a model of the problem;
- Formalization;
- Creating an algorithm;
- Writing a program using programming languages;
- Carrying out a calculation experiment.

In the process of setting the problem, attention is paid to its accuracy and clarity, and what is given and what needs to be found? should answer the question [2].

When modeling a given object, it starts with its analysis based on the purpose of modeling. At this stage, all known subjects representing the modeling features of the object are determined. Designated entities should represent the object model as fully as possible.

There may be different ways to describe the model

–Expressing the model through words;

–Representing the model through various drawings;

–Representing the model in the form of tables;

–Expressing the model through formulas;

–Representing the model in a schematic form;

–Setting up the calculation algorithm;

–To create a program on a computer;

–Computer computing experience, etc.

RESULTS AND DISCUSSION

After choosing the described form of the model, it is transferred to its formalization.

The result of the formalization stage is an informative model. The constructed model is checked and analyzed for contradiction and its appropriateness and adequacy is checked.

It is known that the computer works in a sequence of formalized commands written in a certain algorithmic language. Therefore, at the next stage, an algorithm is created to solve the problem on the computer.

Algorithm is a correct representation of the sequence of actions aimed at solving the given problem.

The algorithm can be expressed in the following common ways:

–Expressing the algorithm in words, that is, a sequence of actions expressed in words to solve the problem;

–Depicting the algorithm graphically, that is, expressing the sequence of performed actions through a block diagram or drawings;

–To express the algorithm using algorithmic languages, that is, to write the program using programming languages to obtain and analyze the results.

After the software tool is created, the calculation experiment is conducted. The obtained results are checked for the adequacy of the model and in this way the model is improved.

All the actions mentioned above are examples of computer modeling [2].

Computer modeling offers us the following opportunities:

–Expands the scope of research of the object, provides an opportunity to study repetitive, non-repetitive, occurred and may occur events that cannot be investigated in real conditions;

–The ability to visualize any features of the object;

–Research of dynamic processes and events;

–Time management (speed up, slow down, etc.) ;

–Conducting multiple experiments on the model, returning to its initial state;

–Receiving their descriptions in graphic and numerical form;

–Finding the optimal construction without making a copy of the test construction;

–Conducting experiments without harming the environment and health.

The main stages of computer modeling are as follows:

1. Statement of the problem and its analysis;

1.1. Determining the purpose of the model;

1.2. Clarify what the results will look like;

1.3. Determining what results are needed when building a model;

2. Building an information model;

2.1. Determining the parameters of the model and their interdependence;

2.2. Assessment of which parameters are strongly related to the given problem;

2.3. Mathematical representation of the interdependence of parameters;

3. Development of an algorithm and method of application to a computer model;

3.1. Development and selection of methods of obtaining results;

3.2. Creating an algorithm for obtaining results based on the chosen method;

3.3. Checking the correctness of the algorithm;

4. Creating a computer model;

4.1. Creating a software tool for computer application;

4.2. Creating a computer model;

4.3. Checking the correctness of the computer model;

5. Conducting experiments;

5.1. Creating a research plan;

5.2. Conducting experiments based on the created computer model;

5.3. Analysis of the obtained results;

5.4. Draw conclusions.

In high school and school textbooks on computer science, you can find different definitions of a computer model:

A computer model is a model of a real object, process or event obtained with the help of a computer.

A computer model is information about the system being modeled, presented by a computer in the form of a picture, graph, diagram, text, spreadsheet, database, knowledge base, animated image, video, etc.

A computer model is a virtual object, because it exists only in the computer memory and does not obey the laws of physics (virtual objects do not exist outside of memory).

Currently, there are two types of computer models:

They are called structural-functional computer models, which represent a conditional image of an object (identity, three-dimensional model of an atom, trajectory of an object) described with the help of computer environments.

Simulation models are called computer models, they are a program or a set of programs that allow you to repeat the processes of the object in different conditions (atomic decay, particle radiation, embryo development, animation) [4].

Computer models can be created using various software tools and packages: Excel, Word, Access, MathCad, 3DMAX and any programming systems.

A computer model based on a mathematical model is called a computer mathematical model.

Computer programs written in any programming language that build models of objects, processes, events are called modeling programs.

Some authors, along with the results of their work, call modeling programs computer models. They use the symbols of the programming language they write. Modeling programs can have three main blocks.

1. Initial data block. This block defines the goal (strategy) of modeling and may include the following information:

- Static parameters such as gravitational constant, acceleration due to gravity, mass, dimensions, etc.;
- Dynamic parameters such as time, speed, acceleration;

These data in the program can be constants or variables, values for variables can be entered from the keyboard, from a file or assigned in the program itself.

2. Working block.

It includes the algorithm of the performed task, if the program is written in an algorithmic language, it is written as a set of programming language operators. This block usually contains procedures and functions to handle various situations. If a logical language is used, then the unit of work is the knowledge base of the program and its purpose.

3. Results block.

This block contains the output of simulation results in any form: verbal, digital, graphic, in the form of demonstration or simulation of a process or event. In some cases, the work block and the output block may be the same.

In order to achieve such economic growth, first of all, it is of great importance to introduce large-scale systematic market reforms and to attract foreign investments, to implement deep structural changes in the economy, and to rapidly develop business and private entrepreneurship. Studying the competitive environment and market conditions in the national economy of our republic, predicting

economic indicators using simulation methods and models in the in-depth analysis of their nature and laws, choosing an alternative solution from multiple options, making optimal economic decisions in conditions of risk and uncertainty, later, simulation modeling is important in studying the theoretical and practical aspects of computer monitoring of the implementation of these decisions.

Simulation modeling is a research method in which the studied system is replaced by a model that describes the real system with sufficient accuracy (the constructed model describes the processes as they are in reality), with which experiments can be conducted and information can be obtained about it.

Experimenting with a model is called taqlid (imitation is understanding the essence of a phenomenon without resorting to experiments in a real object). Imitation modeling is a special case of mathematical modeling. There is a class of objects for which analytical models have not been developed for various reasons, it is fundamentally impossible to create an analytical model, methods for solving the resulting model have not been developed, or the solutions are unstable [5].

Compared to other sciences, it is very necessary to apply simulation modeling to concrete sciences, that is, computer science. Because it is more convenient and useful to show the student on a large monitor than to draw and explain a problem on the board. Then the essence of the matter will be understandable and interesting for the student. The student can easily see on the computer through simulation modeling the experiences that he cannot imagine in real life.

Simulation modeling is widely used to solve many theoretical and practical problems.

Different programs can be used in computer classes. Problems with a high degree of complexity help to develop the thinking and creative abilities of every student. The use of simulation models in solving problems in the lessons ensures an interesting passage of the lesson. The advantages of using information technologies, i.e. slides, are that you can return to the beginning of the issue at any time, stop at its individual parts, talk with students, and listen to their opinions.

In informatics classes, the curriculum can be used by students in learning new materials, in the stages of initial identification and repeated training. It should be noted that at the tutoring stage for upper grades, the teacher usually uses the curriculum when working with unsuccessful students or those who, for some reason, have gaps in the material under consideration. In the next decade, the use of computers in the teaching of computer science was carried out in several main directions. These include computer-assisted knowledge assessment, development and development of various types of educational programs, etc. [6].

CONCLUSIONS

In conclusion, the emergence of personal computers brought new qualitative changes to the modeling methodology. It did not remain only as a tool for performing calculations based on models

and algorithms created with the help of personal computers, but also played an important role in building models and conducting experiments using the model.

It should be noted that, in some cases, there were cases where teachers illustrated and demonstrated various graphics to students on the blackboard or verbally without the necessary equipment [10].

But the development of modern information technologies has changed this situation. The fact that teachers can independently create computer science educational resources and show them to students is not too difficult, as well as provided many options for preparing high-quality educational resources.

REFERENCES

[1]. Осетрова Е.Ю., Долгирев Ю.Е. Компьютерные модели в учебном процессе. Новые образовательные технологии в вузе – 2008.

[2]. N. Ravshanov, F.M.Nuraliyev, B. Yu. Palvanov. Matematik va kompyuterli modellashtirish asoslari. Ma`ruzalar to`plami (uslubiy qo`llanma). II-qism. Toshkent-2016

[3]. Xotamova A., Xayrullayeva Sh., Boymurodova A., Zaripova A. Kompyuterli modellashtirish bosqichlari. Международный научный журнал «Новости образования: исследование в XXI веке» № 9(100), часть 3 апрель, 2023 г.

[4]. Т.Н. Горностаева, О.М. Горностаев. Математическое и компьютерное моделирование. Учебное пособие – М.: Мир науки, 2019. – Сетевое издание. [5]. Ablazov Lazizbek Abdiqosimovich. Imitatsion modellashtirishning asosiy konsepsiya va vositalari. “Raqamli iqtisodiyot va axborot texnologiyalari” elektron ilmiy jurnali. 131-bet.

[6]. Yo`ldosheva D.M. Yuqori sinflarda matematika fanini o'qitishda zamonaviy axborot texnologiyalarining o’rni va ularni darslarda qo`llash metodikasi onlayn maktabning matematika fanini o'qitish usullarini o'rganish.

[7]. N.Rutten “The learning effects of computer simulations in science education” (https://www.sciencedirect.com/science/article/abs/pii/S0360 131511001758)

[8]. Summers R.L. Computer simulation studies and the scientific method // (https://pubmed.ncbi.nlm.nih.gov/16363976/)

[9]. Имитационное моделирование производственных систем / под ред. А. А. Вавилова. – М.: Машиностроение, 1983.

[10]. Isayev N.F. Imitatsion modellarni qurishning asosiy bosqichlari. Uzluksiz ta`limda raqamli texnologiyalarni joriy etishning zamonaviy tendensiyalari va istiqbollari**.** Respublika ilmiy-amaliy anjumani materiallari. (2022 yil 20-dekabr)