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MATHEMATICAL AND INFORMATIONAL MODELING

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KEYWORDS

model, object, subject, physical model, mathematical models

ABSTRACT

The article will talk about the types of mathematical modeling and modeling. The article will also focus on the types of models.

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Model (lat. modulus - measure, norm) is an image or example of a system of objects or objects.

For example, a model of the Earth - a globe, a model of the sky and stars in it - a planetary screen, a photo in a passport can be called a model of the owner of this passport.

Humanity has long been interested in the problems of creating conditions for a comfortable life, identifying natural disasters in advance. That is why it is natural for humanity to study various phenomena of the outside world.

Specialists in the field of Exact Science study only the properties of this or that process that interest them. For example, geologists study the history of the development of the earth, that is, when, where and what animals lived, where plants grew, how the climate changed. This will help them find mineral deposits. But they do not study the history of the development of the personality society on Earth, historians are engaged in this.

As a result of the study of the world around us, vague, and incomplete information can be obtained. But this does not interfere with flying into the universe, identifying the secret of the atomic nucleus, mastering the laws of the development of society, etc. On their basis, a model of the phenomenon and process under study is created. It is necessary that the Model reflect their characteristics as fully as possible.

The approximate character of the model can be manifested in different ways. For example, the accuracy of the instruments used during the Experiment affects the accuracy of the result being obtained.

Modeling is the study of objects of cognition (physical phenomena and processes) using their models, making and studying models of existing objects and phenomena.

The modeling style is widely used in modern science. It facilitates the process of scientific research, and in some cases becomes the only means of studying complex objects. The importance of modeling in the study of an abstract object, objects located far away, objects of a very small size is great. The modeling method is also used in physics, astronomy, biology, economics to determine only certain properties and relationships of an object.

Depending on the means of selection of models, it can be divided into three groups. These are abstract, physical, and biological groups.

Among the abstract models. includes mathematical, mathematical-logical and similar models. Among the physical models, small layouts, various instruments and devices, simulators, etc. are included.

Let's briefly get acquainted with the content of the models.

1. Physical model. The nature and geometric structure of the process under investigation are the same as in the original, but models from which the quantity (size, speed, scale) differs from the ground, for example, models of aircraft, ships, cars, trains, HPS, etc., will be an example of a physical model.

2. Mathematical models consist of a mathematical and logical-mathematical description of the laws regarding the structure, interaction, function of living organisms, compiled according to experimental data or on a logical basis, and then checked by

experiment.

A computer study of mathematical models of biological phenomena makes it possible to know in advance the nature of the change of the biological process under investigation. It should be noted that the organization and conduct of such processes by experiment is sometimes very difficult. The creation, improvement and use of a mathematical and mathematical-logical model creates favorable conditions for the development of mathematical and Theoretical Biology.

3. The biological model is used in modeling the biological structure, function and processes characteristic of various living objects and their parts - a molecule, a cell, an organism, etc. In biology, basically, three different models are used.

They are biological, physical and mathematical models.

Biological model-allows you to test a certain condition or disease that occurs in humans and animals in animals in the laboratory. In this case, the mechanism of origin, course, consequence of this condition or disease is studied on the basis of experience. In the biological model, various methods are used: exposure to the genetic apparatus, infection with microbes, removal of certain organs or the introduction of Harmons, which are the product of their activity, and Basha methods. In such models, knowledge in the field of genetics, physiology, pharmacology is investigated.

4. Physicochemical models are the RE-generation of biological structure, function or processes by physical or chemical means.

5. Economic models began to be used approximately from the XVIII century. F.For the first time in Kene's "economic tables", an attempt was made to show the formation of the entire process of social reproduction.

Different models are used to study different areas of activity of economic systems. The most general laws of economic development are checked with the help of models of the national economy. Large economic models are used to analyze the dynamics and ratio of various complex indicators, including national income, employment, consumption, savings, investment indicators, to predict it. When checking specific economic situations, small economic systems, when checking complex economic systems, mainly mathematical models are used.

Mathematical modeling has been successfully applied to solving various practical problems in the Exact Sciences. The method of mathematical modeling provides an opportunity to express one or another magnitude that characterizes the issue from the quantity quotient, and then learn what is related.

On the basis of style lies the concept of a mathematical model.

A mathematical model is said to be a functional link between the characteristics of the object being studied, expressed in the form of a mathematical formula or algorithm.

After the invention of the computer, the importance of mathematical modeling increased dramatically. There was a real opportunity to create complex technical, economic and social systems, and then implement them using computers. Now an experiment began to be carried out not on an object, that is, on a real system, but on a mathematical model that

replaces it.

The computer execution of huge calculations associated with the trajectory of movement of spacecraft, the creation of complex engineering structures, the design of transport Highways, the development of economics, etc. confirms the effectiveness of the mathematical modeling method.

Usually, conducting a computational experiment on a mathematical model is carried out in cases where it is impossible to research a real object in an experiment or it is impractical from an economic quotient. It should also be taken into account that the results of such a calculation experiment are not much more accurate than the experience carried out on a real object. But such examples can be given that the computational experiment carried out on a computer serves as the only source of reliable information about the process or phenomenon under study. For example, it is possible to predict the consequences of the impact of nuclear war on the climate only by conducting mathematical modeling and computer computing experience. The computer indicates that the nuclear will not be an absolute winner in an armed war. A computer experiment shows that as a result of such a war on Earth, environmental changes, that is, a sharp change in temperature, pollination of the atmosphere, melting glaciers at the poles, even the earth can leave its axis. In mathematical modeling, mathematical expressions of given physical processes are modeled. The mathematical model is an approximate description of the class of some kind of phenomena of the outside world, represented by mathematical signs. The mathematical model is a powerful way to know the outside world, as well as predict and control.

The analysis of the mathematical model provides an opportunity to absorb into the essence of the phenomenon under study. The study of phenomena using a mathematical model is carried out in four stages.

The first stage is the expression of laws linking the main objects of the model. The second stage is the verification of mathematical problems in the model.

The third stage is to determine whether the model satisfies the accepted practice criteria. In other words, to clarify the question of whether the results of the observation of the object obtained with the theoretical results obtained from the model correspond.

The fourth stage is the conduct of the next analysis of the model by summing up the information about the studied phenomenon and its development, clarification.

Thus, the main content of modeling is made up of experimental and (or) theoretical analysis of the model based on the initial study of the object, comparison of results with information about the object, correction (improvement) of the model, etc. To draw up a mathematical model, initially the issue is formalized. In accordance with the content of the issue, the necessary signs are entered. Then a functional link is formed between the magnitudes, written in the form of a formula or algorithm.

We will consider what was mentioned in a specific example.

The question of finding a thought number (mathematical focus). Students are required to think of an optional number and perform the following steps with it:

1. Let the thought Number be multiplied by five.

2. Add to the multiplication the number corresponding to today's date (or another optional number).

3. Let the Harvest be doubled.

4. Add to the result the number of the current year.

The presenter emphasizes that after some time the student can find the number he thinks.

It is obvious that the number thought by the student is determined using a model suitable for mathematical focus.

Let's formalize the issue: X is the number that the reader thinks about, U is the result of the calculation, N is the date, M is the current year.

Hence the instructions of the presenter:

U=(X*5 + N)*2 + M

expressed by the formula.

This formula serves as a mathematical model of the issue (mathematical focus) and represents a linear equation with respect to the variable X.

We solve the equation:

X = (U - (M + 2N))/10

This formula shows the algorithm for finding a thoughtful number.

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