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CONSTRUCTION SYSTEMS IN NATURE AND ROAD VEHICLES

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Abstract: The article is devoted to the current research of biomechanical modeling, which allows the most economical, to give an idea of the operational and convenient object of cognition and structural systems in nature and technology. The paper proposes a model that indicates the nature of the functioning of the system of the working body of road machines.

Keywords: road car, nature, biomechanics, model, system, working body.

Introduction

The biomechanical modeling methodology makes it possible to most economically give an idea of the object, purpose and mode of action. A biomodel, despite a number of inherent limitations, is an operational and convenient object of cognition and research of structural systems in nature and road vehicles [3].

The most effective is the combined method of modeling in research, which allows you to combine the study of systems on models with a production experiment. The presentation of the results of system analysis by models of various types and purposes is a new promising method of research and the nature of functioning, as well as assessing the effectiveness of structural systems [1].

Biomechanical models, which are based on the principles of bionics in research, are formed to obtain relevant knowledge, identify the mechanisms of the process of interaction with the environment, etc. Evaluation of processes to identify characteristics, properties, capabilities, comparison performance, etc. , development of new alternatives, preparation of a basic solution [2].

It can be said without exaggeration that the assessment of alternative models, brought in the process of evolution after centuries of selection to the highest degree of perfection, exist in living nature.

The application of the models is based on the following considerations. According to the definition, a system is a collection of elements linked by a common function. The functioning of the system in time is subject to a certain rhythm and sequence, which is characteristic for it and can be accurately described.

We propose a block diagram that indicates the nature of the functioning of the system of the working body of road machines (Fig. 1).

The individual stages of work are shown by letters enclosed in frames, and the necessary work and results are shown by arrows, which are a combination of elements (stages and operations) organized to achieve the goal of the research.

In fig. 1 shows that we have switched from a real model A to a theoretical system created as a result of a deep study on the basis of system B, simplification occurs, if necessary, the scheme can be supplemented with hypothesis D, the degree of accuracy of which will be confirmed and taken into account in the future. At this stage, we are also trying to replace the functional plan drawn up on the diagram with digital designations. This phase can be called the phase of formalization, it is reflected in the object B, which is called the model.

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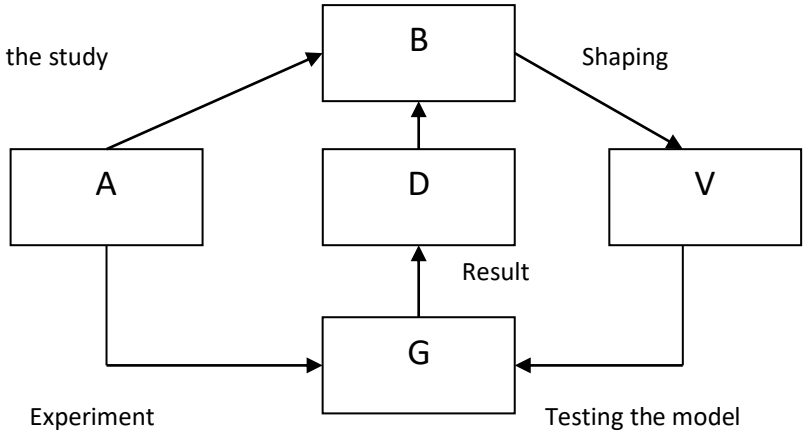
In the field of bionics, simulation bridges the gap between engineers and biologists.

In biology, it is customary to evaluate the effectiveness of the constructive schemes of living organisms.



Rice. 1. Study of structural systems using a model

A - the studied constructive system.

B - theoretical system.

B - model (biomodel).

D - comparison of the characteristics of a real system.

D - improvement of the model based on the received

results.

In biology, it is customary to evaluate the effectiveness of constructive schemes of living organisms in terms of carrying capacity - the ratio of the weight of the skeleton of an organism to the weight of its body. This also makes it possible to establish the influence of gravitational forces on the formation of the structure and constructive forms of living organisms living in various environments. However, the ratio can be considered a more objective indicator of the effectiveness of biological structural systems.

$$K_c = \frac{P}{m}\eta$$

where P- is the ultimate load supported by the structure or its element; *m*- is the mass of a biological structure or its element.

Criteria K_c is a power characteristic of a biological constructive system. It allows you to assess the degree of perfection of an object only by its bearing capacity and does not affect the energetic area of interaction of a living organism with its environment. Therefore, to assess the effectiveness of biological structural systems, the $K_э$ criteria are used:

$$K_э = \frac{П}{m}$$

where Π is the productivity or volume of mechanical work per unit of time, biologically performed by the object in connection with its vital activity; *m* is the body weight of a biological object.

The expression for $K_э$ does not include the energy factor, its place is taken by productivity, which, ultimately, determines the level of efficiency of using biological energy and the degree of perfection of the "working organ" of the living object under study. In addition, the use of the K_2 criterion avoids the difficulties associated with direct measurement of the

amount of energy consumption of a biological object for performing mechanical work [4].

The simplest analysis shows that the $K_э$ criterion has a very important property, which is of fundamental importance in these studies. This property lies in the invariance of the $K_э$ criterion with respect to the nature of the studied structural systems, i.e. in the possibility of its application in the energy assessment of both living and artificial objects. So, for road cars, productivity and weight, as well as for living objects, are among the main parameters, and their ratio shows how effectively the material from which they are made is used.

Conclusion

In the conducted studies, the invariance of the $K_э$ criterion was used to substantiate the method of biomechanical modeling of the working bodies (or their elements) of road machines. This method is formulated by us in the following form: the synthesis of the working organ (or its elements) according to the totality of all the characteristic features of the burrowing apparatus of the biological prototype, i.e. a natural animal - a digger, best adapted to the habitat of the region in which the operation of the created mechanism is supposed [4].

At the research stage, the corresponding model and the original are made of the same material. This model can be used to obtain the main indicators of the functioning of the working bodies (reliability, reliability and durability, wear resistance).

At the stage of system analysis, information concerning a more accurate assessment of the technical and economic indicators of road vehicles is of great interest.

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