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THE CONCEPT OF “PROBLEM” IN SYSTEMS ANALYSIS

From a practical point of view, system analysis is a universal method for solving complex problems of an arbitrary nature, where the concept of “problem” is defined as a “subjective negative attitude of a subject to reality”. The article discusses the approach to identifying problem situations, when the system models and the forecast models that the analyst forms are presented in an explicit form accessible to the interpretation by the subject (including natural language). The analysis of Russian-language works on system analysis allows us to identify two of the largest areas in this area, which can be called the rational and objective-subjective approaches.

The first direction (rational approach) considers system analysis as the set method. Another approach of the system analysis area is an objective-subjective one, which is based on the works of Ackoff.

As is known, for effective perception and understanding of reality, a person breaks up the complex into the simpler (which is the essence of analytical thinking). For example, a person uses very simple, concise forms to express physical laws, although the latter are not an exact description of reality. Obviously, if knowledge is sufficiently large or difficult to describe, then for the subject in most cases it will be difficult enough for perception — it will be a black box model. Therefore: knowledge should be compact (in form, description), which makes it accessible for understanding, interpretation and further use. Next, it is necessary to determine which models of knowledge representation should be used when identifying problem situations. Traditionally, in the theory of data analysis, descriptive models are identified that are necessary for a better understanding of the system under study, known facts and observations, and predictive models necessary for understanding new facts about the system. These models include:

1. Regression models (including exception models, association models, sequence models, etc.);
2. Classification and clustering models.

In terms of presentation, the most common and most natural for human perception and understanding are:

1. Logical rules expressed by means of natural language in the form of IF-TO;
2. Symbolic expressions (for example, math functions).

In this paper, there was proposed a multi-criteria approach to the construction of intelligent technologies. In general, the set of criteria The identified problems of knowledge extraction are quite effectively solved by the following methods of intelligent information technologies: methods based on fuzzy logic, evolutionary algorithms.

The proposed method of identifying knowledge using a multi-criteria approach to building intelligent information technologies makes it possible to make the system research process more transparent for the subject who formulates the problem and makes decisions regarding intervention in a problem situation.

The opportunity to get not only one, but a lot of effective and different in the form of information presentation solutions, allows us to consider the system from different “points of view”, which increases the reliability of the interpretation of the results: some aspect of the system description is more understandable to the subject, some is less clear. Numerical studies show that as a result of the implementation of the approach, it is possible, firstly, to significantly simplify solutions with permissible accuracy of the system description, secondly, to obtain solutions that can be interpreted with possible loss of accuracy. At the same time,

test examples showed that the loss of description accuracy is not so critical, since the solutions allow to draw the most common and practical useful conclusions.

From a practical point of view, system analysis is a universal method for solving complex arbitrary nature problems. In this case the key concept is the concept of “problem”, which can be defined as “the subjective negative attitude of the subject to reality”. Accordingly, in complex systems the stage of identifying and diagnosing problems is the most important, because it determines the goals and the system analysis objectives, as well as the methods and algorithms that will be used later with the decision-making support. At the same time, this stage is the most complex and least formalized.