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DEVELOPMENT OF INTELLIGENT CONTROL SYSTEMS WITH THE HUMAN FACTOR INCLUDED

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Modern information technologies make it possible to automate the control process and switch to unmanned (crewless) driving. For example, crewless ships are already being created in maritime transport which are capable of solving the problem of cooperative maneuvering without human help automatically[1]. In spite of the positive results, the automation of the process of managing moving objects has some disadvantages associated with the isolation of the vehicle operator from the control process. According to A. E. Sazonov, "The control system of a mobile object (ship, vessel, aircraft) is a man-machine and consists of a regulator, which includes both an operator (watchman, pilot), and a control object, which is a mobile object as engineering structure"[2].

If the human factor is not taken into account, this can adversely affect traffic safety and lead to emergency situations. For example, statistics show that the human factor is the main cause of accidents in maritime transport. According to the average statistics, it accounts for an average of 70–80% of all accidents [3]. The inclusion of the operator in the chain of control of the motion process leads to the solution of the complex problem of simultaneously taking into account both the psychological characteristics of a person and the characteristics of the controllability of the control object. To solve the problem of the human factor, it is proposed to use an intelligent system for controlling the movement of moving objects in the study. Those system allows taking into account the influence of subjective characteristics of a person on the control process using the concept of *meaning*.

The purpose of the study is to develop a conceptual scheme for an intelligent control system for the movement of moving objects, taking into account the human factor. Research methods are based on the basic concepts of cybernetics, information theory, logic, probability theory and mathematical statistics. The theory of probabilistic evaluation of meanings was used while developing the concept of an intelligent control system for the movement of moving objects [4]. The main concept of this theory is the *concept of meaning*: "meaning is a statistical parameter that measures the average amount of entropy per one conclusion"[4, p. 86]. The concept of meaning allows one to characterize the effectiveness (degree of meaningfulness) of the decisions made by the operator and thereby take into account the human factor. From the point of view of the theory of probabilistic evaluation of meanings, the human factor is a statistical parameter of the Poisson distribution of a random variable that measures the average amount of entropy of the probabilistic state of the "operator-control object"system per one decision made by the operator.

Recently, artificial intelligence researchers have come to the conclusion that it is necessary to step over *the barrier of meaning* [5] firstly, in order to include an element of consciousness in the machine. Thus, scientists can come closer to creating an artificial intelligent system being capable of independently making reasonable management decisions and controlling various moving objects. The results of the study can be used for creating a new class of decision support systems like socio-cyber-physical and human-machine systems.

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