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## Development of a Mathematical Model of Traffic Safety Management with Account for Opportunities of Web Technologies

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### Abstract

Traffic safety (TS) management is a multifaceted complex process. Web technologies possess opportunities for more efficient traffic safety management. A decision maker (DM) forms processes ensuring the TS in the form of a decision model. Within the framework of use of information technologies for TSM, the article considers the development of a mathematical model of TSM with account for opportunities of Web technologies. The analytical dynamic model is based on the object integrity maintenance law. Development of the TS system on the basis of the proposed model will improve efficiency of the TS and guarantee the achievement of the management objective.

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### 1. Introduction

Development of Internet technologies (Web technologies) leads to the automation of many areas of human activity and also increases the control over them, for example, in the field of observance of road traffic regulations. On the basis of models improving the efficiency of traffic safety (TS) management, using Web technologies,

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continuous monitoring and control of observance of road traffic regulations (RTR) are performed.

The traffic safety is a state of this process, reflecting the degree of protection of its participants against traffic accidents and their consequences. Ensuring of the traffic safety is the activity aimed at preventing the causes of traffic accidents, and reducing their consequences.

Web technologies allow improving the TS. It is necessary to develop a model of the TS with account for opportunities of Web technologies.

The activities of both a traffic participant and a specialist in traffic management and safety are based on human decisions. Persons act on the basis of the model [Anokhin (1979), Arbib (1976)]. Therefore, in order to act adequately to the traffic situation, it is necessary to have an adequate mathematical decision model. It is interesting that in the literature on development of managerial decisions it is affirmed that to build the mathematical decision model is very difficult, not to say impossible. The publications contain only results of the decision validation but not the decision model. However, without the mathematical decision model, it is very difficult to guarantee that the goal of traffic safety management will be achieved. The same situation is with the construction of the traffic safety system, as there is no criterion of synthesis of the properly constructed system. This combination of factors determines the topicality of the present paper. And the goal of the paper is the selection and justification of conditions, under which the achievement of the objectives of traffic safety management, taking into account opportunities of Web technologies, based on synthesis of the mathematical decision model, is guaranteed.

## 2. Main text

### 2.1. *Natural-scientific approach to the synthesis of the traffic safety management model with account for opportunities of Web technologies*

In the process of traffic safety management, situations often arise when the results of the activities do not guarantee the achievement of management objectives. The unsatisfactory result of management is based on contradictory conclusions. To avoid the contradictory conclusions, the axiomatic method shall be used. Only this method allows excluding the arbitrariness in the reasoning [Burlov (2007a, 2007b, 2015)].

In order to generate conditions that guarantee achieving the objectives of the activities, the natural-scientific approach (NSA) to traffic safety management is used. The NSA is defined by the integration of properties of human thinking, surrounding world, and cognition [Burlov (2007a, 2007b, 2015)]; it is implemented by the scientific-pedagogical school “System integration of public management” [Committee on Science and Higher Education (2013)]. Three components are reflected in three principles [Burlov (2007a, 2007b, 2015)].

1. Principle of three-component cognition.
2. Principle of integrity of the world. The object integrity maintenance law is implemented [Burlov (2007a, 2007b, 2015)]. It is a stable, objective, repetitive connection of the object properties and actions for a fixed purpose.
3. Principle of cognoscibility of the World. It is implemented by methods. Decomposition. Abstraction. Aggregation.

A person operates with the categories of “system”, “model”, and “purpose”. There are two directions of the development of the system (model): the development based on analysis and the development based on synthesis. This approach is known from the systems engineering [Goode and Machol (1957)]. Even Anokhin P. K., a member of the USSR Academy of Sciences (1979), pointed out and experimentally confirmed that for the system synthesis it is necessary to identify the “basic law” of the general theory of functional systems. He also addressed to leading experts in the field of creation and research of systems (for example, to M. Mesarovic and others [Mesarovic and Takahara (1975)]) with the issue of developing a formalized criterion for the system construction. The issue received no response in the known publications, but it is developed by the scientific-pedagogical school “System integration of public management” in form of the object integrity maintenance law (OIML) [Committee on Science and Higher Education (2013)]. In this work, the OIML is used for synthesis of the decision model [Burlov (2007a, 2007b, 2015)]. The most appropriate approach for assessment of the adequacy is “the completeness of basic laws of subject domain”. In natural sciences, in order to evaluate the adequacy of the model, the laws of physics and chemistry are used. However, in the field of complex, social, economic, technological, and other systems, it is suggested to use the OIML [Burlov (2007a, 2007b, 2015)].

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