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Mechanisms of Functional Properties Formation of Traffic Safety Systems

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Abstract

The Article describes a multi-level systematic organization of traffic safety activities. The grounds are given to support the concept of current system status observability by monitoring the functionally necessary activities in all the traffic safety system hierarchy levels. The functional configuration of the traffic safety system is also proved to be the means for converting the objectives into desirable results of the system functioning in terms of the controlled (cybernetic) system theory. A procedure is presented to demonstrate using of the schematic diagrams to support the mechanisms of formation of the basic system functional properties, such as controllability, accuracy of performance by input signals, noise immunity etc., that are not presently applied in real traffic safety practice, but are able to significantly enhance the functional capabilities of the traffic safety systems, and therefore to prevent death cases in the road traffic.

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Keywords: Traffic safety system, functional configuration of the system, system functional properties, traffic safety, mechanisms of formation of functional properties, causes of road traffic accidents.

1. Introduction

The key term in the traffic safety issue is "causes of the road traffic accidents". Knowing of their variety and of the mechanisms of their prevention is the basis for providing "zero death rate on the road" [European Report about Traffic

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Safety Status (2009), WHO (2015)], and for integrating such concept into real-life practice [Tzizniy Erez (2005), Safe Traffic (2012), [Gamulin (1989)]. To develop such basis in spite of all difficulties requires substituting the “black box” technique, being used almost everywhere nowadays, with the means of formalization of such tasks as functional organization and control of the traffic safety systems’ status. Whereas the traffic safety systems are considered as a part of the organization system class, in particular, of the multifunctional hierarchical systems, having many factors which affect their effectiveness, and considered together with the functionally necessary activities to be performed within such systems that are bound by common system objectives. For such systems, as well as for the controlled systems of other classes, a well-proved complex of standard techniques for investigating their properties. Although such techniques are not used in the world traffic safety science and practice for control of their effectiveness. Probability of their application is supported by the knowledge that the system parameter are formed as a combination of the system basic (essential) properties such as: controllability of the concerned (operational, current) traffic safety level change process in terms of the classic complex system control theory; noise immunity or high tolerance to the major system faults that can cause the road traffic accidents tolerance, such as professional mistakes and misbehavior of the road service personnel and users (traffic participants); quick action, i.e. a rate of response to some dangerous deviations of the system participants’ professional activities from a regular mode; full observability of the system status parameters providing an opportunity to quantitatively measure how effectively each functionally necessary element and the entire system function; accuracy of performance by any control, corrective and counteracting signal, i.e. commands, instructions, procedures, dispositions, standards, etc. Apart from the priority of using the assessments of the system functional features (a combination of its functional properties), an opportunity is provided to arrange for provisions of systematic knowledge collection (knowledge database) about the above mentioned mechanisms, and to start developing a related science, and applying such science to the traffic safety system organization practices. This science has its own subject, investigation and design techniques. The latter, besides the mentioned structural properties and elements, is able to provide and implement a “humanities” function by continuously and properly informing the society about a current status of the traffic safety system in terms of the system’s functional properties implementation. Such science can bring to the society an objective and qualitative assessment of the system’s status in terms of the system’s properties and the government performance quality, and to make such assessment sound emotional and motivational, i.e. it can become a tool helping to form the citizens’ mentality and its components, such as a feeling of involvement into some common activity, commitment, patriotism, honorable and respectful treatment of the state, living (home); comfort.

The “zero death rate in the road” concept is applied in all European countries. The concept details are specified in the international standard ISO 39001: 2012, that is also accepted for Russia [Russian National Research Institute of Standardisation and Certification in Mechanic Engineering (2015)]. Russian traffic safety concept has the same purpose as the European one, but at the same time its formula (refer to the Federal law about the traffic safety [State Duma (1996)]) is more rational and comprehensive, i.e. to provide the measures for preventing the causes of major traffic accidents. According to the Russian concept the source of the traffic danger includes “improper” violations of the traffic rules, and many other organizational factors, i.e. types of improper performance of the functionally necessary (regulated) activity (that can cause some major traffic accidents) by certain authorities in all levels of the system hierarchy (that is specified in their official duties and their due liabilities).

The mentioned Law, however, did not provide norms to implement it in the real life [Kravchenko (2012), Fedorov and Kravchenko (2013)], and thus released the entire administrative superstructure of the system of its legally binding liabilities. This law changed the attention of the system’s responsible persons towards the first system level alone, i.e. to the level of drivers and pedestrians, i.e. again to the level where the accidents has already happened, and where post factum the end causes are being searched for, but the root causes, which mostly originate from that very superstructure, are not investigated at all.

The traffic psychologist declares that the Doer “believes in the necessity to observe the law to the extent to which his direct higher-level managers believe in that” [Kotik and Yemelyanov (1993)]. Recklessness in the Russian practice takes origin in the non-systematic and unclear distribution of responsibility among the participants of the all-state traffic safety system that is a root cause of any offence in all levels of the system including road traffic by the traffic participants due to their demotivation.

It would be rational to start justifying the mechanisms that are used to form the functional properties of the traffic safety system, from such property as the full observability of the system status. This is provided by setting environment

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