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Scientific Basis of the Expert System of Road Safety

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Abstract

Developing an objective approach to take decisions aiming at reducing the number of injuries and damage inflicted by the road traffic incidents and accidents has become a top priority issue. A rational solution deals with setting up an intelligent road safety expert system comprising a complex software system that allows gathering the knowledge and applying it to improve road safety control.

The methods to assess comprehensively the road traffic safety status were developed. The status is determined according to the behavior of traffic participants and conditions of the road facilities. The paper suggests using the theory of fuzzy sets as the most rational research tool.

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Keywords: road safety; traffic participants; road traffic injuries; traffic accident; expert system; research tools; fuzzy sets; comprehensive assessment

1. Main text

At the meeting of UN General Assembly in September 2015 the heads of the states approved historic Sustainable Development Goals (SDG) to ensure development of traffic safety systems [WHO, 2015]. One of the main challenges of SDG is to decrease by half the number of deaths and injuries caused by road traffic accidents (RTA) by 2020. Undertaking the commitment to reduce road traffic injuries means recognition of a strong scientific base

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underpinning activities aimed at reduction of injuries. There is a significant scope of effective measures designed to improve the road safety. The countries that have been successful with implementing them show a steady reduction in traffic accident fatalities. Implementing these programs at a global scale would give an opportunity to reduce the incident rate dramatically saving human lives.

In Russia, the Federal special purpose program “Improving traffic safety in 2013–2020” has been underway since 2013. It is aimed at reduction of road traffic injuries and accidents [Government of the Russian Federation, 2013]. The effectiveness of the program is provided in the form of Managing Objectives as a basis of the government management in the area of road safety through accepting and subsequent implementing the Program. The latter would allow the following:

- Establishing common goals and objectives of activities aimed at increase of road safety until 2020.
- Developing a priority system to improve the road safety that is permanently bringing down the number of causes of accident root causes in systemic manner.
- Improving management in the area of road safety at the federal, regional and local levels, as well as improving interaction of departments and agencies and coordinating federal executive bodies, executive bodies in the entities of the Russian Federation and in the local self-governing authorities.
- Focusing government resources on implementation of priority goals and objectives in the area of road safety.
- Applying principles of result-oriented budget planning.

It should be mentioned that according to Burkov et al. (2012) the Russian traffic safety public policy today is undergoing the process of formation lacking integration and coordination of authorities which results in numerous contradictions and inconsistencies. This implies that the profile of the road safety management should be made more visible. The authors believe that challenging the approach to the road safety throughout the country can be made through improving the management efficiency along with the general trend of delegating authority from the center to the regional and local level.

One of up-to-date areas to improve the traffic safety control deals with application of a type of artificial intelligence as an expert system. Intelligent Expert System is a complex software system that allows accumulating the knowledge about a certain field of activity and managing this knowledge to solve issues in the subject area [Emelianov and Yasinovsky (2009)]. Among the advantages of intelligent expert systems there are responsiveness, scalability and ability to solve non-algorithmic tasks.

Expert systems are used to solve important real-life problems; the quality and efficiency of these systems are not inferior to the human expert solutions; the systems are capable of self-education, and they are available to any user [Popov (1987)]. These advantages determine the need for developing the “Road Safety” expert system (ESRS) (Figure 1).

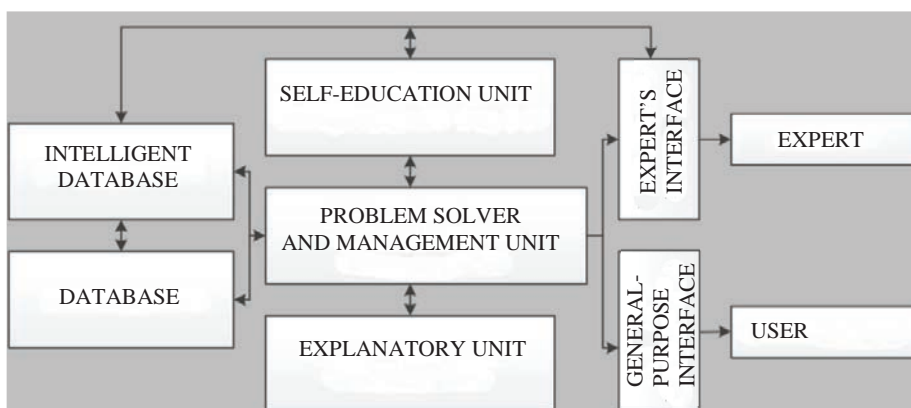


Figure 1. Chart of generalized expert system “Road Safety”.

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