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## Creative Approaches to Organization and Safety of Road Traffic

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### Abstract

The article identifies problems of ensuring safety of vehicles and pedestrians at street intersections and road intersections outside inhabited localities, as well as at pedestrian crossings. Recommendations for the use of special markings are given, taking into account psychophysiological characteristics of road users. To reduce potentially dangerous situations, we substantiated expediency of improving the light signal design by means of special sensors that are adjustable to coverage area.

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### 1. Main text

The objective of the research is to improve road safety at street intersections and road intersections outside inhabited localities, as well as at pedestrian crossings and sidewalks on the basis of rational traffic organization.

The urgency of the problem is confirmed by statistics of road accidents (RA). More than 30% of road accidents occur at street intersections alone. About 75% of road accidents happen in cities, and 50% of them at the intersections. A considerable number of accidents are recorded at the pedestrian crossings located between the intersections, and at the road intersections outside inhabited localities.

This situation is caused by:

- shortcomings in the road regulations that do not provide full safety of vehicles and pedestrians at the street intersections, road intersections outside inhabited localities, and at the pedestrian crossings;

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- scientific groundlessness and potential danger of official standards of signal control implementation;
- lack of scientifically substantiated methods for calculation and determination of parameters of the safe traffic organization;
- lack of research of psychophysiological properties of drivers and pedestrians that affect safe traffic organization and objectivity in criminal and internal investigation of traffic accidents;
- lack of scientifically substantiated methods for full-scale study at the street intersections, road intersections outside inhabited localities, at the pedestrian crossings, and sidewalks in order to establish the actual values of parameters of safe traffic organization;
- lack of methods of mathematical processing of experimental data, suitable for practical purposes, to obtain statistically valid values of parameters of safe traffic organization.

One of solutions to the problems of improving traffic efficiency is rational use of the existing road network, i.e. traffic control in specified conditions.

Activities aimed at improving traffic organization can include segregation of streams according to speed, channeling of streams according to direction, ensuring uniform change in the characteristics of traffic stream [Antonov et al. (2014)]. To segregate the streams according to speed, as a rule, there is organized multilane roadway, with allocation of lanes for slow moving vehicles; additional lanes uphill and downhill; acceleration-deceleration lanes at the intersections; bays and widenings for vehicles stopping; and well-organized areas for vehicles parking [Ambartsumyan (2009)].

However, these activities do not always take into account psychophysiological capabilities of road users. Main road users (drivers and pedestrians) remain the determinative element, that's why their psychophysiological qualities must be considered [Ganichev and Antonov (2013)]. Therefore, concept of a human being only as a cybernetic model in the operator's activities, which was prevailing for many years, has not justified itself. To strive for traffic improvement and not to take into account the human behavior means to condemn all the work to failure a priori.

Experience of the authors in this field allows formulating the following recommendations.

### *1.1. Special marking*

Marking in the form of dashed or solid lines and curbs can have orienting or enclosing meaning. Predominance of one or another depends on the conditions of visibility: the better the visibility is, as well as other conditions of orientation and driving, the more meaning the enclosing function has, and vice versa. When the marking is on the right edge of the roadway, the traffic stream is shifted to the right. When there is only dashed lane line on the highly visible road in daytime, the traffic stream is shifted to the left on the right half of the roadway, which increases the number of moving vehicles in the middle of the roadway, while at the low visible left turn this dashed line clearly performs the enclosing function. Due to combination of dashed and solid lines, it is possible to implement the orienting functions of the markings of both kinds [Ganichev (2012)].

### *1.2. Special techniques for reduction of the vehicle speed*

To reduce the speed by means of uncomfortable flashing, an "optical brake" in the form of transverse lines can be used. In this case, series of transverse lines on the roadway are used, the distance between which is being gradually reduced, which gives the impression of increasing speed. On road sections of 300 meter long, sixty transverse lines of 50–60 centimeter wide are marked, and the distance between them is reduced from 5–6 meters to 1 meter. Such marking on the highway will reduce the speed immediately after entering the marking (maximum by 25% in 70% of cases). By analogy with the "optical brake", we also recommend to use an "acoustic brake" ("noisy surfaces"). The noise effect should have the same interval and duration in order to last half a second with exceeding of the total background at least by 3 dB [Ganichev and Antonov (2013)].

### *1.3. Improvement of light signals*

Road accidents are often caused by errors of drivers in the assessment of the traffic situation. Inattention, carelessness and unjustified haste have irreversible consequences [Mikheeva (2008)].

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