Abstract

Method for assessing photometric properties of road obstacles in night driving conditions

The subject of the dissertation is the method of assessing photometric properties of road obstacles in night driving conditions. This issue was taken up due to the apparent lack of a precise method in road accident investigations, based on which it would be possible to perform a technical analysis of the course of a road event, in which the photometric properties of the actual lighting situation gain significant significance.

The following thesis has been formulated: ***the use of a transparent superposition of light spots and wavelet analysis for the detection of obstacle edges will allow for the determining the conditions of night observation of objects on the road, including the determination of their perception.***

The reason for taking up the research problem discussed in the dissertation, concerning the determination of photometric properties of objects and traffic environment, were the author's problems encountered during the reconstruction of road accidents occurring in night conditions, carried out for the purposes of issuing opinions to national procedural bodies. In the absence of a uniform and universal method of determining photometric parameters of a road situation in traffic accident studies, which determine the possibility of identifying obstacles / pedestrians, the need to develop a new method is observed. It would take advantage of modern research tools to determine the actual lighting properties of the incident site and the photometric parameters of the projectors and reflectors used in vehicles.

The research undertaken in the thesis consisted of three basic parts. In the first one, the scientific literature relevant from the point of view of the dissertation was analyzed, as well as the scientific thesis, purpose and scope of work were presented. It also analyzes the issues of observation of objects on the road, development of requirements and lighting technology in the field of the main lighting of motor vehicles, as well as the available methods for assessing the visibility of pedestrians have been reviewed. It also discusses image processing methods consisting in point and spectral transformations, with the possibility of their using for transformations of luminance images.

In the second part of the research, a systematized method for acquiring comprehensive photometric data of the road situation (objects and traffic environment) was prepared in field and laboratory conditions. In the third part of the thesis, an original method for evaluating photometric properties of a road situation was developed, consisting in the use of a transparent superposition of fixed luminance of light spots of vehicles and road infrastructure, for converting picture points and wavelet detection of the edges appearing on them. The method was verified on the basis of a comparison of real lighting situations with the situations simulated. The obtained actual and simulation results displayed high consistency, which was confirmed by the calculated values of absolute errors, comparing the actual photometric data with the data simulated for different lighting situations.

From the point of view of the subject matter in question, it was found that it is possible to apply the developed method for retrospective acquisition of the photometric data of the road lighting situation. The method of assessing photometric properties of road obstacles in night driving conditions presented in the thesis can be employed in the methodology of technical investigations of road accidents occurring in conditions of limited visibility. At the end of the thesis, further directions of research related to the dissertation were defined.

Keywords: luminance, contrast, model, pedestrian's silhouette, lighting.

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