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IMPROVEMENT OF EXPERT ANALYSIS FOR ROAD TRAFFIC ACCIDENTS USING COMPUTER SIMULATION PROGRAMS

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The existing methods for auto-technical expertise presuppose selection of some parameters on the basis of the expert's intuition and experience. Type of a vehicle and its loading rate, road conditions are not taken into account also in the case when deceleration is to be determined. While carrying out the analysis it has been established that an application of special software makes it possible to improve significantly efficiency of the executed works directed on solution of the assigned tasks, to speed up calculation processes, to decrease qualitatively probability of arithmetic errors and provides the possibility to visualize results of the conducted investigations. Possibility of using various models for dynamic motion simulation and collision of vehicles (in the form of 3D-models) has been established in the paper. In such a case specific features of vehicle technical conditions, its loading rate and condition of roadway surface have been taken account in the paper. The given paper also permits to obtain a dynamic display of reconstructed accident mechanism in axonometric projection, to film video-clips when a camera is positioned at any spatial point: road, roadside, raised position, moving vehicle, driver's seat in the vehicle. The paper contains an analysis of possibilities of road traffic accident simulation programs, a statistical analysis that shows significance in differences between simulation results when various programs have been used. The paper presents initial data and results of vehicle speed calculation on the basis of braking track length which have been obtained with the help of road traffic accident express analysis (a classical approach) and PC-Crash when additional influencing factors are taken into account. A number of shortcomings have been revealed while analyzing the simulation results of the applied software. The shortcomings must be removed in the analyzed software products. On the basis of the executed analysis in respect of application of road traffic accident simulation programs it has been proposed to involve responsible and controlling authorities (Road Police Inspectorate, expert institutions, insurance companies) for practical activity with the purpose to increase the objectivity of the result conclusions.

Common to manytypes of forensics is the performance of calculations according to one or another formula, which include the values of the corresponding tabular reference data, parameters and odds. Experts note that the process car braking occurs under the influence of a large number of random factors, different in nature, intensity and duration of action. Therefore, the values of the braking characteristics calculated by the expert (for example, deceleration, braking distance) are random values, scattering.

Existing methods for conducting technical expertise (CTE) suggest selection of some parameters based on expert intuition and experience. The

initial values when calculating the vehicle speed at the time of the accident - braking distance and tire grip. Any inaccuracy in determining these parameters immediately leads to an inaccuracy in the calculation of speed.

However, if the stopping distance can still be measured with a tape measure with acceptable accuracy, then reliably estimate the value of the coefficient of adhesion, using the reference data, fundamentally impossible (devices for measuring the coefficient of adhesion does not exist). Recommended Help the tables contain discrete values of the coefficient of adhesion and only depending on type of road surface and the quality of its surface, dividing the surface into dry and wet, clean and dirty, smooth and rough, etc. In this case, the table values adhesion coefficient for different surfaces of even the same type of coating are significantly different.

In addition, studies show a strong dependence of the coefficient of adhesion on factors such as vehicle speed, pressure intires, worn treads, pavement temperature, etc. Note that all reference parameters and odds: a) are initially determined empirically, through measurements on a representative sample; b) are inevitably evaluated with some inaccuracies. Absolutely accurate theoretical calculations or practical measurements it just can't be. So every the reference parameter or coefficient is the statistical average value of one or another indicator of the general population of similar objects in given conditions. Techniques used in the practice of CTE, based on the laws of physics, theoretical mechanics, theories and designs of cars, collision theory, etc. In this case, as a rule, the applied mathematical dependencies are simplified. This is due to that in the production of examination may be the number of input parameters is limited to simplify the calculation process, which leads to a decrease in the reliability of the result. Therefore, urgent tasks are to increase the reliability of expert research and reducing the time of their production. The use of software can significantly improve the efficiency of the work performed to solve the tasks in several respects: the settlement process is accelerated; in quality terms, the use of computer programs reduces the likelihood arithmetic errors; it becomes possible to visualize the results of the study.

In the Republic of South Africa, the Ministry of Police cooperates with three companies supplying this software: IbBInformatik GmbH, manufactures computer modules CARAT (Computer Assisted Rekonstruction of Accidents in Traffic); Dr. SteffanDatentechnik, brings to the market the PC-Crash program and its associated modules (PC-Rect); Dr. Werner Gratzer - ANALYSER PRO.

In the course of the study of the simulation results of the applied software, a number of shortcomings to be developed were revealed, for example, the effect of various parameters of the vehicle's brake system onbraking distance value. The greatest discrepancies in the results of tests and simulation of braking distance for the absolute value corresponds to the Chevrolet Cruze '17 (2.06 m, relative error of 5.00%), then Toyota Corolla '18 (1.96 m, relative error of 5.30%), the smallest - VW Polo'18 (0.10 m, relative error 0.24%). Moreover, the programPC-Crash does not take into account tire temperature, which affects braking distance. However, it is impossible according to the available sample, state the significance of differences in the results.