

# Objectivity and reliability: a new method for analyzing road accidents

Researchers at Siberian Federal University have developed a method for calculating the speed of a car at the moment of sudden braking associated with tire damage. This method helps accurately determine the dynamics of the vehicle up to its complete stop. The scientists believe that their development will help reliably assemble the picture of a traffic accident and provide materials for fact-based analysis of the events. The article is published in Transport Problems.

When analyzing road accidents, it is important to calculate the speed of the vehicle at the time of sudden braking. This will allow determining the dynamics of the further movement of the vehicle and understand whether the driver had the technical ability to prevent the accident. Also, the speed is necessary to reassemble the relative position of elements, objects and participants involved into the accident at the time of the occurrence of the traffic hazard.



*"The existing methods for determining the speed of a vehicle are based on the calculation on the traces of braking, and on the assessment from eyewitnesses in the absence of these traces. It should be admitted that the assessment of speed on the braking tracks is not always adequate to real events, and eyewitnesses give only approximations. We propose a scientific and practical method for calculating the speed of a car at the moment of sudden braking and determining the dynamics of movement up to its complete stop. This method is devoid of subjectivity (as in the case of visual perception of the event by eyewitnesses) and gives results that are more accurate than a road experiment. After all, accident modelling is usually complicated by the different technical and operational properties of vehicles used in the test. In essence, we propose to build a model of an accident based solely on the laws of physics,"* said **Igor Blyankinshtein**, professor of the Transport Department of the Polytechnic School of Siberian Federal University.

It is proposed to calculate the vehicle speed at the moment of sudden braking by the value of the linear displacement of the vehicle's centre of mass. In turn, the method for calculating the number of revolutions during the movement of the vehicle from the moment of sudden braking to its complete stop is given by the value of the linear displacement of the centre of mass of the vehicle. The authors also proposed a method for calculating the duration of the process of translational-rotational movement of the car from the moment of sudden braking to its complete stop.



*"Traffic accidents claim lives, health and property every day. It would not be an exaggeration to say those road accidents are a kind of ongoing epidemic on the roads of the whole world. This is why it is important to deal with each such case quickly and objectively, avoiding the traps of imperfect human perception and errors in traditionally conducted experiments. Our methodology allows reassemble the circumstances of the accident and identify the necessary data that can become evidence for finding out the truth in the case of traffic accident. And, what is important, our method has a solid scientific basis. This is an important step towards impartiality on the roads,"* said **Valery Kovalyov**, professor of the Department of Transport of Siberian Federal University.

The scientists note that their method has passed compulsory verification with the use of computer modelling.



*“To assess the reliability of our development, we first determined the values of vehicle speeds using the proposed method, and then — by means of computer simulation using the PC CRASH. The initial data were the travel distance from the moment of braking to a complete stop, the weight of the car, the dimensions of the base and rut, the tire-to-surface friction coefficient in the longitudinal and transverse directions. As a result, it turned out that the speed of the car, calculated by our method, practically coincides with the speeds determined by computer modelling,”* said **Dmitry Morozov**, associate professor of the Department of Transport.

*23 september 2020*

© Siberian federal university. Website editorial staff: +7 (391) 246-98-60, [info@sfu-kras.ru](mailto:info@sfu-kras.ru).

Web page address: <https://news.sfu-kras.ru/node/23611>