Section: Research Paper

METHODOLOGICAL RECOMMENDATIONS FOR DETERMINING VEHICLE SPEED

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Abstract: Vehicle speed is a crucial factor that impacts road safety and traffic flow. Accurate speed measurement is vital for traffic management and law enforcement. In Uzbekistan, determining vehicle speed is critical for ensuring safe and efficient road transport. However, existing speed measurement methods in Uzbekistan have limitations in accuracy, reliability, and consistency. Therefore, this paper presents methodological recommendations for determining vehicle speed in Uzbekistan. The recommendations cover various aspects of speed measurement, including selection of appropriate measuring devices, positioning of measurement points, calibration of devices, and data processing. The proposed methodology considers Uzbekistan's road network and traffic characteristics and aims to improve the accuracy and consistency of speed measurement. The recommendations can be applied by road authorities, traffic police, and other stakeholders involved in road safety management in Uzbekistan.

Keywords: Vehicle speed, Speed measurement, Road safety, Traffic flow, Measuring devices, Calibration, Data processing, Road network, Traffic characteristics, Accuracy, Consistency, Uzbekistan, Methodological recommendations

In our republic As the process of automobilization is developing rapidly, ensuring the safety of road traffic remains an urgent issue. The effective use of special knowledge in determining the causes of traffic accidents is of particular importance. Therefore, forensic auto-technical expertise is considered an important evidence tool for determining cases and conducting justice.

Traffic accidents mainly:

- hitting pedestrians;
- vehicle collision;
- overturning of vehicles;

- knocking down inconspicuous growths; _ _ _
- are divided into types such as the occurrence of accidents due to malfunctions in the systems affecting the traffic safety of vehicles, etc.

The purpose of the methodical direction in determining the speed of the motor vehicle is aimed at solve the problems presented to the expert by studying the presented documents, video recordings and the situations reflected in them.

The main areas of research are:

1. Acquaintance with the documents submitted to the research.
2. View the object where the video image is recorded.
3. Clarifying whether the video image in the submitted object is an original copy, an original copy or a copy reproduced using another device (device).
4. Evaluating suitability for conducting expertise based on the quality of the video image.

In order to carry out this type of examination, the specialist should be provided with the decision of the investigator on the appointment of the examination or the ruling of the court, objects of research and other documents that help to clarify the details of the incident.

Clarification of the speed of movement of the vehicle is an important factor in solving problems related to accident investigation.

Until now, in practice, issues related to determining the speed of a car were solved based on the tracks left on the road by its wheels.

Using this method of determining the speed does not always give the expected result, because brake marks are not always left at the scene of an accident, and the absence of concrete evidence or the fact that the driver does not apply the brakes leads to an overestimation of the information about the actual speed of the car.

Of determining the speed of a vehicle on the eve of an accident based on the length of the brake or skid marks left on the surface of the road by its wheels is widely used in documents related to incidents related to hitting pedestrians.

In the case of an accident involving a collision of vehicles, the brake trail left before the collision limits the possibility of determining the actual speed of the vehicle. Methods based on the rules of shock theory are used to determine the speed in the event of a car collision.

Currently, there is no scientific method to accurately calculate the speed of a vehicle that has had an accident without braking, based on the path it travelled after the collision, the angle it turned as a result of the collision, or the mechanical damage caused by the rollover. Because the collision situation is a complex event, and in this process, kinetic energy is spent on the formation of deformations (damages). Energy consumption is related to speed decay.

Today, scientific methodological guidelines for determining the value of kinetic energy, which is the cost of the speed lost during the collision, have not been developed. For this reason, it is not possible to technically determine the actual speed

of the vehicle that collided without braking at the time of the accident by means of an expert examination.

The technical characteristics of vehicle movement are constantly improving (the use of the AVS braking system) creating uncertainties and difficulties in determining the speed of movement. Therefore, the formation of an updated system of scientific and methodical recommendations using modern technical tools in the analysis of accidents puts an end to the problems in this direction and creates convenience in calculating the speed indicators of the car.

It should be noted that changing the speed value alone has a negative impact on the process of blaming (exonerating) the causes of the incident and creates misunderstandings and conflicts in making informed decisions.

The proposed methodical recommendation eliminates the shortcomings in this direction and clarifies the situation through the analysis of the video recording of the accident, which is considered the main source.

Video recording allows the direct use of methods for determining the speed of moving objects, taking into account their dynamics.

A number of methods for determining the speed indicator can be distinguished depending on the specific situation, assuming that the main goal is to determine the speed of objects in the research of the incident through the video image. First of all, in order to determine the speed of an object (car, bicycle or pedestrian), it is enough to know the path travelled by it during a certain time. The distance travelled by an object in a given period of time can be determined using several specific methods. The following methods of video recording can be mentioned. These are:

• made with the help of a fixed camera and in the process of recording, the vehicle is reflected in the frame at different angles while moving along a straight line;

• cases where a vehicle overtook another vehicle moving in the same direction, speed and length of which is known, were recorded using a fixed camera.

As mentioned above, one of the most important issues in the process of investigating the causes of a car accident is to determine the speed of the car before the collision, and the practice confirms that the speed obtained on the basis of testimonies is not reliable and differs significantly from the actual speed.

The reason for describing the speed as overestimated or underestimated is explained by the fact that a person's ability to accurately (estimate) this technical indicator is limited.

As everyone knows, usually the information about the speed of the car is obtained from the speedometer (speedometer) indicator on the instrument panel. But the information seen through the speedometer may not always be the true speed indicator. Because, like any measuring device, the speedometer has a margin of uncertainty. This uncertainty is also affected by the size of the tires installed on the

vehicle (installation of tires of a size not intended by the factory). Therefore, it is no surprise that the speed indicated by the speedometer on the instrument panel of the car is completely different from the actual speed. It is for these reasons that it is necessary to know how to determine the speed of an object (vehicle).

In the daily practice of republican forensic organizations, the method of determining the speed of objects (vehicles, pedestrians) based on the video recordings obtained by stationary surveillance or other types of cameras and video recorders in vehicles has not been established through scientifically based methodological recommendations.

Currently, the method of determining the distance, speed or trajectories of vehicles monitored by cameras is used in the experiences of advanced foreign countries (France - 2002, China - 2002, Russia - 2010, Ukraine - 2018), and these studies it is performed using a special program and measuring device (video cameras).

The programs used as a source of supply ("AvtoUragan"-VS (Russia), TruCam (Ukranina) and others) are able to determine the speed of cars moving in the range from 1 km/h to 255 km/h. It is worth noting that it is inappropriate to compare technical devices with radars (radar Doppler speed meter), and it is necessary to show that their working process is completely different from each other.

The methodical recommendation developed by experts of the Ministry of Interior EKBM is designed to determine the speed of the car based on the video recording.

The presented video recording, the place where the video surveillance device that recorded the video recording was installed, the accident and its changes during the research, the recording of the video surveillance device that recorded the video recording the computer system and its technical indicators, fixed objects at the scene, road and weather conditions, the researched vehicle, as well as other factors are studied individually based on the analysis (comparison).

It should be mentioned in advance that the methodological recommendations developed by the experts of the Ministry of Internal Affairs and Communications can be applied only to situations similar to the analyzed event. It is inappropriate to apply this recommendation as a general rule for all cases.

Based on the methodological recommendation, the video recordings and the situations reflected in them are studied, and then the research object (TV or pedestrian) is selected separately.

In order to determine the data determining the speed of the vehicle, a planned experiment was conducted at the regulated intersection of Taras Shevchenko - Nukus streets, Tashkent city, in daylight, dry weather conditions and unrestricted visibility. One of the employees involved in the event was assigned the task of receiving the results of the examination planned to be conducted through the monitoring monitors

at the MIA YHXBB YHX MKB and AH radio communication control points and delivering information about them to the rest of the participants and to coordinate the work being done. A COBALT car was chosen as a vehicle to participate in the experiment.

MOOG video surveillance cameras provided by the Israeli company "VLATCOM" installed at a height of 5.5-7.0 meters above the ground, at a height of 5.5-7.0 meters from the ground on different sides of the intersection, and a computer-controlled by the Ministry of Internal Affairs of the Republic of Uzbekistan YHHBB, provided by the Israeli company "VLATCOM" system was used. The cameras are included in the computer system under the control of the Ministry of Internal Affairs and Communications under the number P1F1, P3F1, P3F2, P2F1.

7984-7934 consists of 50 frames, and the frequency of recording frames is 24 (twenty-four) frames per 1 (one) second, it turns out that the car spent 2.083 seconds of time (t) for the distance travelled between the points**.** It was determined by performing the following calculations:

$$t = N_{7984} - N_{7934} / f;$$

$$t = 51/24 = 2.083;$$

here:

N_{7934} – *The time of the front right wheel of the* "COBALT" car *in frame 7934, seconds;*

N_{7984} – *The time of the front right wheel of the* "COBALT" car *in frame 7984, seconds;*

f - *frame recording frequency, 2 4 frames per 1 second.*

Based on the fact that the COBALT car travelled 29.3 meters in the accident, its speed at the time of the accident **(And)** is defined as follows :

$$V_a = S_a / t3.6;$$

this where :

S_a - *model "COBALT". of the car moving past the road, 29.3 m ;*

t - *model "COBALT". points 1 and 2 of the car between the distance pressing to pass spent time, 2,083 s.*

Done deeds, as a result, is called "COBALT". the car movement speed of 50.6 km / h was determined. If the decimals in this value are rounded up without being taken into account, it turns out that the speed indicator is 50 km/h.

So, the present video footage and the experiment were determined on the spot to information mainly "COBALT" model car intersection 50 travelled at a speed of km / h.

In Figure 1, a camera installed in the car interior showed that the speedometer reading was 50 km/h while crossing the intersection.

Figure 1: *View of the COBALT car moving at a speed of 50 km/h using a video camera installed in the cabin.*

Figure 2: *View of the part of the car in the initial field of view of the P1F1 camera that clearly shows the position of the front right wheel touching the pavement.*

Figure 3: *P1F1 camera view of the part of the car clearly showing the front right wheel touching the pavement in the final field of view.*

In conclusion**, it can be said that** this methodical recommendation made on the basis of the above experiment provides an opportunity to accurately determine the speed of the car at the time of occurrence of the incident without errors. However, low-quality, long-distance, reverse angle and low-light video data may cause difficulties in determining the vehicle's speed. Technical operations performed on the basis of imprecise data may increase the margin of error in determining the speed value. Therefore, it is necessary to analyze the quality of the video image presented in the cited cases, to determine the fixed points reflected in it, to match the video surveillance camera that recorded the situation and the provided video recordings, and at the same time to clarify the vehicle speed indicators by conducting additional inspection-experimental actions at the scene of the incident.

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