Evaluation Safety of Vehicle Motion in The Condition of Visual Impairment

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Abstract
Given the lack of visual information, potentially dangerous sections of the roadway are a significant cause of traffic accidents. Currently, one of the basic principles of increasing the active safety of a car is information support for the driver. However, the existing methods and means of information support for the driver have several disadvantages. Thus, the use of video recording systems is limited in conditions of insufficient visibility (for example, in difficult weather conditions), inertial navigation systems are expensive, and the use of specialized road laboratories to register the boundaries of the roadway is laborious and expensive. The ability of the driver, as well as the information support system for the driver to reliably and quickly determine the spatial position of the vehicle on the roadway, to predict and choose the mode of movement of the vehicle in the context of a lack of visual information causes road safety and is an important task. The paper addresses the implementation assessments of ERO-GLONASS navigation system and e Call via service network composition in Autonomous Vehicles (AV) in order to overcome lack of visual information and accidents in the territory of Uzbekistan.

Keywords: GPS, Autonomous Vehicles (AV), ERA-GLONASS, vehicle identification number (VIN).

Introduction
"ERA-GLONASS" is the Russian state emergency response program for collisions, designed to improve safety on the road and reducing accident death rates by reducing emergency warning time. This is a partially adapted European e Call system with several adjustments in the data being transmitted and partially backward consistent with the European. The process concept is quite simple and straightforward: in the case of accidents, the device mounted in the car in full automatic mode and without human intervention determines the severity of the accident, determines the position of the vehicle via GLONASS or GPS, establishes connections with the network infrastructure and transfers the necessary data on the accident in accordance with the protocol transfers the necessary data on the accident a certain distress signal. The network operator's call center worker would contact the onboard computer after receiving the radio signal to find out what happened. If no one responds, send the data received to database and send it to the exact coordinates of the rescue team and clinicians, and several minutes is given to the last one to arrive at the location. And all this, we emphasize, without a person's involvement: even if people caught in an incident can't call emergency services individually, the accident information will still be transmitted.

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To one of the effective technical solutions can include satellite monitoring of transport, which allows solving monitoring, control tasks compliance with traffic schedules, optimization of circuit and safety is implemented satellite monitoring of transport systems monitoring of moving objects built on basis of satellite navigation systems, equipment and cellular and radio communication technologies, computing equipment and digital cards. Satellite vehicle monitoring is used to solve tasks of transport logistics in transportation management systems and automated fleet management systems. The scheme of operation of such a system is shown in the figure. The principle of operation is to track and analyze the spatial and temporal coordinates of the vehicle. There are two monitoring options: online - with remote transmission of coordinate information and offline - information is read on arrival at the control room. A mobile module is installed on the vehicle, which consists of the following parts: a satellite signal receiver, coordinate data storage and transmission modules. The software of the mobile module receives the coordinate data from the signal receiver, writes it to the storage module and, if possible, transmits it via the transmis-
sion module. The transmission module allows you to transfer data using the wireless networks of mobile operators. The received data is analyzed and issued to the dispatcher in text form or using cartographic information. The mobile module can be built based on satellite signal receivers operating in the NAVSTAR GPS or GLONASS standards. In the offline version, there is no need for remote data transfer. This allows you to use cheaper mobile modules and refuse the services of mobile operators. Both systems use a 2G or 3G cellular network and satellite positioning system for the transmission of an accident and the vehicle (MV) information. The operating principle of the emergency response system when an accident is shown below Figure 1.

The emergency response system in case of accidents consists of four elements: a user interface unit (UIU), a global navigation satellite system (GNSS), a cellular communication network and a call center and emergency services coordination. In case of an accident, the user interface can be started manually by the driver or passengers by pressing a special button, or this happens automatically. In the latter case, the system determines the severity of the accident to the sensors that are triggered, for example, when deploying airbags. The user interface automatically makes a tone call to a single number control center. The call is routed to the nearest call center using existing public mobile networks. The reason for using 2G and 3G networks is that they have a wide area of coverage, especially in rural areas. After establishing a connection between the car and the call center, the system transmits a standardized minimum data set containing the vehicle identification number (VIN), the location of the accident, the time stamp, the direction of travel at the time of the accident, the number of passengers on board coordinates indicated using GNSS. ERA-GLONASS uses the same principles and protocols as eCall but has more functionality. For example, it has a callback mode and can use SMS as a backup transmission channel for a minimal data set. Since SMS transmission requires minimal network capabilities, this greatly increases the likelihood of receiving a minimal data set. An SMS can request SMS transmission if the voice connection has been established successfully, but the first message with a minimum data set has not been received. In turn, the user interface unit can send SMS if it could not establish a voice connection. The user interface unit is installed in the passenger compartment of the vehicle. A typical user interface unit consists of an integrated control microcontroller, a tonal modem and a GNSS receiver, as shown in the Figure 2 below.

A key element of the user interface unit is a vehicle with an integrated control microcontroller. It continuously monitors on-board sensors and simultaneously monitors the GNSS receiver and the tonal modem through the corresponding vehicle interface. The user interface block makes up the minimum data set, using the data entered at the factory, such as the VIN code of the vehicle and the type of fuel, as well as current information from the on-board sensors - vehicle position, time stamp and number of passengers. The GNSS receiver provides a permanent vehicle-based location for a vehicle. In the event of an accident sensor, the tonal modem over a public cellular network (2G and 3G) establishes a voice connection with the nearest control center for transmitting message. The user interface unit is equipped with a microphone and loudspeaker, allowing the driver or passengers to talk with the operator of the call center. Moreover, accurate positioning is crucial to the emergency response system. It is very important for vehicles that GNSS provide the exact geographic coordinates of the scene of the accident. There-
fore, for a user interface unit requires a very reliable and accurate GNSS receiver which provides navigation message.

**Conclusion**

The goal of usage ERA-GLONASS system is reducing response times for accidents or other emergencies on the roadways. The Russian government has enacted a law requiring integrated ERA modules on all new automobile models. ERA is harmonized with the European e Call system. It uses the same principals and protocols but provides further features like a redundant channel (SMS) or additional data services. ERA GLONASS is a manually or automatically actuated emergency service, which is available 24 hours a day, seven days a week.

Emergency centers aid and information during an emergency. In case of an accident with activation of airbags or belt tensioners, an emergency call is placed automatically. An immediate connection with an advisor will be established who will check whether help is needed. The back-up system for all elements is in place to ensure the reliability of ERA-GLONASS. In our country "GM Uzbekistan" (General Motors) factory currently many cars equipped with ERA-GLONASS "J200 GMUZ ERA GLONASS Development” modules.

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