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INTELLIGENT ROAD TRANSPORT SYSTEMS

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In order to solve transport problems, it is advisable to introduce intelligent systems into the process of controlling the movement of transport in large settlements, the use of which will reduce the level of congestion on highways and increase their capacity, and optimise the use of road transport.

Intelligent systems allow for the creation of conditions for interaction with individual road vehicles or with traffic flow using information and communication technologies, as well as with road transport infrastructure.

Information and communication technologies are used to solve the following tasks: increasing the mobility of people and controlling the transportation of passengers and goods (by collecting, transmitting, processing and receiving information about the traffic process); organizing feedback in global transport systems (based on quantitative assessment of the results of practical observations of traffic flows); controlling the quality of transport services (safety, efficiency and environmental friendliness); expanding opportunities to meet the growing demand for cargo and passenger transportation.

The scope and level of saturation of vehicles with automation components depends on their purpose and the required level of vehicle traffic control and workflow management. The automation system is a complex of sensors and receivers of radiation of various types and ranges that can be installed on almost any wheeled vehicle before it is converted into an unmanned vehicle. The vehicle is controlled based on commands generated from the data of functional systems.

In recent years, the automotive industry has paid great attention to automation. As a rule, this refers to the creation of local automatic systems, such as automatic fuel injection and turbo charging devices, automatic transmissions, anti-lock braking systems, etc. However, the amount of information coming from individual functional

units of the car and from the environment is so large that it often exceeds the driver's ability to analyse this information quickly and, as a result, make appropriate decisions. Therefore, the tasks of automating the control of the vehicle as a whole are becoming increasingly important.

The driver's functions, the automation of which is the most important, include: choosing a route; selecting the optimal fuel consumption mode for the engine and main vehicle components; compliance with traffic rules; timely detection and recognition of road signs and obstacles on the road; monitoring the technical condition of the vehicle.

The peculiarities of the above tasks indicate the need to build vehicle control systems using intelligent algorithms, which make it possible to ensure high speed, comfort and efficiency of movement in a wide range of changes in external traffic conditions, to select optimal routes and modes of movement with automatic adaptation to possible changes in the route task and malfunctions of vehicle units, which ultimately guarantees high quality and safety of traffic control. When building intelligent vehicle traffic control systems, it is promising to use neural networks, which are an effective control channel correction device, as well as multi-agent computing systems capable of providing fundamentally new qualities of adaptation, self-organization and intelligent behavior, implementing, in fact, on-board distributed information systems.

The use of these systems is an urgent need to improve the rest opportunities for drivers, a combination of a lack of available parking spaces and a lack of information about these spaces, which leads to drivers wasting fuel and polluting the environment when looking for parking, or they park in places without suitable parking spaces, using the engine to idle. These systems will therefore have a direct impact on the fuel economy of heavy vehicles.

Connected vehicle technologies, also known as collaborative intelligent transport systems (C-ITS), are rapidly developing across all major automotive companies and original equipment manufacturers. The technology is designed for environmentally friendly driving, which can have an impact on the fuel economy of trucks. The system provides drivers with additional information about their vehicles' performance in real time and recommended speeds, while other auxiliary systems can control vehicle speed to optimise fuel efficiency.

The most important short-term impacts of the introduction of intelligent vehicle systems will primarily be related to safety, fuel consumption and environmental impact.

The main tasks that intelligent systems in road transport should solve are

- determining their own location on the road/terrain;
- monitoring and analysis of the actions of surrounding moving and stationary objects;
- information interaction with the elements of the surrounding road environment, the control centre, and the technical support service;
- observance of the traffic speed regime, lane formation, safe driving distance;
- emergency braking or changing the trajectory to prevent an accident.

Energy-efficient vehicles must be equipped with the latest on-board computers using the latest generation of intelligent systems. List of the main intelligent systems of a modern car: ACC (Adaptive Cruise Control); BreakAssist (Electronic Emergency Braking Assist); EBS (Electronic Braking System); AFS (Active Front Steering System); LDW (Lane Departure Warning System); Blind Spot Monitoring System; Night Vision System; Fixed Object Detection System; CDC (active roll control); ASR (anti-skid system); EDS (electronic differential lock); Adaptive ESP (electronic stability program); Stop&Go (manoeuvring assistance); HAS (hill start assist); maximum speed limiter; driver training system; unified information space.

Intelligent automotive systems are developing in parallel with the development of IT technologies in the world. The main task of designing cars is the ability to update the data of intelligent systems through a single information space.

Conclusion

There is no doubt that the development of intelligent systems in road transport will significantly reduce operating costs in the transport of goods. The effective use of intelligent systems will lead to a significant reduction in travel time. The ability to quickly regulate the speed of traffic in certain areas and inform drivers in a timely manner will help to improve transport and environmental safety. The positive aspects of the introduction of intelligent systems in transport also include the ability to provide emergency rescue and emergency medical assistance in the event of road accidents with severe consequences by calling the relevant special services as soon as possible.

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