

DEVELOPMENT OF INTELLIGENT CONTROL SYSTEM OF AUTOMOBILE MANEUVERABILITY

Klets D.M., Doctor of Engineering Science, Head of Department
(Kharkov National Automobile and Highway University)

Economic development leads to wheeled vehicles speed increasing, as well as the traffic flows saturation. In this regard, the issues of the vehicles operation efficiency improving and road safety are becoming urgent. Vehicles operation efficiency improving is possible by using technologies to improve their individual properties, drivers' skills or implementation of artificial intelligence elements. Improvement of individual properties can lead to the deterioration of others, and the physiological abilities of a person are limited, so the most promising direction is the development of artificial intelligence elements in transport to ensure functional stability of the operational properties of wheeled vehicles.

Well-known foreign system can increase stability during the drift, as well as provide control and dynamic properties. However, in the Ukrainian automotive industry intelligent control systems for vehicles are still not widespread. The question of stability systems development with the application of new principles of action and elements of artificial intelligence is actual. Developed in Kharkov National Automobile and Highway University mobile registration and measurement system allows to test the stability and controllability of wheeled vehicles without using of expensive equipment, as well as to determine their power, aerodynamic and traction-speed properties and the parameters of movement resistance.

The main functions of our intelligent platform are to determine the road, climatic and technological conditions; to prevent the occurrence of skidding (automobile "immunity"); to control the tire pressure; to provide indicators of automobile manoeuvrability taking into account its technical condition. Auxiliary functions are self-diagnosis system of vehicle components and characteristics; climate control; energy recovery; vehicle-to-vehicle technology; automatic alarm about a dangerous stretch of road or the vehicle condition; protection from outside interference in the systems operation. Management functions are proactive management (stability against skidding); management of the vehicle longitudinal, vertical and lateral dynamics; adaptive cruise control. The speed of receiving signals from sensitive elements is 200 measurements per second.

Therefore, we have developed intelligent platform "Vehicle Manoeuvrability Improvement System" (VMIS). The implementation of the developed platform is possible with fuzzy logic and object-oriented programming. For its operation, it is necessary to determine the coefficients of wheel-to-road coupling. Our system allows automatically limitation of vehicle acceleration in traction mode to ensure its stability against skidding taking into account road conditions. Three-component accelerometers MMA7260QT with a measurement limit of ± 1.5 g are the sensing elements of our system.