39. SELF-DRIVING CARS: PROBLEMS AND PERSPECTIVE

Fedorako A.A., Hudnitskii A.V.

Belarusian State University of Informatics and Radioelectronics
Minsk, Republic of Belarus

Riabykh V.A. – Lecturer, Master of Arts

This paper discusses the topic of unmanned vehicle transport. Now, this topic is widespread and discussed, since it allows the development of humanity to jump far forward, can help make the life of every person more comfortable, and will correct the problem of driver negligence and reduce the number of road accidents to a minimum.

Experiments to invent the first unmanned vehicles began in the 20s of the last century and the first tests began in the 50s. The topic of automation of ground transport began development. For the development of such a technically complex project, every year the countries of the world allocate a huge amount of finance. Many giant companies such as Tesla, Google, BMW, Audi, Bosch, Mercedes, Volkswagen and others are interested in creating the ideal car [1].

To classify cars according to the degree of their automation, the community of automotive engineers (CAE) came up and established a level classification. It consists of six levels: starting from zero, where the driver fully controls the movement process, and ending with the fifth, where the car completely does everything itself in various situations. Those levels allow you to understand the differences between systems presented in different technologies, and what practical tasks this system performs. Each level has certain characteristics and criteria that make driving a more comfortable and enjoyable experience.

Level zero vehicles does not have automation features. All control functions are fully monitored by the driver. However, the car may have some driver assistance systems, such as brake assist. Today, most cars can be classified at this level. Level one cars have some automation features, such as adaptive cruise control and parking assistants. Cruise control allows you to maintain a certain speed and monitors the safe interval from the car in front. Level one automation and beyond uses a multisensory platform that includes camera, radar, inertial measurement units (IMUs), inertial navigation systems (INS) and ultrasonic sensors. Camera and radar are prerequisites for all further levels of automation. Cars at level 2 include driver assistance systems for steering, vehicle speed, and lane keeping assist, but driving is still dependent on the driver. At this level, absolute localization is computed from GNSS, RTK, IMU and odometer. Level three cars can operate most functions themselves, but the driver must still be willing to take control if necessary. At this level, the autopilot operates only in ideal road conditions. A feature such as traffic jam pilot is a good example of Level 3 automation. The system handles all acceleration, steering and braking while the human driver can sit back and relax. Cars at Level four can fully drive themselves in certain conditions or modes. For example, they can be fully autonomous in urban environments, but require human intervention in difficult conditions, such as driving in rain or fog. Current Level four systems use LiDAR, cameras and radar for both perception and localization, primarily relying on LiDAR for localization. GNSS is not the primary location sensor because of availability and integrity challenges. Level five vehicles are fully autonomous and capable of operating in any conditions that a human driver can handle. Level five cars will not have steering wheels or acceleration/braking pedals. They will be free from geofencing and are able to go anywhere an experienced human driver can [2].

Self-driving cars represent a promising future in the automotive industry that could fundamentally change the way we approach transportation. They promise to improve road safety, reduce traffic and reduce carbon emissions. However, despite the potential of this technology, it is very difficult to implement. Thus, people are meet face to face with a huge number of problems, such as bad weather, road quality, and unforeseen circumstances. Therefore, the biggest problem now is ensuring safe movement of vehicles for drivers, passengers and pedestrians. As an example, there have been cases when a car camera saw a green balloon at an intersection and mistook it for a green traffic light. There are big amount of examples of errors and shortcomings of artificial intelligence, and what is worst is that they cannot be foreseen in any way. This is the reason why we will not be see self-driving cars on the roads any time soon, but we are sure this idea will be a reality in the future.

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