THE FUTURE OF AUTOMOTIVE - AUGMENTED REALITY VERSUS AUTONOMOUS VEHICLES

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Autonomous Vehicles (AV) are the field of interest of many research groups. An Augmented Reality (AR) research in connection with a Driving Assistance (DA) research contributed to market launch several systems. Success in both research areas is a fact, although AV is not connected with any solution on the market. This article is going to show where is the border between those two fields of interest (using some examples from the past few years and new ideas) and how they are going to influence on the future of automotive. Besides authors show how Head-up Displays (HUD) and sound can be used in AR. Authors also present their own AR system - Intelligent Driving e-Assistant (IDEA) - based on soft-computing methods used for an object classification problem.

Augmented Reality (AR) and Autonomous Vehicles (AV): two approaches, two different types of understanding of the future of automotive. AR solutions give driver a chance to change a way of driving (make it easier, safer and much more reliable), whereas AV eliminates driver at all. This paper presents main features of both approaches and gives a necessary background to show the IDEA system developed by the authors at Wroclaw University of Technology. It is a driving assistance system created to recognize road events and inform a driver about e.g. road signs, pedestrians, unidentified dangerous objects only using some voice (specialized voice alerts). IDEA works as an autonomous solution without any interference with a driving process.

General Assumptions:

- **IDEA** informs a driver about various types of road events e.g. recognises speed limits, traffic jams, obstacles;
- system is autonomous and needs only a power supply;
- system works in a real time;
- **IDEA** cannot have any direct influence to a driving process;
- devices used for a prototype cannot be especially assembled; they must be widely available;
- software developed for **IDEA** should use most known algorithms adapted for special tasks.

An application developed for **IDEA** system is modular. Each module is a part of the application responsible for a special task. Functional blocks and modules communicate to each other using some specified data and parameters. Each module can be controlled outside the application by control parameters without which its processing is impossible. The control parameters are very important. Their values determine a correct **IDEA** processing. **ADC** is a device, which converts a camera signal to digital frames in a specified format (readable for the application). Extraction block is a set of modules, which processes frames. Contours selector is responsible for finding and selecting contours in a frame, which is processed. Classifier block is a set of modules, which consists of two subsystems: a classifier and learning subsystem. The first one works in “a real time”. **IDEA** research process is divided into three parts:
• architecture concept and application development;
• laboratory tests;
• real environment tests.

The future of AR solutions for an automotive industry is strictly connected with head-up displays. They need to be cheaper and easier to obtain. Compilation of:
• object recognition systems (pedestrian, road signs, buildings and institutions);
• GPS based navigation;
• set of sensors monitoring vehicle environment;
• adaptive cruise control systems;
• simple sensors such as park sensors;
in connection with a head-up display and sound device can increase traffic safety, give the chance to drive the easiest way and does not eliminate a driver. The future of AV is to collect as much data as possible to cover the biggest number of road traffic scenarios. Further challenges such as DARPA Grand Challenge will show the trend of development. Nevertheless future changes in a law should give a motivation for an automotive industry to commercialize developed autonomous solutions. But there is one open question for AV developers: are people mentally prepared to share roads with robots?