

Nano-Sensors Integration and Fusion for driver assistance

Road safety is one of the main public health problems. Among the factors underlying each car accident, it is of paramount importance the "human" aspect that is the main cause of a percentage between 20 and 40% of mortal episodes.

Today, the main objective of ADAS systems is to assist the driver in safety aspects - for himself and for the other participants in mobile and pedestrian traffic.^{[1][SEP]} The safety features of the current ADAS systems are mainly based on the control functions of the movement of the car respect to external reference points. These functions are then based on input data from external imaging sources (RADAR, LiDAR), computer vision, and auto-networking systems. They are therefore functions that rely on data not directly related to driver actions.^{[1][SEP]} There is a great interest in providing the actual ADAS systems for additional sensors to improve the security level. For example, monitoring the driver's level of sobriety (before and during driving) through alcohol ignition interlock devices that do not allow the driver to start the car if the alcohol level is above a well-defined amount.^{[1][SEP]} Another crucial point of interest in improving ADAS systems is monitoring the driver's level of attention. There are currently no car technologies that can meet this requirement. The level of attention of an individual is in fact controlled by the central nervous system and the control technique for this type of process is the EEG (ElectroEncephaloGram) which, obviously, because of its signal acquisition (electrodes on the head) does not mtch the ergonomic criteria required to be included in a car.

Demand for advanced driver-assistance systems (ADAS) is expected to increase over the next decade, stimulated largely by regulatory and consumer interests in safety applications that protect drivers and reduce accidents. For instance, both the European Union and the United States are mandating that all vehicles be equipped with autonomous emergency-braking systems and forward-collision warning systems by 2020.