

FRAMES – Pre-warning system for the adaptive-human-vehicle detection and accident prevention

Prof. Trimpop, T. Ruttke, J. Brachwitz, FSUJena; Prof. Wieker, M. Fünfroeken, M. Huber HTWSaarland

Currently the development of Driver-Assistance Systems is strongly pushed by European and other international groups, especially the automotive industry and some governments who pursue the goal of reducing accidents. Especially the car to car communication is standardized so that many new cars will have the possibility to communicate through special frequencies (ETSI-G5 802.11p-standards) to avoid collisions and traffic jams. While a number of studies have focused on this topic, unfortunately, two aspects have been largely neglected. Topic 1 is the occurring of unwanted behavioral adaptations, that follow virtually every technological change and reduce the possible benefit. For example data show that people drive faster on wider roads and pay less attention when using adaptive cruise control. Topic 2 is the problem that weaker traffic participants are not included into other programs and research. There are however a number of accidents happening in normal traffic, for example with school children, between bicycles and cars etc, as well as in occupational traffic, where often workers on foot fall victim to trucks and special vehicles, such as in collecting garbage or during inner company transport. Both topics are addressed with this research, since the system will provide early warnings to both the vehicle users and the other traffic participants alike.

In the first phase of the three phase project the following goals were achieved:

The literature was reviewed and typical vehicle-pedestrian accident within the company were identified and analyzed as to their causal structure. Behavioral observations were made to form the basis for an algorithm to program the pre-warning system with reliable behavioral and anticipatory data, to avoid both too many as well as too few warnings. The system works on GPS and radio waves, thus it can see the other participants even around corners, other than mere vehicle based systems that need visual or direct contact, such as the parking sensors. These data were used to program an initial prototype and the prototype was built, using technology that is both modern but readily available to open the possibility for companies and people alike to use it. The first tests within a logistics company showed, that the system could both detect and warn both the driver and the pedestrian around corners, hidden behind containers and standing underneath obstacles. However, the size of the system is still too big and the range of uncertainty for detection is with about 50 centimeters still to be improved. Both topics will be addressed in the second phase.

Furthermore, to tackle the problem of unwanted behavioral adaptations (risk compensation) a laboratory experiment was designed and conducted, that clearly showed that this type of warning device also shows the unwanted effects in part. Although the number of accidents was reduced, the speed at collision was much higher and the preparation for braking reduced, while drivers felt much safer and admitted to being less attentive. Thus for the next phase, the utilization of both pedestrians and drivers with the system will be tested, as well as the design and training features that are capable in reducing these unwanted effects. Furthermore, simulations with a traffic-simulator and a closed-shop traffic street environment and on a company property will be run, before the system will be introduced into the general traffic.