

Detecting Intentions of Vulnerable Road Users Based on Collective Intelligence

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Vulnerable road users (VRUs, i.e. cyclists and pedestrians) will play an important role in future traffic. To avoid accidents and achieve a highly efficient traffic flow, it is important to detect VRUs and to predict their intentions. Vehicles equipped with sensors, data processing systems and communication abilities, referred to as intelligent vehicles, acquire and maintain a local model of their surrounding traffic environment, e.g. crossing cyclists.

Heterogeneous, open sets of agents (cooperating and interacting vehicles, infrastructure, e.g. cameras and laser scanners, and VRUs equipped with smart devices and body-worn sensors) exchange information forming a multi-modal sensor system with the goal to reliably and robustly detect VRUs and their intentions under consideration of real time requirements and uncertainties. The resulting model allows to extend the perceptual horizon of the individual agent beyond their own sensory capabilities, enabling a longer forecast horizon. Concealments, implausibilities and inconsistencies are resolved by the collective intelligence of cooperating agents.

Novel techniques of signal processing and modeling in combination with analytical and learning based approaches of pattern and activity recognition are used for detection, as well as intention prediction of VRUs. Cooperation, by means of probabilistic sensor and knowledge fusion, takes place on the level of perception and intention recognition. The evaluation is done using real data gathered with a research vehicle, a research intersection with public traffic, and mobile devices.