Autonomous Traffic Warning System With Car-to-X Communication

Precise detection and timely warning of danger situations

Of the 2.36 million traffic accidents recorded in Germany in 2011, traffic congestion and tailgating caused the most injuries. Because they are usually positioned at 1 to 2 kilometer intervals, conventional traffic control systems do not adequately warn drivers of sudden danger situations. When positioned between the systems, drivers must rely solely on their own perception of the situation.

To address this issue, Fraunhofer ESK worked with Ruetz Technologies and TRANSVER to develop an autonomous traffic warning and information platform that can more quickly detect critical situations and provide precise local warnings through finer granularity.

Sensors and road side units recognize the traffic situation

The combination of various sensors enables much faster and reliable detection of critical situations on high-speed roads through autonomous stations on the edge of the road (road side units or RSU). Fraunhofer researchers designed the system with stationary sensors, such as radar or measuring loops, and information that is relayed from the vehicles.

The system analyzes the data and recognizes if a dangerous situation exists such as the sudden appearance of road construction sites, traffic back-ups and warnings of objects on the road or inclement weather. Drivers are warned of the precise location of the danger through warning lights integrated in the reflector posts and directly via car-to-x communication.
The data gathered by the system must be processed in real-time. The main task involves merging the data generated by various sources in order to create a consistent overview of the traffic situation. The data is analyzed to determine its quality, aggregated depending on the current network capacity and needs of the application scenario, and then forwarded. The system’s modular design enables the transparent use of different sensor technology.

From sensor measurement to warning light

The traffic data, such as the position and speed of the individual vehicles, is recorded within a dense grid, merged if needed, and then transmitted via wireless technology to a higher-level control unit (remote terminal unit or RTU). The RTU uses the accumulated information to ascertain the current traffic situation in real-time. If the system identifies a problem that leads to a dangerous situation for traffic heading this direction, drivers are given a heads-up via warning lights before they reach the point of danger. If appropriately equipped, vehicles can also directly receive and display traffic warnings. This raises the level of awareness among traffic participants in this particular grid.

Fraunhofer ESK is creating a heterogeneous network concept for the communication between vehicles, infrastructure and RTUs in which the data is aggregated in an adaptive manner. The concepts and processes are validated in a simulation environment and then implemented with in-house developed software and hardware on a test route.

This project was funded by the Bavarian Ministry of Economic Affairs and Media, Energy and Technology.

1 The traffic warning system informs vehicles of accidents before they reach the point of danger.