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V2V: GM Technology Can Prevent Accidents

- **Car's "sixth sense" warns driver about critical situations**
- **Vehicles "talk to each other" via proven communications technology**
- **General Motors system could potentially be used in every vehicle class**
- **Practical exercises demonstrate possible fields of application**

Rüsselsheim/Dudenhofen. "V2V" could soon be a new synonym for "dialogue". The new General Motors assistance systems feature V2V (vehicle-to-vehicle) technology that enables vehicles to communicate with each other without driver involvement. V2V refers to wireless vehicle networking that enables the exchange of data such as location and speed. The system analyses this data instantly and can help prevent accidents by warning drivers early about potential danger from other vehicles. In the "Car2Car Communication Consortium", GM's German subsidiary, Opel, is working with many other manufacturers to establish a common European industrial standard for this technology. GM engineers demonstrated the current status of V2V development with Cadillac, Saab, Opel and Chevrolet cars at the Dudenhofen Test Center in Germany.

"Driving is a very complex task. Knowing where the other guy is and where he's headed can be as critical as being in control of your own vehicle," said Hans-Georg Frischkorn, Executive Director, Global Electrical Systems, Controls and Software. "With V2V technology, we intensify the driver's awareness of his environment to improve road safety, without any distraction to him and certainly without reducing his level of control. This sixth sense lets drivers know what's going on around them to help avoid accidents and improve traffic flow."

Proven components for high reliability

To develop its V2V technology, GM uses familiar, tried and tested components that not only ensure high levels of reliability, but also offer affordability for the customer. The core hardware consists of a microprocessor, a GPS receiver (Global Positioning System) and a Wireless LAN module. Vehicles equipped with this technology can establish communication within a few hundred meters of one another.

The cars pinpoint their own location via GPS and exchange this with other vehicles, along with additional relevant information such as speed, acceleration and road conditions.

Today, vehicles can be equipped with multiple safety sensors, including radar-based sensors connected with speed control devices or sensors to detect objects in a car's blind spot. GM can increase the operating range and coverage of individual sensors significantly with its comprehensive technology - a more effective and affordable way to provide extensive observation and assessment of the surrounding traffic conditions. In addition, the V2V technology provides an affordable method for deploying driver assistance systems across a wide range of vehicles.

Demonstration with everyday driving scenarios

GM engineers demonstrated the new technology's advantages with seven practical exercises:

1. Stationary Vehicle Ahead

The system alerts drivers if a vehicle is stopped at the side of the road, because of a breakdown, for example. Even if the stationary vehicle is not in the approaching car's lane and there is no immediate danger of a collision, the system informs the approaching driver, via symbols on the display, for example, even before visual contact has been established, so that he is aware of a potentially critical situation, for instance people on the roadside.

2. Emergency Braking Warning

Turning on the hazard lights when braking suddenly, for instance when approaching the end of a traffic jam, has long been common practice and was legalized several years ago. In the meantime, "pulsing brake lights" that flash rapidly when the driver brakes hard have also been introduced in production vehicles.

Even more effective warnings are now possible thanks to V2V technology, which can promptly inform the following drivers of a dangerous situation, allowing them to adjust their speed accordingly. This occurs very early, even before the danger zone is visible, for instance behind a corner or large lorry, or over a crest. A visual warning symbol on the display is used here too.

3. Forward Collision Warning

Another scenario could possibly occur in a traffic jam, but also during a breakdown on a country road without a shoulder; a vehicle has stopped or is traveling very slowly, presenting a potential danger to the traffic behind. Thanks to V2V technology, the driver of a car approaching in the same lane receives a warning on his display of a possible collision. As the following car gets closer, the tail lights of the stationary vehicle also flash rapidly, while an audio advisory and vibrating seat alert the approaching driver. At this point, the driver still has enough time to react by braking, or by performing an avoidance maneuver if necessary.

4. Blind Spot/Lane Change

The lane change assistant alerts the driver to vehicles traveling in the car's blind spot, making it a particularly important safety feature in the increasingly heavy traffic on multiple-lane roads. A visual signal warns the driver if another vehicle is traveling in an area that is not visible in the side-view mirror. A light emitting diode (LED) in the A-pillar or side-view mirror is activated on the relevant side of the car. The warning is intensified if the driver then creates a potentially dangerous situation by activating his turn indicator in this direction to change lanes. The LED starts blinking and the driver's seat vibrates on that side. The system also takes the speed of each vehicle into account: the faster the overtaking vehicle is traveling, the earlier the warning is given.

5. Emergency Vehicle Warning

When drivers hear a siren, it is often difficult for them to tell which direction an emergency vehicle is coming from, especially in city traffic. The siren is often initially drowned out by a loud car radio, and many drivers are uncertain if and where they should create a lane for the emergency vehicle. With the help of V2V technology, drivers are not only informed about the emergency vehicle's location and direction of travel, but can also receive directions, such as "Merge right!" or "Create path between second and third lanes!" This potentially saves a substantial amount of time on the way to the emergency, giving the injured or critically ill patient a better chance of speedy medical assistance.

6. Work Zone Warning

Every driver is familiar with this situation: the central reservation is being mown and the highways maintenance depot has taken elaborate safety measures; a safety vehicle with a sign displaying a large arrow and blinking lights follows several hundred meters behind the mower. But it still often happens that a careless driver runs into it from behind and causes a serious accident. This danger is reduced if the safety vehicle transmits a warning signal that is displayed in the cars behind, for example, "Left lane closed. Please pass on the right." Longer term road works can also transmit a similar signal together with the relevant speed limit, which is available to the driver for the length of the work zone.

7. Intersection Collision Warning

Blind intersections without traffic lights, for instance on country roads, are particularly dangerous because road users are distracted or cannot see each other until it is too late. With the help of V2V technology, vehicles communicate with each other before they are within visible range, enabling the system to promptly alert both drivers to an imminent collision. They then have enough time to react by braking or performing an avoidance maneuver. If an accident cannot be avoided this way, V2V could even automatically brake one or both vehicles.

Goal: Wide availability for as many vehicles as possible

GM has deliberately based this technology on inexpensive, proven components, giving it the potential to become standard equipment in many vehicles. The alternative would be to offer extremely expensive high-tech systems for just a few cars, but as Hans-Georg Frischkorn says: "GM has always been committed to democratizing innovations. Our V2V systems are affordable and could potentially be used in every vehicle class. That is especially important because cooperative systems like these become more effective when many vehicles are equipped with them."

Contact:

Andrew Marshall
GME Technology Communications
+49 (0) 6142-7-73815
andrew.marshall@de.gm.com