Inter-vehicle communications may save lives

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Emerging wireless technologies for vehicle-to-vehicle communication promise to dramatically reduce fatal roadway accidents by providing early warnings to motorists. As well as improving road safety, such technologies will also help optimise traffic flow and enable drivers to take greater control of their vehicles.

This is the broad vision behind the IST-funded project CarTALK 2000. The project developed cooperative driver assistance systems and a self-organising ad-hoc radio network with the aim of preparing a future standard. Dr Christian Maihöfer of DaimlerChrysler and coordinator of CarTALK 2000 believes that such technology will have a vital role to play in saving lives in the future.

"If we want to achieve the goal of improved road safety and significantly reduce the number of road fatalities, local sensors alone will not be able to fully achieve this goal. Therefore the idea is for sensor information and information about manoeuvres to be transmitted from one car to other cars in the vicinity. This allow early reactions like braking if some vehicles in front have had to use emergency braking and helps to prevent rear end collisions," he says.

The data exchange between vehicles is made possible by ad-hoc networks. These short-distance connections are spontaneously created between the vehicles as the need arises and can organise themselves without the help of any external infrastructure.

Other scenarios where such technology might be useful are if a vehicle

encounters a critical situation such as congestion, fog, ice or an accident. It can pass the relevant information on to all affected road users in the immediate vicinity of the danger spot. Traffic approaching from further away is given ample warning and can respond to the situation.

In this spontaneous information network, each vehicle can take on the role of a sender, receiver or router, allowing a chain of information to be built up that is capable of covering a substantial distance. There are also clear benefits for traffic flow as well, explains Maihöfer.

"The system allows cooperative manoeuvres like lane merging or highway entering, where some vehicles – and not necessarily the entering vehicle, perhaps vehicles already driving on the highway – have to be slowed down or accelerated in order to allow for smooth traffic flow. This also prevents accidents and increases comfort," he says.

CarTALK 2000 consisted of several distinct stages: analysing the system's functional requirements, developing the applications and integrating them into vehicles, and then validating and standardising them. Significant emphasis was also placed on the socio-economic assessment of the proposed systems, to ensure that the technology was affordable and viable for eventual commercial exploitation.

"Unfortunately we were not able to conduct extensive trials because our demonstration systems only allows testing on limited test tracks rather than on public roads. However, we made an extensive socio-economic analysis, which shows that a significant number of fatalities and costs can be saved with such a system," he says.

Maihöfer also acknowledges that making the transition from successful concept to fully commercial application is not likely to be a straightforward process.

"There are a few main obstacles to be overcome," he explains. "The first customers, for instance, will not derive any benefit from the system because it depends on other systems in the vicinity to be viable. The benefit comes only after a significant penetration is achieved, somewhere around 10 per cent of all cars equipped with the technology. This makes it difficult to introduce such a system," he said.

Another formidable obstacle to be overcome is the need for standardisation and agreement among all European Original Equipment Manufacturers (OEMs) on adopting and implementing one common system, a task that will inevitably delay the introduction of such technology. This is currently addressed in the car-to-car communication consortium (C2C-CC). And finally, there are complex and costly legal issues to be addressed, explains Maihöfer.

"The current legal framework will make it difficult for OEMs to introduce such technology because even if the system saves lives in total, the liability for individual system failure must be settled," he says.

So, will the technology developed by CarTALK 2000 find its way into cars in the near future? Maihöfer believes such a question misses the real point of the project, which was to advance the cause of inter-vehicle communications as a potential boon for road safety.

"From the project partners there are no immediate public product plans for the system investigated in CarTALK 2000 because this was very visionary research which could not come into commercial production before 2010. However, we know that several OEMs and suppliers are continuing their research and some have started pre-development activities," he says.

Despite missing immediate product plans, however, Maihöfer is confident that CarTALK 2000's technology will resurface in some shape

or form in the near future.

"As a definitive result we can say that the technologies and some spin-offs of these technologies considered in CarTALK 2000 will soon be seen in vehicles, even if at the beginning they are not used for safety applications.

CarTalk itself has ended but there are other research projects such as Prevent and Safespot where we carry on the most important ideas of CarTalk but with more focus on short-term realisation and production probability," he ends.

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