ICT and automotive: New app reduces motorway pile-ups by 40 percent

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What do you do if you're driving down the motorway and 500 meters ahead of you there is an accident? Now there is an app that tells your car to stop. It does it in half the time of any of the applications, and in contrast to the systems already available on the market, not only does it act on what can be seen from your car but also on what is happening miles away.

According to the researchers from the University of Bologna (Italy) who designed the app, this automatic accident detection system could reduce the number of vehicles involved in pile-ups by up to 40 percent. For now, at least, that's what it does on paper and in computer simulations, as is described in an article published in the scientific journal *Computer Networks*. Road tests will be carried out this summer, on the streets and highways of Los Angeles, around the campus of the University of California. Here, together with engineers from Toyota, other scientists are also working on the system hardware. And it is not by chance that this project has aroused such interest in the shade of the palm trees along Sunset Boulevard. There is much more than a software app that reduces accidents at stake. The challenge in fact lies in the technology which in the near future will see millions of cars on-line.

"Basically, what we are doing is placing cars in peer to peer communication," comments Marco Roccetti, professor of Internet architecture at the University of Bologna. If an accident occurs further along the road, the car finds out about it from one of the cars ahead in a split second, and informs the driver. The cars send information to each

other. And the first car to set off the alarm is the one which is impacting, or go out of control. "All it requires is an acceleration sensor," explains Gustavo Marfìa, one of the other authors of this research study. "There are anomalous movements which can only be caused by an accident."

In a realistic scenario, with hundreds or even thousands of vehicles on an eight-lane motorway, the problem lies in making the grapevine as fast as possible, and in preventing the system from being flooded. If all the cars pass on the message received, the maximum available bandwidth would be reached very quickly, blocking all communication. So the system needs to be selective. When a car sends an accident alarm message, all those within a range of between 300 and 1000 metres receive the signal, but only one of them in turn sends it on, to reach cars that are further away. But how is the car which sends on the message identified?

Until now, the most evolved systems chose the one furthest from the car that triggers the signal. Being the furthest away, this car can in turn pass on the alarm message further still, researchers must have thought. But no. The idea underlying the Bologna software is very simple. "It's quite obvious," Roccetti smiles. To make propagation as fast as possible, the car has to forward the alert message not to the furthest vehicle but to the vehicle which in turn can send the signal as far as possible.

And why is this not necessarily the furthest away? Wireless communication, particularly between moving objects, is rather unforeseeable. The furthest car could have a truck behind it which limits its transmitting capacity, or could be fitted with a less powerful communication system than the one in front of it. Our app allows cars to stay in constant contact with each other. They read each other. They know the direction and speed that all the other cars are travelling. And they also know their transmitting capacity. All this information is updated every second or so. And the frequency is optimised so that it doesn't slow the system down. When the signal is sent out, the car that is

in the best condition knows that it has to forward the alarm signal. And so it does. This halves the propagation times.

"The technologies we are using are already mature and available," says Alessandro Amoroso, another of the project's authors. "It could be integrated directly into the car dashboard, or in the sat-nav. If the road tests go well, deciding whether or not to launch on the market is merely a commercial issue."

The business in question however goes far beyond the accident-prevention software. What Italian and US researchers have been working on for years is the prospect of bringing the Internet into cars at a reduced cost. While the system monitors road safety, in the car the passengers can download music, publish photos and update their Facebook page. Compared to conventional smartphone-type connections, this type of technology requires less investment. It does not need hundreds of miles of cables, posts or antennas to cover the whole of the road network. It also aims to be cheap for users. To navigate on a smartphone you need a contract with a phone company. To connect to other cars in wireless, all you need is some company on the road.

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