Alan Pierce
pierceaj@techtoday.us

Crash Survival Systems + Car-to-Car Communication = A Next Gen Crash Avoidance System

When modern cars collide, some of the damages that they sustain are designed to happen. The breaking of molded plastic and the bending of sheet metal are part of the energy-absorbing systems that people hope will protect the occupants of the vehicle. Basically, the damages sustained by the vehicles in an accident are irrelevant if the damages to the cars can, in some way, protect the people inside.

Built-in car crash survival systems include seatbelts, shoulder harnesses, airbags, crumple zones, and a rollover passenger compartment protective cage. The body restraint systems are designed to keep passengers in place so that each of the other crash survival systems can perform their functions properly.

The latest National Highway Traffic Safety Administration (NHTSA) Fatality Analysis Reporting System (FARS) data report was posted online in 2010 and it reports 2009 statistics. It said, in part: "More than 5.5 million police-reported motor vehicle crashes occurred in the United States in 2009. Twenty-eight percent of those crashes (1.52 million) resulted in an injury, and fewer than 1% (30,797) resulted in a death." The point made is that crash survival systems do prevent a lot of injuries from occurring and, in cases where they don't prevent injury, they do keep most injuries from becoming fatal. (For more details, see www-nrd.nhtsa.dot.gov/Pubs/811402EE.pdf.)

It is now believed that communication technologies can be used in accident avoidance systems to keep vehicles from crashing into other vehicles and objects. If each car could tell every other car, "Here I am," avoidance systems could prevent the cars from hitting each other. (See Fig. 1.) Each car manufacturer has its own package that might include some of the following features:

- Cameras combined with sensors (laser and/or radar) and video screens to help you back up and park without hitting objects.
- Cameras and sensors to warn you if you are wandering out of your driving lane, driving onto the shoulder of the road, or if something is in your blind spot.

Images: U.S. Department of Transportation

Fig. 1—Cars that communicate with each other, and that also have robust collision avoidance systems, might reduce car accidents.

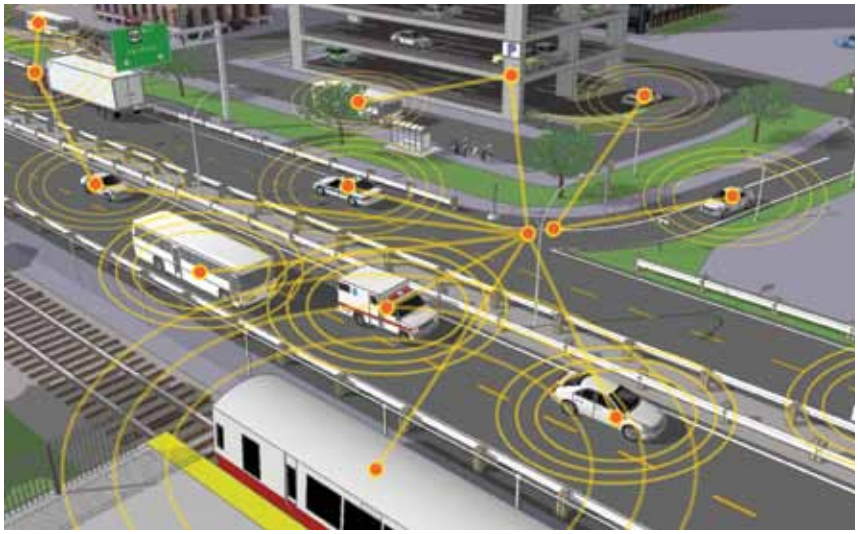

Fig. 2—Real-time data source ring:
A robust car-to-car and car-to-infrastructure communication system should be able to reduce traffic, save gasoline, and also prevent accidents.

- Active breaking systems that will automatically slow down or stop your car if the system sees that a crash is imminent.

The U.S. Department of Transportation (DOT) gurus see these disjointed efforts by the different car manufacturers as the next major steps into a future of smart cars and smart highways. So they are now funding a major test to determine if accidents and driving times could be reduced and gasoline saved if cars talked to each other and also communicated with traffic lights and other highway and city infrastructure. (See Fig. 2.)

This research project will include eight automobile manufacturers. The goal of the research is to establish a uniform standard for car-to-car and

---

Alan Pierce, Ed.D., CSIT, is a technology education consultant. Visit www.technologytoday.us for past columns and teacher resources.

car-to-infrastructure communication and to test the system's effectiveness. Data collection and evaluation will be performed by the University of Michigan's Transportation Research Institute (http://www.umtri.umich.edu/news.php). The testing will run from August 2012 to August 2013 and will be based in Ann Arbor, MI, where the University of Michigan is located.

The test will involve approximately 3,000 cars. Sixty-four of these cars will be new vehicles with the systems built in and the rest will be retrofitted with the hardware needed to allow for full, robust communication. A system like this will not only let your car talk to the vehicles around it, it will also let each car pass information about traffic jams ahead so your GPS mapping system can provide you with an alternate route before you are stuck in bumper-to-bumper traffic. When looking for a parking space, such a system could lead you straight to an open spot or tell you a parking lot is full before you enter its driveway. Traffic lights that are a part of the system can turn green or red depending on what is best for traffic flow at a specific moment. (See Fig. 3.) Such a system would grow more robust over time as technologists find more ways of increasing its effectiveness.

Fig. 3—In car-to-infrastructure communication, a traffic light senses how many cars are waiting on each road that it covers. It can increase traffic flow by keeping its light green where the traffic is greatest on a moment-to-moment basis.

If data analysis proves that the system prevents accidents, it is only a matter of time before all new cars will have to include a car-to-car and car-to-infrastructure communication system. The system that might eventually be mandated will probably be built by many different companies to a uniform standard. For such a system to work, it is critical that each car, regardless of its manufacturer, can be understood by every other car on the road that is equipped with the system.

Recalling the Facts

1. What do you see as the advantages and disadvantages of car-to-car and car-to-infrastructure communication?

2. What is the difference between an accident avoidance system and an accident survival system? Support your answer by listing features you would find in each system.

