



Technology driving motorists to distraction

Sophisticated GPS systems, stability control among recent innovations

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Sometime in the near future, a driver may be navigating a city street with a three-dimensional GPS interface and breezing through a self-organizing traffic light when her bumper-mounted radar sensor slows her car to avoid a close encounter with another sedan. Whew! Now if only that tune emanating from the asphalt was a bit more melodic.

Car gadgets are nothing new, but a growing crop of high-tech systems designed for both vehicles and roadways may dramatically transform how drivers commute in the 21st century. Some, like increasingly sophisticated GPS systems, offer dashboard-mounted virtual worlds complete with realistic city landmarks. Others, such as "Melody Roads," reward drivers moving at set speeds with songs played every time their tires move over precisely cut grooves or raised patterns along a road.

But where automotive technology is concerned, can there ever be too much of a good thing?

Helpful or harmful?

With so many recent arrivals popping up around the world, "I'm confident in saying we don't know very much," said Rob Foss, a senior research scientist at the University of North Carolina [Highway Safety Research Center](#) in Chapel Hill. "Some of this stuff is going to be terribly dangerous and some of it is going to be tremendously helpful, and probably everything in between. We have no idea, but we're really worried."

The potential for driving while distracted, a danger already well-documented among cell phone users, is one major concern. So is the difficulty in predicting whether drivers will be able to understand often complex navigation and safety systems, and how they'll change their behavior as a result.

Unlike the drug approval process governed by the Food and Drug Administration, many car systems are sold independently of the vehicles, complicating the ability of the National Highway Traffic Safety Administration to monitor their safety.

"So from a regulatory side, there's some gaps in terms of who's responsible," said John Lee, Director of Human Factors Research at the National Advanced Driving Simulator at the University of Iowa in Iowa City. "Also, there hasn't been a really well-stated or well-defined arrangement for assessing how new technology is changing driving for the better or the worse."

One product set to hit U.S. markets this year is a software package that allows GPS devices to display three-dimensional maps of road elevation, surrounding terrain, nearby buildings and other landmarks. Budapest, Hungary-based [Nav N Go](#), which introduced its iGO 8 system to North American drivers in January at the International Consumer Electronics Show in Las Vegas, is calculating that photorealism will dominate the navigation market within the next five years.

From a purely navigational standpoint, CEO Leon van de Pas said his company's 3-D interface isn't inherently better than existing software. What sets it apart is its use of landmarks to provide visual cues for drivers as they near their final destinations. "People like to have it as realistic as possible," he said. "That's why Google Earth is so popular."

Safety concerns

Some of iGO 8's landmarks are uncanny in their likenesses, like the Old Chicago Water Tower and London's Big Ben. But realism isn't necessarily an advantage if a virtual London or Chicago prevents drivers from paying attention to the real thing.

"In principal, it's like one of these Second Life [virtual worlds]. You're going into a second world, when you need to be devoting every second to your real world and driving," Foss said. "It doesn't strike me as a good

idea in terms of safety.”

Nav N Go’s van de Pas said the virtual buildings become transparent as drivers approach them to cut down on distractions. But with sound controls, a simulated dashboard of speed and time information, and a zoom in and out function that can display a city block or an entire continent, there’s no shortage of things to look at.

“Anything that takes the driver’s attention away from what he or she needs to be doing, which is paying attention to the road at all times, probably is not going to be helpful,” Foss said, stressing that inattention for more than two seconds can be particularly dangerous. The risk is especially high for younger, inexperienced drivers who are still learning to keep their eyes on the road.

A further obstacle is whether a new technology’s users will understand what to do in response to a beeping sound or a flashing light. To bridge the knowledge gap, automakers have tinkered with more automated systems even as they try to improve how drivers perceive their surroundings. One relatively new feature, known as intelligent speed adaptation, can warn a speeding driver to slow down, make stepping on the gas more difficult and automatically slow the car.

A separate innovation, Nissan’s radar-based [Distance Control Assist](#), uses bumper-mounted radar sensors, a buzzer and semi-automatic brake and gas pedal controls to keep drivers from tailgating. “If you’re close, the accelerator pushes back quite a bit,” said the University of Iowa’s Lee, who helped develop the technology. “In addition to seeing the car ahead, you’re essentially feeling the car ahead.”

Safe passing

Yet another system, an “overtaking assistant” in development at [Delft University of Technology](#) in the Netherlands, uses a red or green light to advise drivers when it’s safe to pass a slower car on a two-lane road. Although the technology is aimed at dissuading reckless drivers and encouraging overly cautious ones, Lee said truly safe passing margins could vary widely based on a driver’s age and ability, regardless of whether a green light offers its affirmation.

Some researchers have conceded that their ideas will hinge on how motorists react. A self-organizing traffic control system under development in Zurich, Switzerland, uses variable traffic light patterns to smooth out travel times and promises to improve traffic flow in car-clogged cities by up to 95 percent. But relieved congestion, its backers admit, could be all for naught if drivers upset over another lane getting two green lights in a row decide not to wait their turn.

Experts like Lee and Foss say technology that doesn’t rely on direct interaction with a driver is likely to work best. One such system, called electronic stability control, has generated considerable excitement over its ability to automatically adjust engine and braking power in a car that has suddenly swerved or decelerated, helping to stabilize and keep it from rolling over. A 2006 study by the [Insurance Institute for Highway Safety](#) found that the feature reduced the risk of fatal crashes by 43 percent, leading the institute to recommend that it be standard for all vehicles.

“In the end, though, those systems are not fool-proof,” Lee said. “If the driver does something really extreme, physics takes over and there’s nothing that a fancy computer system can do to help prevent a crash.”

Ironically, the anti-lock brake technology on which the stability system is based has been a bigger disappointment in crash reduction, he said, perhaps because drivers are more aware of its presence and drive faster and closer to other cars than they otherwise would. On the other hand, tests on Nissan’s [Intelligent Cruise Control](#) found that drivers change lanes less frequently while using it, unexpectedly raising its potential to reduce lane-change collisions. “So the idea of driver adaptation is incredibly important and hard to anticipate,” Lee said.

Good vibrations

Equally hard to prejudge is how existing technologies can morph into new ones. Rumble strips, those loud roadside standbys, have long since proven their effectiveness in preventing sleepy drivers from veering off highways. In Japan and South Korea, engineers have tweaked the concept by cutting precisely shaped and spaced grooves into roadways called Melody Roads and Singing Highways, respectively. When a vehicle’s tires contact the grooved surface, the vibrations produce an identifiable song — optimized for the posted speed limit, of course. The unusual features double as both entertainment and warning systems along dangerous or

isolated stretches, particularly in South Korea, where "Mary Had a Little Lamb" is now a roadway hit.

In the end, Foss said, technology that relies on human behavior works best when integrated into a social network. A windshield-mounted system distributed by San Diego-based [DriveCam](#) can record and replay the moments leading up to a crash or near-miss, potentially serving as a tool for a peer support system that encourages better driving behavior, whether of teen drivers or car-service employees.

Likewise, Lee and his colleagues used a tracking device to tally how often 18- to 21-year-old drivers look away from a virtual road for longer than a second. By providing the volunteers with a "report card" on how often their eyes strayed, the researchers spurred significantly safer driving behaviors after only a few sessions.

Similar technology could be used to assess risky behavior and reward or punish individual drivers with something that would really grab their attention — insurance premiums. Apart from improving safety, Lee said, the electronic monitors could help gauge how drivers are adapting to all the other onboard gadgetry. "I'm optimistic," he said. "In general, I think that technology has huge promise and could really make a big difference in terms of driving and safety."

In one sign of things yet to come, researchers have developed a video camera system that can detect when a driver has drifted too far toward the center line or side of the road, triggering a system that vibrates the car seat. If engineers can combine that technology with a Melody Road, they could put a whole new spin on a song like "Good Vibrations."

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