

GM researches smart windshield

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Researchers at General Motors R&D labs in Warren, MI, are working on an enhanced vision system. Various elements, including patent-pending technology from GM as well as patented technology from California-based **SuperImaging**, can effectively highlight on the windshield the road's edge during foggy weather.

A driver is leaning over the steering wheel with eyes practically glued to the windshield in a desperate attempt to see the lane markings through a dense fog, but this driving situation vastly improves with the aid of an enhanced vision system under development.

"We're working to enhance your vision of the road," said Thomas Seder, Lab Group Manager for Human Machine Interface for **General Motors Research and Development**. "By using an infrared sensor to detect where the edge of the road is, we can show you that edge by highlighting it on the windshield and that can be very helpful if you're driving through foggy conditions. Even as you move your head, that mark would also move so you would always see where the edge of the road is."

Highlighting certain things—such as the outline of a person, animal, or object in the vehicle's pathway—can make the driver more aware of actual surroundings. "It is not about changing anything with the external world. This is a way to have images register where they are being seen, which is through the windshield," said Seder.

Through a combination of technologies, the driver experiences an enhanced through-the-windshield view. In its laboratory incarnation, the enhanced vision system is partially comprised of a windshield that is coated with transparent phosphors that fluoresce visible light upon absorption of invisible ultraviolet light. The project system uses micro-mirrors to aim the radiation from miniature ultra-low-power diode lasers at the phosphors and a variety of sensors (IR and visible cameras) that detect important real-world features.

Other onboard vehicle systems—such as navigation and facial recognition—would link to the enhanced vision system. "This needs to be an integrated system, so it is a complicated roadmap to get everything embedded in a high-value way," said Seder. A networked system would assemble lots of information and then dispense needed information accordingly.

For instance, a roadside speed-limit sign is especially relevant to a motorist exceeding the speed limit. "The windshield could show a circle around the sign, then make the circle smaller and smaller until it disappears—leaving your eye right on the sign. That's one example of directing your attention to something you need to know," said Seder.

Key technologies found in the enhanced vision windshield were part of the **Chevrolet Volt concept car's** dual-mode instrument cluster display. "There are two planes of information in the Volt show car's gauge cluster. One plane is presented on a transparent display that is positioned just forward of the traditional primary cluster plane. The transparent display shown on the Volt show car is what's being fine-tuned and improved upon to realize an advanced vision system via the windshield," said Seder.

While Seder and his team are working to develop an enhanced vision system that would benefit all motorists, aging drivers stand to gain the most "because if you look at the assortment of health issues that occur as we age, the overwhelming depreciation is with our vision," said Seder. GM's in-development enhanced vision system has presented "no insurmountable technical issues, but we still have a lot of work to do," according to Seder. 