

## E-Windshield: a study of using

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### Abstract:

The E-Windshield is a study in augmenting information with external knowledge as well as automobile relevant information. A prototype projection windshield is used to demonstrate 4 scenarios for using imagery on automobile windshields. Scenarios are subdivided into two conditions: Driving and Non-driving. In the first condition it demonstrates the use of annotation to draw drivers attention to objects. In the second condition the system presents an interface the size of the windshield providing a multimedia experience to the user. When a car is not occupied, it can be used as a public information board, showing information concerning time, things that are around it or simply presenting advertising. This display can also be used in collaboration with other displays to form a large screen array.

### Introduction:

The automotive windshield is one of the most dynamic, interactive information space in our lives. It changes the whole time we are driving. The ritual of driving focuses peoples attention at the windshield. Automobile designers take advantage of this situation and present information that is crucial and time sensitive. The driving seat is the most carefully designed seat we buy. For many of us it is the most sat in place in our lives as well. Experiments in heads up displays for military and commercial airplanes, such as the "clouds of danger displays" for military pilots have demonstrated the benefits of information augmentation (Boeing, Darpa Grants) [1,2]. Commercial automobiles are starting to project and reflect imagery on automotive displays. These experiments underscore the importance of understanding what visual experiences are possible and appropriate inside a vehicle (GM, Mercedes). E-windshield scenarios were designed to use the simplest sensors and create new possibilities with them.

### Scenarios:

We identify 4 situations in which a windshield may find itself useful as an information surface. In the driving condition we show the more standard uses of a windshield as a surface that can present and augment information that is part of the driving experience. In the non-driving condition, we show that a car can change the way it looks from the outside. We also show a car can be used as an information surface by people that are sitting in the car. And finally, it can be used as a media entertainment presentation surface.

### Driving: augment information

We comment on the standard driving experience, the one in which the engine is engaged and the wheels are turning. Many vehicle experiments have been done presenting heads up displays in cars; Indeed the idea of presenting controls, instruments and even commentary on external events is causing many car companies to consider including every information source to drivers while driving (North Star by General Motors, for example). Our demonstration vehicle shows imagery to propose that virtual signs and annotation can improve driving. So often physical road signs are inadequate or missing. Our E-windshield draws information from GPS, this is available information that requires no development of new sensors. Looking at the Never Lost™ on the dashboard while driving is a distraction. [3] If instead it were presenting information in the visor area or slightly below it, the "sign" might be a lot easier to notice without taking attention off of the road. There are times when glare, night and fog make driving a challenge. New sensors and inexpensive cameras can allow the windshield to annotate or highlight people, animals and other interesting objects in these conditions.[4] Our simulations demonstrate the way that a circle or pointer near a pedestrian can make them much more noticeable in the dark. An upcoming turn is made more obvious with a virtual sign and a darkened place on the windshield can reduce the annoyance of glare.

### Non-driving Scenario: Outside the car:

Companies such as VERT (<http://www.vert.net>) [5] have begun placing advertisements on displays affixed to moving vehicles. Motivation for such includes the fact that so many people are on the road all the time, that moving imagery can attract many viewers and that it can change to be useful depending on where the car is. The E-windshield concept has different goals. The e-windshield is useful for cars that are not on the road all the time. When a car is stopped and parked in front of an empty parking lot, it could actually make money for the parking lot by waving customers into the lot. The windshield might be useful to project a large arrow, the name of the parking lot and animate the whole image. At a mall many cars might be enlisted to make parking lot sized promotional information displays to enlist people's enthusiasm for an event: sale, grand opening, or other celebration. In other areas, the car could simply provide information "1 mile left, Go Runners!", time and temperature (brought to you by a clock company), news (brought to you by a TV channel), etc. In addition, the cars could improve safety, indicating stops ahead, scary turns, bumps, pot holes and construction. In the same way bicyclists do, the car that sits at the side of a road for 2 to 8 hours could use its power, and communication infrastructure to increase outdoor media technology infrastructure where ever it is.

**Non-driving Scenario: Computer Inside the car**

Most automobile companies are working to provide some sort of web browsing service in cars. What does this mean? When and for whom is it appropriate to use a computer in a car. Most car drivers are not in a position to take more attention away from their driving [6]. When the car is stopped however it is a comfortable and interesting place to sit. Cars are lined up in front of many schools for 30 minutes before school is let out everywhere in America. I witnessed a few dozen cars running with people sitting in them waiting for a sports camp to let out in Kanogawa-ken prefecture in Japan this year: some occupants sleeping; some reading; some listening to the radio and some just sitting there. If the windshield could be a display they could have been reading, writing, surfing the web or watching a movie while they waited. How often do we go into a store on an errand just because sitting in the car seems like a waste of time? It could be more productive to sit and use the car as a computer. Imagine a windshield sized computer screen curved for complete viewing. The car seat is specifically positioned for excellent view, a display on it might be an extremely comfortable place to work. The car web browser and computer in our scenario turns on whenever you are in your car.

**Movie Theater Scenario: In the Car**

When you get into a car with a companion the E-windshield demo immediately adjusts the speakers, to improve sound quality, based on seat pad switches. The switches also help promote other uses of the E-windshield. They show the position of riders. But more importantly if the car is not driving and the driver leans back then the windshield can be turned into a movie screen. This is better than any drive in Movie Theater could have been. By using the whole screen, it can be immersive, by using the 6 or 8 built in speakers it can have better sound than there ever was in a drive-in, finally by being run off of the car computer it allows the experience to happen when the car is in a driveway, garage, or parked at a beautiful view after watching the sun set.

**Conclusion:**

This paper establishes several uses and value based scenarios that support what heads up display in a windshield could do for a car owner. The approach of motivating a special design feature such as an unusual display with more than one utility can be extremely productive at sharing the cost of motivation for an ergonomic feature (refer to Burleson & Selker's IBM Journal paper).

This paper describes a video of a E-Windshield that we have prototyped to demonstrate 4 scenarios of use for a windshield-display. While most commercially available new features and accessories establish their use while the car is traveling. This paper explores scenarios that celebrate the car as a place to sit and do things. As well the work demonstrates the value of the car to a community even when users are just sitting there. Experiments still need to be done to test the effectiveness and distraction factor of the E-Windshield.

**Citations:**

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