Project Title: The Smart Windshield

Key Terms: Augmented Reality, Heads up Display, Helmet Mounted Display, Virtual retinal display, Speech Recognition, Transparent Glass, Eye Tracking Technology, Eye Tracking Software

Abstract: The Smart windshield is seemingly a typical windshield for vehicles such as cars, trucks, and buses which primary goal is to eliminate the need for what we know as a dashboard. The thing that makes the smart windshield *smart* is instead of having the operator of the vehicle look down at a dashboard to see the information that is normally displayed there, dashboard information can instead be displayed on the windshield and therefore the driver never his to take his or her eyes off of the road. If you are familiar with Hollywood blockbusters such as the Iron Man films when Robert Downey Jr.'s character is in the Iron Man suit and he's looking through the "eyes" of the suit he not only sees what's in front of him but stats, if you will, of the suit and that's the aim of the smart windshield. The smart windshield will also be capable of Augmented Reality mainly for the purpose of displaying GPS data onto the windshield without the need for the driver to take his or her eyes off of the road and look down at a separate GPS console or take instructions from an automated voice system. The smart windshield however will be designed to take voice input from the user.

Research – Tangible: There are several similar technologies that are applied into other fields, not available to the consumer, or are simply just available in military industries and products. Research for this device closely examined heads up display technologies, augmented reality technologies and virtual retinal display technologies. The ultimate goal of the Smart Windshield is to mend all of these emerging technologies into one place for consumers.

Helmet Mounted Display is commonly used in combat aircrafts but not a stranger to commercial aviation. The way it works is the primary operator of the aircraft wears a helmet which is connected to the aircraft and the helmet projects a HUD which displays information such as targeting reticles, weapon system cues, and it alerts the pilot to the direction his or her head is pointing. HMDs use head tracking technologies so it can always be aware of where the pilot's head is positioned. Although vaguely similar to what the smart windshield it trying to do

it is not the same mainly because the device is attached to a helmet and it suited for the field of aviation and not transportation. A helmet isn't suitable for a passenger vehicle. It also is just a virtual retinal display so what we understand as augmented reality is not applied here.

Transparent Glass is what we refer to as the next wave of wearable computers devices. A transparent glass technology is seemingly a derivative or evolution, rather of head or helmet mounted displays but the design is far more streamlined and less boxy and clunky. They appear to just look like a regular pair of seeing glasses with some extra components attached. As a result they are far more feasible for every day common usage and more attractive to the general consumer to actually wear. The Google Glass or GLASS is at the forefront of this style of Head Mounted Display is described as a s an augmented reality wearable computer with a HMD which allows for information in a smartphone-like format to be displayed hands free. In addition the GLASS will come with speech recognition technology and Google's own Android operating system which inherently lends it Google Maps for GPS software. While both the Smart Windshield and the GLASS are transparent glass technologies the main difference between them is that the GLASS is a wearable computer which displays smartphone -like data for the individual while the Smart Windshield's intention is for vehicles and data displayed will be relevant to the needs of a driver.

Research – Philosophical:

[http://news.cnet.com/8301-1035_3-57574099-94/eye-tracking-tech-in-the-samsung-galaxy-s4-say-what/]
[http://www.tobii.com/en/gaze-interaction/global/eye-tracking/]

Eye tracking has been around for a while so it may not have earned its place in an academic paper focusing on emerging technology however, it's main application was in psychology for usage in cognitive studies and in product design. But as eye tracking methods become more and more sophisticated technologically, we can see it used in more and more places turning it into emerging technology. One of my the newer articles points out that eye tracking tech is going to be used in the next samsung galaxy phone to auto scroll pages a user is reading once their eyes reach the bottom. This gives me loads of ideas with the smart windshield; an integral part of the of it is to keep the user occupied on the road so allowing them to operate it with only their eyes and voice can further deliver on that objective.

The second article describes how modern eye tracking techniques works. It's particularly useful because knowing what eye tracking techniques exists and the scope of in which it tracks our eyes allows me to see how it can be implemented into the smart windshield. Things like even examining how large or how small a person's pupils are which gives key information.

Lauren Drell's article on Mashable.com titled *7 Ways Augmented Reality Will Improve Your Life* explains 7 different scenarios where Augmented Reality technology can be used to improve everyday modern life. The scenario of note which can be applied to the Smart Windshield is what the Laura describes as urban exploration. She gives example scenarios where the theoretical user is looking for a coffee shop or restaurant and the "AR app" which lists possible locations for the user to visit in the city and 3D maps out the location and directions for them to travel to. She also has customer service scenarios which can also be applied the Smart Windshield where two drivers can offer directions and driving tips to each other remotely.
John Havens' *The Impending Social Consequences of Augmented Reality* article also on Mashable.com is the opposite of the pervious article. It gives an alternative perspective on augmented reality technology and describes the potential consequences of it. I mainly researched this article since the main thing the Smart Windshield wants to be is safe and unobtrusive. Road accidents are already high enough and there doesn't need to be another consumer device which adds another distraction while driving. However the article mainly raises relevant privacy concerns. Wearable augmented reality devices allows for easy access to public information such as mortgage data due to the information being displayed visually. It also points out Ford's MyKey technology which allows car owners to set limitations for other users of the vehicle. Technology like that can easily evolve into a system which creates driver profiles which creates these profiles by keeping tabs on the way someone drives. Armed with this information user can actively seek out good or bad cab drivers or weed out who are accident prone. There's fair use to that but it bypasses consent and things society hold dear such as the 1st Amendment.
The final article researched was one that described the origins of augmented reality technology titled "*Where Did Augmented Reality Come From?"* by Jennifer Shore also on Mashable.com. The article talks about Morton Heilig who is known as the "Father of Virtual reality" and Bob

Sproull who is known as the "Father of Graphics". 2 patents both men have made have really been the precursor to the technology that is emerging now. It explains when and who coined the term augmented reality. This article was mainly looked at because it gives historical perspective on the technology and gives a sample size of the many surrounding fields.

http://mashable.com/2012/09/24/aug me nted-reality/

http://mashable.com/2012/12/19/augmented-reality-city/

http://mashable.com/2013/02/08/augmented-reality-future/

http://www.autoevolution.com/news/ford-mykey-system-explained-13465.html

Full Project Description: The Smart windshield is a transparent glass technology that will change the traditional mobile vehicle windshield into a HUD. The user can put all the dashboard cues, icons, and notifications on to the windshield itself. So is instead of having the driver look down at a dashboard to see key information that is normally displayed there, dashboard information can instead be displayed and viewed on the windshield and therefore the driver never his to take his or her eyes off of the road. The driver is also able to display the information in any manner they like. The icons, cues and notifications can be moved around and place anywhere on the windshield to the liking of the driver via capacitive touch interface. The smart windshield will also be capable of Augmented Reality. The AR features will most definitely be used for the purpose of graphically and intuitively display GPS data onto the windshield without the need for the driver to take his or her eyes off of the road and look down at a separate GPS console or take instructions from an automated voice system. The main purpose of the smart windshield is to eliminate distractions many drivers face while operating a vehicle so putting GPS and AR content at eye level, on the windshield can help that. The smart windshield is also capable of voice input and commands via speech recognition technology for that same purpose. The vehicle operator can issue commands to the smart windshield hands free. The driver can tell the smart glass to find him or her Starbucks near them and directions for it or simple things like switch the channel on the radio just with their voice. Needless to say the smart windshield itself can be ordered around with voice recognition technology for example the user can use voice commands to highlight the dashboard board notifications, cues and icons. The smart windshield can evolve into an OS of sorts for vehicles. The driver can set configurations and settings for the

their vehicle and program in limitations like with Ford's MyKey service. Essentially the Smart windshield will transform vehicles into what military fighter jets can do giving the vehicle operator a new and unprecedented amount of control over their operator. I imagine this not only being limited too just personal vehicles. Potentially a MTA customer can ride a bus and see exactly where they are going with the smart windshield graphically. The bus operator himself or herself can also benefit similarly to how operators of personal vehicles can. No more getting lost on a bus ride. I believe the smart windshield will revolutionize vehicle operation simply by providing fewer distractions from the road for the driver and giving them a unprecedented level of control over their vehicle. Traveling on the road should be a lot safer than what it is and the driver needs to feel like they own the road. I feel the smart windshield is able to accomplish that. A car should always have a HUD

Plus

Timeline of Your Tasks for Remainder of Semester:

System Diagram

Journal

Visual Picture of what I want

Journal

App Coding

Journal

Journal

Presentation

Journal

Due date

Description of Deliverables:

My first deliverable is the system diagram of the smart windshield. A system diagram usually demonstrates the sensors being the inputs of the system, the controllers the thing that does the processing and the actuators the thing is apart of the output. For example a system diagram of how a car moves would have the foot pedal as one sensor, the car engine as one of the controllers, and the wheels as one of the actuators. I felt a system diagram would be a good deliverable for my project because with it I am able to clearly articulate how each feature of the

smart windshield works with in the entirety of the system. Instead of referring to them as sensors and actuators I just used inputs and outputs.

My second deliverable for the project is a 2D sketch or mockup of the device from the perspective of the driver. Everyone should know how a car windshield looks so that isn't the reason the sketch was made rather I wanted to show how the icons and such will be displayed on the windshield from the perspective of the driver. I used color coded boxes to show where information on the smart windshield is going to be arranged.

The 3rd deliverable is a diagram I put together of all the functions or I should say outputs of the smart windshield in action. So it basically shows how the smart windshield augments the user's driving experience with on screen cues and markers that come from GPS data. But this diagram is only capable of showing the end result and not the user input in getting to it. That brings me to the final deliverable which is intended to be a video demonstration or a proof of concept on how the user interacts with the smart windshield to receive data and instructions from it. I can also do this via a flash video or web page and mouse clicks can simulate the actions users take to interact with the smart windshield.

the deliverables will be proof of concepts, visual representation, and demonstrations. My first set of deliverables will be a system diagram of the OS inputs and outputs and a 2D visual representation of how the smart windshield looks in action. Next I will try to be building a program or app that emulates what the smart windshield wants to accomplish. I want to try and emulate the onscreen dashboard and active positioning through touch.

Going forward with the smart windshield, assuming it gets off of its feet and is a relative success, I wish to make the smart windshield smarter. Through doing my journal entries and coming across eye tracking technology I learned that this sort of thing is used for cognitive studies. Knowing where a drivers eyes goes while driving is very helpful in assisting them while driving. Also eye tracking software is able to pick up cues such as how diluted a persons pupils are which informs you if someone is intoxicated. Where I'm going with this is the smart windshield giving driving meaningful real time driving instructions to the driver of a car if they desire. Or even the

smart windshield locking up a vehicle preventing a driver from driving if they are under the influence of control substances.