Project Proposal:
EVE Touchscreen Interface

Problem Space & Existing Solutions

Driving a car is an integral part of daily life for most Americans. The commuter driving home from work, the soccer mom driving kids to practice, and the teenager with a new license all have one thing in common: they all spend a large amount of time traveling in their cars. Although cars are a very convenient form of transportation they are very dangerous and consume a significant amount of energy.

Interacting with the vehicle center stack to change a radio station or turn up the cabin temperature can result in the driver having to take their eyes off the road for an extended period of time. Systems such as the BMW iDrive have attempted to solve this issue by providing a single dial to control the whole center stack interface. This particular system is difficult for the user to learn and is very limiting in terms of the actions that a user can take.

As gas prices are rising, the demand for more fuel efficient vehicles is also rising. In the effort to create a more fuel efficient vehicle, the UW EcoCAR 2 team has converted a Chevy Malibu into a Through-The-Road Plug-in Hybrid Electric Vehicle, with a diesel engine connected to the front axel, and an electric motor connected to the rear axel. Although the UW EcoCAR 2 team has created a highly efficient vehicle, the way it is driven has significant impacts on its efficiency. Research has shown that aggressive driving, such as rapid acceleration and breaking, can lower gas mileage by around 33% on the highway and 5% in the city (www.fueleconomy.gov). Vehicles that do provide some efficiency data to the driver, such as the Toyota Prius, do not provide very actionable data that can actually help the driver improve the efficiency of their driving.

Solution & Applications

For our project, we aspire to help drivers enjoy using their car as much as they like without a fear of the monetary consequences and sacrificing their safety.

Our project hopes to provide a worthwhile addition to UW EcoCar's hybrid vehicle with an entertainment system called EVE that not only helps promote better driving habits and efficiency, but also does not deviate the driver's attention and risk their safety.

Tactile Interaction

For this, we will be replacing the existing center console of the car with our own custom-designed and built screen and bezel that has in one half dynamic visual content, and in the other ridged edges to provide tactile interaction that is memorable and does not distract drivers. The bezel adds an extra layer that separates the main sections of the screen. This allows users to feel for the control they want without much difficulty. To further encourage attentiveness of the road ahead, vibration transducers will be added to the interface so that certain actions will trigger vibrations of various strength.

Applications
The applications of EVE will be created on a FreeScale i.MX6 microprocessor. It involves three main features: music, climate control, and most importantly driver feedback. Music will be available through auxiliary, usb, and internet radio. Climate control will be used to operate fan speeds, intensity, and temperature. Most importantly, driver feedback will be provided during and in more detail at the end of each drive. The information for this feedback will be collected once every tenth of a second through CAN bus protocol. Then, the information will be analyzed in the cloud and displayed to the user as they drive. This includes data such as cost per mile, miles per gallon, and optimal accelerator pedal position. You can also go back and view the trip history to see improvement.

Example Scenarios

New Driver
You are a teenager who has just gotten your license! You would like to drive your parents' car as much as possible because it has a cool entertainment system. Your parents are happy to let you use the car because they know that although the entertainment system is very stylish, its tactile interaction will not overly distract you from the road. However, they make you responsible for the gas money. Although you have a part-time job, you know that you will not have as much money to spend on gas and hanging out with friends, while also driving as much as you want. Using EVE's driver feedback you learn after the first couple of drives accelerating fast and breaking sharply before traffic lights is not optimal. You try to work on this among other tips EVE gives, and after a while, you not only have to go to the gas station less often, but you are able to drive more and save money for other extracurricular activities.

Productive Rivalry
Let's say you and your partner are competitive in almost anything you partake in. This rivalry can be used to improve your driving! When taking trips with the car, each user chooses themselves as the current driver. At the end of the month, you and your partner can compare who drove the most efficiently on many of the categories EVE analyzed. Loser has to do dishes!

Related Technology
EVE Driver Feedback finds inspiration from FitBit (http://www.fitbit.com/) which logs daily physical activity and has a website for displaying data analysis of the activity. EVE applies the FitBit principles to efficient driving rather than physical activity.

EVE also finds inspiration from many existing automotive infotainment systems, such as the BMW iDrive and the Tesla Model S.

Resource Budget

Item	Cost	Note
Custom Intel x86 Mini-ITX Computer	$0.00	Purchaced by EcoCAR
Freescale iMX.6 SABRE AI	$0.00	Donated by Freescale
12” 800x1280 Touchscreen	$0.00	Purchaced by EcoCAR
Arduino Uno	$0.00	Purchaced by EcoCAR
Vibration Motors	$50.00	