Thesis Project Portfolio

Wearable Technology: Developing a Skin-Like Temperature Sensor
(Technical Report)

The Effectiveness of Apple CarPlay on Driver Safety
(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

It is nearly impossible to go a day without seeing a car. Cars enable us to get to a multitude of destinations every single day including work, restaurants, and home. Without them the world would look very different. Vehicles and the technology within them are changing every single day, the car you bought five years ago will not compare to a new car purchased today. With most drivers and government officials being concerned about safety, vehicle manufacturers are creating new ways to make crashes safer for occupants and they are also developing in-vehicle technology to discourage using hand-held devices while driving. Apple CarPlay is one example of this kind of technology. This thesis portfolio consists of a socio-technical project that analyzes the ability for drivers to interact with Apple CarPlay without compromising their ability to safely maintain their vehicle.

To understand how drivers interacting with Apple CarPlay impacts driver safety a number of independent studies were analyzed. These studies looked at how drivers' reaction times were slowed, the visual and cognitive commands of the system, and the usability of Siri while driving. While doing research for this project I learned that it is difficult to find information related to the safety risks of interacting with Apple CarPlay while driving. Drivers who are unaware of the demands of using in vehicle infotainment centers in order to use their phones are at a higher risk of distracted driving related crashes. Therefore, it is important to consider how often drivers are interacting with the system and how they are educated on the risks involved.

Technology outside of vehicles is also rapidly changing, one kind is wearable technology. What first started out as expensive sensors capable of measuring biometrics such as heart rate monitoring, can now be easily purchased and worn on your wrist. Wearable skin sensors,

electronic skins or e-skins, are a fast developing area of technology capable of measuring biophysical signals in order to monitor human health status. This thesis portfolio also consists of a technical project where a wearable temperature sensor was designed, modeled, and created.

E-skins are a fairly niche area of development with the potential to become as relevant to society as Apple Watches or Fitbits. The e-skins in this project were created using both polydimethylsiloxane (PDMS) and multi-walled carbon nanotubes (MWCNTs). A mold was created and then 3-D printed before adding the aforementioned substances. This project had a large focus on the basic manufacturing stages: design, fabrication, testing, redesign, and so on. It was in the fabrication and redesign stages that my team spent the majority of our time. I learned a lot about how important the small details are to the overall final product. There were many times where my team had to reprint our molds because we decided to change the width of the MWCNT channels by a few millimeters. It was not enough to come up with a simple 3-D printed mold, instead we had to determine what characteristics were necessary in order to create a sensor that could measure temperature and fit on an average size upper arm.