Thesis Project Portfolio

FSAE Car Clutch Automation System

(Technical Report)

The Role of Diversity of Knowledge in the Growth of Universal Design

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

As everyday passes technology advances and as a result the products being designed to utilize that technology are becoming increasingly complex. This influx of complexity can cause people, especially those with disabilities to be left behind because they cannot use these new products. Both of my projects focus on this problem as a destabilizing condition and the ways to insight change in order to make technology work for everyone. For my technical project my team and I devised an electro-hydraulic system aided by mechatronics to activate the clutch on a formula SAE car. As for my STS research I focused primarily on the causes behind universal design and secondarily how it affects people when not used in the engineering design process.

My STS research stemmed from the idea that everyone should be able to use every product. This originally came from my prospectus which highlighted the fact that manual cars are much better than automatics in several categories such as cost and performance which are usually the two most important factors when choosing a new car. I used this to then look at why universal design is so important and why it is so effective when used in the engineering design process. The main takeaway was that being able to pull as many different perspectives from as diverse a group as possible and consider every possible side was why universal design was so effective. This was further reinforced by the reading of The Righteous Mind by Jonathan Haidt which was assigned in our STS 4600 class. In this work a major point was that the main reason why humans disagree so furiously about religion and politics is that they fail to consider others' viewpoints. For my primary focus the research points towards the legislature as the guiding force for universal design. However it does appear that as the technology is advancing teaching the idea and process of universal design is being more widely adopted in academia.

For my Technical project my group focused on the clutch of a formula SAE car which is a high performance race car designed in house at the University and raced at a collegiate level. The design was centered around using an electronic switch to activate what was originally a lever and cable system that controlled the clutch. We went through several iterations and design reviews as a group and listed all our given constraints as well as received driver feedback on what would be the most user friendly system. It was finally decided that we would use electronic buttons that would control the release of the clutch to two predetermined points. The first point would be the bite point of the clutch and the second would be the clutch fully released. The actually driving mechanism was composed of a linear actuator which was hooked up to a hydraulic master cylinder that controlled a slave cylinder attatched to the engine. This design was novel and completely new to the Formula SAE competition and will provide the University with a distinct advantage.

Using both my STS research and my Technical project I have been able to put together a deep understanding of universal design. I have also been able to bring it back around and link it to our course work on ethics as well as dissect universal design and define it as a sociotechnical system. On top of all that, the research also provided a better basis for me as an engineer on how to conduct myself as well as providing a very major factor in the engineering design process. I feel as though this research will have a large impact on spreading the knowledge and implementation of universal design into both engineering and non-engineering curriculums.

I would like to first thank my Technical group who all helped in getting this massive undertaking off the ground and being able to put together a working proven prototype in just a few short weeks. I would also like to thank our group's capstone sponsor Dr. Mike Momot who allowed us to pursue this project and helped us every step of the way. Finally I would like to thank my STS professor Kathryn A. Neeley who helped guide me through sociotechnical systems and provided all the resources to allow me to explore ethics in the engineering profession and how to abide by them in relation to my own engineering business.