Thesis Project Portfolio

A Multi-purposed Lamp

(Technical Report)

An Analysis on Factors Hindering the Development of Smart Home

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

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In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

Jiahe Tan

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Department of Electrical and Computer Engineering

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Sociotechnical Synthesis

With the introduction of Internet of Things, more and more technology and interconnected products have entered our lives and provide a lot of convenience and changes to our lives. The core concepts of smart home is to allow all large and small home appliances and household products to access the Internet and controlled by smart phones or multiple sensors to obtain a more intelligent use experience. However, today's technology is not mature enough to fully achieve all promising functionalities. There are still many challenges faced by the entire smart home industry.

The technical thesis sought to address the address the basic problem of how to build an exemplary smart home device that make people's lives easier. The goal of the project is to build a multi-purpose lamp that is ideal for both daytime and nighttime illumination. The light sensors embedded in the lamp allows it to adjust brightness automatically according to the brightness of the surrounding environment to provide appropriate illumination level. The brightness of the light can also be adjusted manually as the user preferred. The thesis details three major parts: software design and programming, hardware design and PCB board layout design, exterior material selection and design.

The STS research focus on discussing challenges in the development of smart home industry in three aspects: product quality, price, and customer service quality. I had initially chosen to explore only the security problems of smart home devices. However, as I read through a few research papers, I found out that there were many other problems needs to be mentioned. Therefore, the paper aims to explore challenges faced by the smart home industry from these

three aspects and to discover barriers for smart homes in achieving high quality, low price, and excellent customer services.

The technical thesis finished with all functionalities that we expected. Our group was satisfied with our result. The final demo desk lamp is embedded with a lithium battery that can be recharged with the built-in type-c port. The desk lamp is also able to support both daytime mode and nighttime mode so that it can be used as a desk lamp in daytime and as a bedside table lamp or as a portable nighttime lamp at night. However, due to the pandemic, our group was not able to 3D print the lamp body; However, we solved the problem by building the lamp body using cardboards. The STS thesis analyzed product quality challenges faced by the smart home industry by breaking down barriers in aspects of safety, stability, and availability. I also addressed pricing problems and customer service problems.