Sunny Room

July 21, 2019
Dr. Craig Scratchley
School of Engineering Science - Simon Fraser University
8888 University Drive, Burnaby, British Columbia, V5A 1S6, Canada

RE: ENSC 405W/440 Project Proposal document for HESTIA

Dear Dr. Scratchley,

The document enclosed contains the project proposal for Sunny Room Inc's flagship product HESTIA which is a secure home automation solution using computer vision to replace existing light switches. This light switch of the future introduces autonomous room occupancy detection as well as interaction with mobile phones and smart home devices to turn on/off/dim the lights.

The project proposal enclosed provides an overview of the project, a high-level functionalities HESTIA provides, risks and benefits, and an analysis of the market and current competitors. Also, the project proposal covers logistics related to the project including scheduling, cost estimates, and a company overview. The development of the product includes an Alpha phase, Beta phase, and Production phase which will act as deliverables for ENSC405W and ENSC440.

Sunny Room Inc is comprised of five outstanding senior engineering students at Simon Fraser University. Alexei Nevmerjitski, Philip Leblanc, Juan Decena, Rony Sheik, and myself Ryan Serkouh. Our team has been diligently and consistently meeting numerous times per week throughout this term to deliver HESTIA.

Thank you for your time in reviewing the enclosed project proposal document. Please direct any questions or comments to myself at hserkouh@sfu.ca.

Sincerely,

Ryan Serkouh

Chief Finance and Communications Officer - Sunny Room Inc.

Sunny Room

Project Proposal

HESTIA

TEAM 4:

Alexei Nevmerjitski - Interim CEO

Ryan Serkouh - CFO and CCO

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Philip Leblanc - CTO

Rony Sheik - CCO

SUBMITTED TO:

Dr. Craig Scratchley - ENSC405W

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Executive Summary

Sunny Room Inc's latest innovation consists of a light switch HESTIA. This light switch of the future is a secure home automation solution using computer vision to replace existing switches. To turn on/off/dim the lights, HESTIA brings on innovative functionalities that give it a competitive advantage over existing light switches. These core innovative functionalities consist of the following:

- **Room presence detection using computer vision:** The physical light switch houses a capacitive touch sensor as well as a camera and a processing unit with a computer vision algorithm to detect the occupancy of the room.
- **Mobile phones and smart home devices interaction using wifi:** The light switch can also be controlled via wifi using a mobile phone application as well as smart home devices like google home.

The viability and economics of the project analyzed show an asymmetric opportunity in terms of rewards.

- **Target market and direct competitors:** The smart home market is a multibillion dollar industry with a substantial portion dedicated to lighting solutions. There is shown to be a large discrepancy in revenues between today's top companies. We believe that our flagship product HESTIA has unique competitive advantages over existing competitors in terms of functionality that will enable us to establish a top spot in the market.
- **Estimated costs:** The estimated cost for the proof-of-concept prototype is $342, and for the final product it is $190 per unit. Please note that these cost estimates include a 12% tax and a 15% contingency. The project is self-funded for now, and could potentially be funded in the future through the ESS Endowment Fund (October application deadline) as well as the IEEE Special Grant (August application deadline).
- **Risks and benefits:** The main benefit is immense potential growth in the home automation market with a competitive advantage consisting of innovative design using computer vision. Once the final product is developed, project viability to take the product to the manufacturing stage would be determined by calculating if the Net Present Worth (NPW) estimate is greater than zero. Currently, we do not have enough information to calculate the final value as the product is still in the proof-of-concept phase. The main risk presented is product safety which will be addressed through rigorous testing as well as third party certification.

Sunny Room Inc. has a proven track record of completing milestones as well as deliverables. Our flagship product HESTIA follows relies on the following:

- **Project plan:** Although the project is still in the very early stages of development, our development team has, from the very beginning, created a schedule before proceeding with any tasks. This schedule of course becomes further refined as progress is made. This process has allowed the team to complete all past milestone deliverables in a timely manner. Previously, the team has created a Gantt Chart that was referred to throughout the term, helping ensure that deadlines are met and that Sunny Room Inc. enters the market with an outstanding reputation for timely delivery of products.
- **Great company with a diligent team:** The team behind Sunny Room Inc. has a proven track record of delivering, and it is comprised of five senior engineering students. The ethics and values of the team members transpire in their commitments to the Intellectual property and eco-friendliness awareness to develop HESTIA.

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Glossary

Abbreviations	Term	Description (if needed)
MARR	Minimum Acceptable Rate of Return	-
NPW	Net Present Worth	-
PIR	Passive Infrared	-

1 Introduction

1.1 Introduction

With smart home devices becoming prevalent in more and more homes the idea of being able to have a fully automated home is becoming a reality. Imagine not having to worry about leaving the lights on when leaving the home or even just a room. Some products exist to fill this need already but they are limited in their functionality and overall smart behaviour. The team at Sunny Room Inc. aims to improve on the smarts inside smart light switches with their flagship product HESTIA, the computer vision enabled smart switch.

Common motion sensing switches work off of passive infrared sensors which can detect the motion of not just humans but other objects and animals as well. HESTIA does not have this limitation as instead of just sensing motion HESTIA relies on computer vision to detect and track only the people occupying the room. With tracking, it can also avoid the requirement of constant line of sight which can be lost due to the shape of the room or furniture throughout the room.

With a simple app, functionality can be adjusted to fit the user's needs and can be changed on the fly. HESTIA also comes with physical interface that can be used to turn on, off or dim the lights if the user so desires. It can also be used to set up HESTIA to interact with Google Home or Alexa and allowing the switch to be voice controlled by either system.

In this document the scope of the project will be covered from its general functional overview to the proposed designs methodology of the main systems that are part of HESTIA. The benefits and risks of the project will be covered as well. It will also present a market analysis to provide evidence that there is both a need in the market and a position for the product within the market. In addition, a brief overview of Sunny Room Inc and its team will be shown. Finally the current progress and future steps planned for the development of HESTIA are present at the end of this document.

1.2 Background

Smart home technology is improving at a rapid rate and becoming more accessible to consumers. Our company, Sunny Room Inc, aims to capitalize on this growing trend and bring an innovative product that will be able to compete and thrive in the current market for smart home lighting and switches.

After analyzing the current technology in the home automation market, our team decided to tackle improving motion sensing light switches. The goal is to integrate a camera and a computer vision processing system into a light switch, so that it can easily replace any normal light switch. As we wanted to keep the camera data private and secure to protect the users' privacy, we decided each unit should have its own processing core even if it meant an increased cost.

Other applications for the technology driving HESTIA include switching other appliances on or off by connecting the switch to a socket meaning the device would not be limited to just lighting. An entire line of products could be created using the technology developed for HESTIA by simply porting the camera and processing unit into a new enclosure for various applications. This would allow a different mounting options and more flexibility in placement in exchange for ease of installation.

1.3 Intended Audience

The intended audience for this document consist of the following:

- Members of Sunny Room Inc's engineering team responsible for the design and testing of the device.
- Members of the instructional staff of ENSC 405W/440 responsible for overview as required for completion of the course.
- Members of funding committees including, but not limited to, ESSS Executives and IEEE grants committee members

2 Scope

2.1 Scope

The scope of the project is to design, implement, and test an engineering prototype for HESTIA, the computer vision enabled smart switch. The goal for the prototype is to be able to detect a room's occupancy and turn on/off/dim the lights based on the user settings from the mobile phone application as well as smart home devices. The core of the device lies inside the light switch enclosure and contains:

- A camera with a wide-angle lens to capture most of the room within the frame
- An on-device chip for computer vision processing
- Power regulation circuitry to allow the device to be powered from the AC power lines
- Relay to allow turning on/off the light with circuitry to allow dimming of the light bulb
- Wi-Fi receiver and transmitter to enable communication between the switch and the phone application
- Capacitive touch plate for physical control of the switch

The system will interact with the phone application to perform setting changes and configuration of the device to interact with other smart home systems such as Google Home and Amazon Alexa.

A high-level system overview for HESTIA is shown in Figure 2.1.1 below and all the sub systems apart from the power regulator will be part of the initial proof-of-concept prototype. After demonstrating that the concept is viable, a suitable chip will be chosen for the processing unit which will dictate additional specifications for the power regulation circuitry. All subsystems will therefore be present in the final engineering prototype.

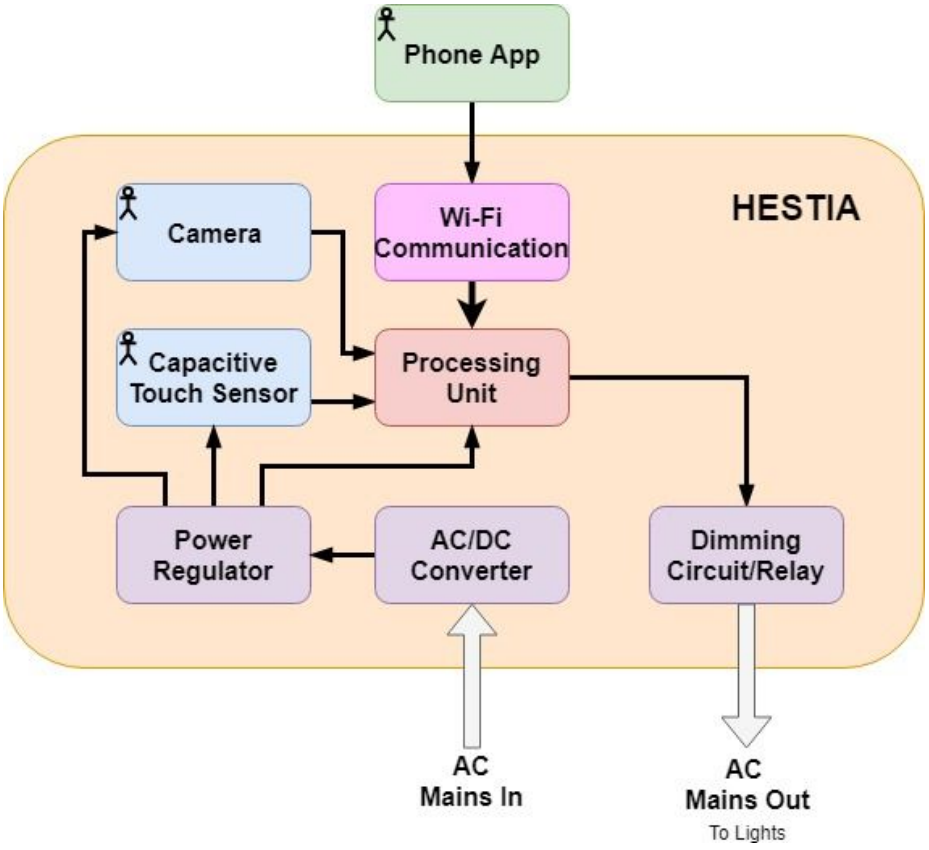

Figure 2.1.1: System Overview for HESTIA

2.2 Proposed Design

The proposed design for each of the components are as follows:

2.2.1 Hardware Design

All of the main hardware components of the HESTIA system can be split up into a few different categories depending on which subsystem they belong in. These are as follows: the power conversion/regulation circuitry, the capacitive touch sensor, and the dimming circuitry. These individual categories have well-established methods of performing their required tasks, which have an in-depth explanation in the Design Specifications. However, they are also roughly described in Table 2.2.1

Category	General Method
Power Conversion/Regulation	• Use a transformer to transform the AC Mains line to a lower voltage • Use a full-bridge rectifier to turn the AC voltage to

	DC ● Use a power regulator along with various step-downs to provide power to connected devices
Capacitive Touch Sensing	● Create conductors that are separated out throughout the light switch UI ● Connect these conductors to an IC ● Put a dielectric on top of the conductors ● Touches are detected by the IC due to the parallel plate capacitor being completed (composed of the human body, the dielectric, and the conductor)
Dimming Circuit	● Use a zero-crossing detection circuit to detect the zero-crossing points of the AC mains line ● Send these points to an MCU ● This MCU then sends signals to control a DIAC, which directly control a TRIAC, changing the amount of time power is supplied to the lights

Table 2.2.1: Hardware Design Summary

2.2.1 Software Design

The software design is planned to be done in parallel with the hardware design. There are two main components:

- **Room presence detection using computer vision:** The physical light switch houses a capacitive touch sensor as well as a camera and a processing unit with a computer vision algorithm to detect the occupancy of the room. The first on-chip software module of this project will focus on the processing of MIPI data from the camera, I2C data from sensor, and the data packets over wifi. The second on-chip software module uses the processed MIPI data and the Haar-Cascade methods to identify a human body shaped object on the captured frame.
- **Mobile phones and smart home devices interaction using wifi:** The light switch can also be controlled via wifi using a mobile phone application as well as smart home devices like Google Home. The user interface of the IOS application will be accessible from the user's smartphone. It will allow the user to control and display the setting as well as add a light based on the roomname and control dimming level. The user is required to create an account to access the light switch control. The MVC design for the application consists of the CONTROLLER to handle user actions about turning on/off/dim the light and select the switch status that the interface displays and the MODEL to communicate with both light switch status over wifi. A cloud database is also used to cache unique object IDs that are associated with each user id, email and

password. The user is able to control the light using a smart device like google home as the online database will be setup to handle actions.

3 Benefits and Risks Analysis

This section explores the possible benefits and risks of this new product. Benefits include penetration of a vast estimated market size for smart home devices. Another benefit is the application of a computer vision detection algorithm used for accurate results of automatic light control. The price-point is yet to be determined, but we will base our initial unit-price on the analysis of similar products existing on the market. Later the cost-effectiveness can be analyzed in order to determine project viability in calculating a hypothetical Net Present Worth (NPW) of the product using a projected rate of returns and an estimated Minimum Acceptable Rate of Return (MARR) for our product [1] [2].

Risk lies in product safety which is addressed and mitigated through rigorous testing along with compliance to Canadian and United-States regulators via third party certification. More analysis will be needed once the product hits the shelves to analyze customer feedback. However, our team is strongly pushing towards home automation with private data as a priority.

3.1 Benefits

3.1.1 Market size estimation

With societal change and the growth of smart home product lines, the smart home market has grown to be a multi-billion dollar market as we'll describe in section 4.1. The initial percentage of market size that HESTIA will be able to capture will, of course, depend on the initial funding used for manufacturing costs, and marketing. As we are in the initial stages of product design, details to calculate an accurate Net Present Worth (NPW) are still not finalized. Currently, we are only at the prototype design, and are not decided on estimations for price-per-unit, number of sales, initial manufacturing, and setup costs.

3.1.2 Security

User privacy is guaranteed as user data is kept local to the device and not transmitted wirelessly. In fact, the image captured from the camera is processed locally using the on-chip device, and no camera data is sent to the cloud.

3.2 Risks

3.2.1 Safety risks

Safety risks go in-line with any electrical device such as electrocution. To address this, strict adherence to Canadian and United-States standards for hardware devices will be followed, and third parties will be used for certification. Our team strongly believes that risk can be avoided if the device is well tested before the final version of the product is manufactured. Our team takes safety very seriously.

3.2.2 Business risks

Estimates for the percentage of market share Sunny Room Inc can capture initially will likely be low if appropriate funding is not secured for use in marketing and manufacturing of units. Past the initial phase of sales, our team will continue to monitor sales revenues as well as customer reviews to see if there are areas of improvements.

4 Market and Competitor Analysis

4.1 Target Market

The smart home market has only been rapidly expanding as time goes on. Current estimates put the smart home market at a valuation of about $76.6 billion USD[3]. This valuation is expected to increase over the coming years, with some estimates going up to as high as $151.4 billion USD by 2024 [3].

Now, it must be noted that the smart home market is broken up into several different categories. The most relevant of which is the HVAC and Lighting category, which has been seen to take up about 10% of the smart home market [4]. This fact is greatly supported by LUTRON. They are one of our biggest competitors, and a company known for creating lighting control solutions. They have created light switches compatible with mobile applications, and have an estimated revenue of about $1 billion [5]. After LUTRON, there is a large gap in the competition, which smaller companies have been vying for, such as iLumi and LIFX, with estimated revenues of about $5 million [6][7]. Sunny Room Inc. believes that HESTIA has what it takes to compete for this large gap, if not for the forefront position in the smart lighting market.

4.2 Current Direct Competitors

There are currently a few alternatives to HESTIA available on the market that can automate turning on light switches based on room occupancy. These alternatives do not use computer vision for their occupancy detection and instead rely on passive infrared to detect motion and heat signatures. Where HESTIA would prove superior would be in its computer vision-based detection and tracking. This allows it to not be affected as severely by line of sight obstructions, lack of movement and nonhuman objects triggering the switch. There are also additional functionalities that HESTIA adds on top of current products, and those are discussed below.

4.2.1 Ecobee Switch+

The Ecobee is the only other motion sensing smart switch that offers smart features such as Alexa support, and configurable profiles based on time of day and lighting. However, the Alexa

support is hard wired into the device with a cut down version of Alexa that has only a portion of the commands a proper Alexa device has. It also does not interact with other existing Alexa devices. It also does not allow for any light dimming as it is only functions as an on or off switch. Most of these drawbacks were considered during the initial design process for HESTIA and are planned to be improved and implemented to gain a direct competitive advantage on the market.

Figure 4.2.1.1: Ecobee Switch+ [8]

4.2.2 Generic Passive Infrared Switches

The majority of all motion detection light switches on the market fit within the generic PIR sensing category. These devices are a standalone unit or require being paired with a whole home solution locked down to a particular company's product line. Some come with dimming functionality while others do not. Most of these devices are fairly well placed in the market and offer a simple solution but do not offer any real smart functionality. Therefore, their main advantage over HESTIA is their low price point with most products being under 70$ USD mark and will be a major competitor to HESTIA when price is favoured over functionality and features. Two of these are product are shown in Figure 4.2.2.1 and Figure 4.2.2.2 below.

Figure 4.2.2.1: TopGreener MWOS-W [9]

Figure 4.2.2.2: Lutron Maestro Dimmer Switch [10]

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5 Company Details

5.1 Overview

Sunny room Inc. is the chosen name of the company. The name references the Simon Fraser University Lab1 “sunny room” which was always used by the team to meet and work on the project. The company logo is depicted at the top of every page of this document. The company’s flagship product is HESTIA, and it is currently at the proof-of-concept stage. The company has already developed a commitment to environmental and ethical values which can be traced all the way back to the requirements specification, as well as a solid intellectual property mindset with an intent to trademark the HESTIA product name and to patent the technological improvement brought to the light switch.

5.2 Team Members

Sunny Room Inc’s team consists of the following:

- **Alexei Nevmerjitski - Chief Executive Officer**

  Alexei is a biomedical engineering student from Simon Fraser University. With course related knowledge of electronics theory, lasers, and software design he is well rounded in terms of his skills. The addition of a previous co-op working with power regulating systems and hardware validation makes him a good fit for the hardware design components of the project. Outside of school, his focus is primarily on playing guitar, making effect pedals for guitars and riding his motorcycle.

- **Ryan Serkouh - Chief Finance and Communications Officer**

  Ryan is an enthusiastic future Computer Engineer currently in his senior year at Simon Fraser University. Passionate about computer software, Ryan always loved working with computers to create cool things including computer, embedded, and mobile applications. With ENSC251/350/351/452 as well as CMPT128/225/275/300 under his belt, Ryan is ready to tackle this course and Capstone project! Relevant technical skills include Embedded Programming in C and Assembly, Object Oriented Programming using C++ as well as Python, IOS Mobile Development in Swift, Web Development using Django/HTML & CSS. Ryan is also a fitness enthusiast as you can find him in the SFU gym when not in front of a computer!

- **Juan - Chief Research Officer**

  Juan is a future Electronics Engineer studying at Simon Fraser University. Although most of his coursework has focused on hardware (with courses including: ENSC350/425/426), all of his industry experience have mainly focused on working with software. As such, he is more of a jack-of-all trades, with his role in the Capstone Project expected to be more of an assistant depending on which tasks need more hands. Relevant technical skills include: Circuit analysis/design, control system analysis/design, signal processing, VHDL, Object Oriented Programming (Python and C++), and SystemVerilog.

- **Rony - Chief Compliance Officer**

  Rony is a senior systems engineering student at Simon Fraser University. He has interests in robotics, interactive device design, digital system design and software development. He has his mind set on a career involved in firmware and software development after graduation. He has gained valuable experience in system analysis, distributed software systems and software development. He also has knowledge and working experience of various programming languages such as C/C++, Python, Perl, Ruby. He is our company's COO, responsible for overseeing and ensuring compliance with laws, regulations, requirements, procedures and policies. He enjoys playing cricket, soccer and table tennis.

- **Philip - Chief Technology Officer**

  Philip is a senior computer engineering student at Simon Fraser University, graduating in Fall 2019. He has an interest in video processing algorithms for object detection and has a background in coding C++ and VHDL to design logic for custom hardware solutions. Courses like ENSC252/450 as well as auditing ENSC895 sparked an interest in deep learning models and hardware accelerators for video processing. He is interested in developing systems for home automation so that the household feels more modern and “smart”. Through classes like CMPT275, he has been exposed to app development using swift and enjoys using open source tools to create beautiful interfaces.

6 Project Planning

6.1 Major processes and milestones

The development schedule for HESTIA has followed the structure provided by the ENSC405w class deliverables. Sunny Room Inc. has continuously met deadline after deadline for each milestone or deliverable. This was accomplished by thoroughly planning each phase before proceeding and continuing to deliver results in a timely manner. A detailed Gantt chart is provided below in Figure 6.1.1 to outline milestones as well as major tasks. The timeline scheduling presented also provides a clear picture of which tasks are dependent on another.

ID	Task Name	Duration	Start	Finish
1	**Create Group**	**6 days**	**May 06**	**May 13**
2	**Decide on Project**	**14 days**	**May 14**	**May 31**
3	Project Brainstorming	6 days	May 14	May 21
4	Reflect/Find Alternative Solutions	7 days	May 23	May 31
5	**Requirements Specifications**	**5 days**	**Jun 04**	**Jun 10**
6	Requirements Specifications	5 days	Jun 04	Jun 10
7	**PoC Prototype Design Specification**	**22 days**	**Jun 11**	**Jul 10**
8	Research Technologies for Design	11 days	Jun 11	Jun 25
9	PoC Prototype Design Specification	10 days	Jun 27	Jul 10
10	**UI/Appearance Prototype Design App.**	**20 days**	**Jun 13**	**Jul 10**
11	Research UI Alternatives	9 days	Jun 13	Jun 25
12	UI/Appearance Prototype Design App.	10 days	Jun 27	Jul 10
13	**Order Parts for PoC**	**14 days**	**Jun 26**	**Jul 15**
14	**Project Proposals**	**7 days**	**Jul 11**	**Jul 21**
15	Project Proposals	8 days	Jul 11	Jul 21
16	**Develop PoC Prototype Deliverables**	**23 days**	**Jul 15**	**Aug 14**
17	**Software**	**12 days**	**Jul 21**	**Aug 06**
18	**Embedded Software**	**12 days**	**Jul 21**	**Aug 06**
19	Main Controller	4 days	Jul 21	Jul 24
20	Camera Input	3 days	Jul 24	Jul 26
21	Image Processing	7 days	Jul 27	Aug 03
22	WiFi	3 days	Aug 03	Aug 06
23	**Mobile Application**	**12 days**	**Jul 21**	**Aug 06**
24	Main Page	3 days	Jul 21	Jul 23
25	User Login	4 days	Jul 24	Jul 27
26	Database	8 days	Jul 28	Aug 06
27	**Appearance Prototype**	**5 days**	**Jul 30**	**Aug 05**
28	Drafting	2 days	Jul 30	Jul 31
29	Assembly	2 days	Aug 02	Aug 05
30	**Hardware**	**11 days**	**Jul 15**	**Jul 29**
31	**Ready Parts Testing/Debugging**	**5 days**	**Jul 21**	**Jul 28**
32	Transformer	7 days	Jul 21	Jul 28
33	Illuminator	7 days	Jul 21	Jul 28
34	Power Regulator	7 days	Jul 21	Jul 28
35	**Dimming Circuit**	**11 days**	**Jul 15**	**Jul 29**
36	Assembly	7 days	Jul 15	Jul 23
37	Modular Testing and Debugging	4 days	Jul 24	Jul 29
38	**Capacitive Touch Pad**	**11 days**	**Jul 15**	**Jul 29**
39	Assembly	8 days	Jul 15	Jul 24
40	Modular Testing and Debugging	4 days	Jul 24	Jul 29
41	**Integration Testing**	**5 days**	**Aug 08**	**Aug 14**
42	**Presentation Preparation**	**18 days**	**Jul 21**	**Aug 14**
43	Poster Design/Outline	7 days	Jul 21	Jul 28
44	Create Poster	10 days	Jul 29	Aug 09
45	Poster Printing	4 days	Aug 10	Aug 14
46	Presentation/Demo	0 days	Aug 15	Aug 15

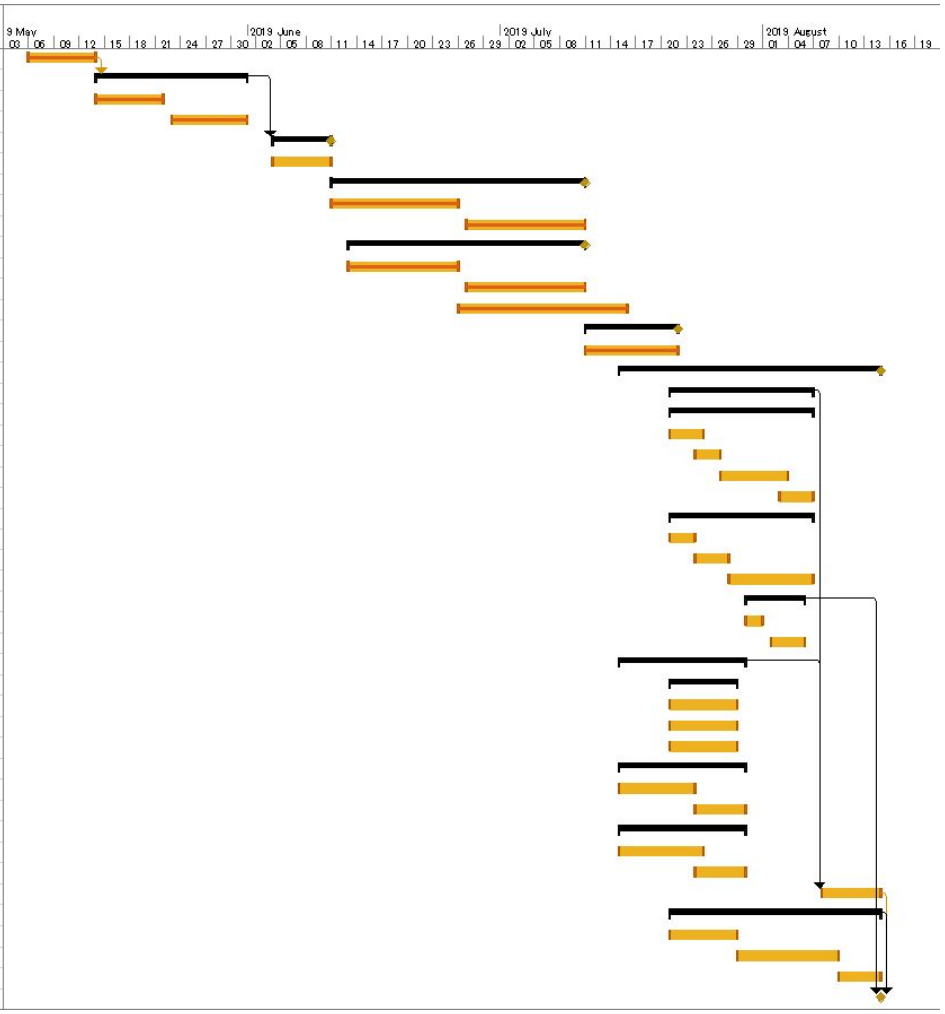

Figure 6.1.1: Gantt Chart HESTIA's Development

7 Cost Considerations

7.1 Budget

Table 7.1.1 below outlines the breakdown for the cost associated with items needed for the proof-of-concept prototype as well as the final product. As outlined, some of the items' costs are non-recurring, and those items can be used for both phases.

Item	Cost (per Unit) $CAD	Proof-Of-Concept Prototype	Final Product	Recurring costs for Final Product Manufacturing
Camera	$35.00	✔	✔	✔
PCB Fabrication	$10.00		✔	✔
3D Printing (SFU ESSS Resource Centre)	$5.00 $0.03 per gram or $1 per hour	✔	✔	✔
Light Dimming Circuitry Parts	$10.00	✔	✔	✔
Power Conversion and Regulation Circuitry	$30.00	✔	✔	✔
Capacitive Touch Sensing	$45.00	✔	✔	✔
Appearance	$10.00	✔		

Prototype Parts				
Raspberry Pi Kit	**$134.39**	✔		
ESP32 Wroom-32U	**$9.00**		✔	✔
JTAG Module	**$6.00**		✔	✔
Apple Developer Annual Fee [11]	**$130**		✔	
SUB-TOTAL	**Prototype: $269.39**		**Final Product: $280 (all costs)** **Final Product: $150 (recurring cost only)**	
TOTAL with 12% Tax 15% Contingency	**Prototype: $342.12**		**Final Product: $355.6 (all costs)** **Final Product: $190.5(recurring cost only)**	

Table 7.1.1: Cost Estimates for Prototype and Final Product

7.2 Funding Sources

Our team plans on using the following grants as the project is self-funded as of right now:

- **ESSEF - Engineering Science Student Endowment Fund:**

  Our team contacted the Engineering Science Student's Society for details about the Endowment Fund. The next funding round is to be held early October 2019. Our team will be able to submit an application during that time, and make a presentation in front of a panel consisting of ESSS executives and an Applied Sciences faculty representative to make a case for our product.

- **IEEE - Institute of Electrical and Electronics Engineering Special Grant:**

  Our team plans on applying to a special grant administered by the IEEE Canadian Foundation. The deadline to apply to the grant is August 15th, 2019 [12]. The grant has

a list of past recipients on the web page [13] which includes past Simon Fraser University Capstone students who can assist our team with the application process.

8 Conclusion

We hope that our document helped swing the balance for you. The project background, scope, and design as well as benefits and risks clearly show the significant asymmetric investment opportunity that our flagship product HESTIA represents. Furthermore, our analysis of the target market based on existing products show HESTIA's competitive advantages and how it'll thrive on the market. Since the project is in the development stage, it is still too early to complete an analysis of NPW and MARR as cost estimates are not completely finalized. We strongly believe in our company and product as our outstanding team is very capable as presented on the short descriptions of team members who can rely on an excellent project plan to guide their progress. Even though the project is self-funded as of now, an opportunity for early stage investors will arise when our final product is developed and we are ready for the manufacturing stage. Cheers!

9 References

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