Subject: TPJ655
Program: Computer Engineering Technology/Technologist
Instructor: B. Shefler
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SecurePI Surveillance System

Project Proposal

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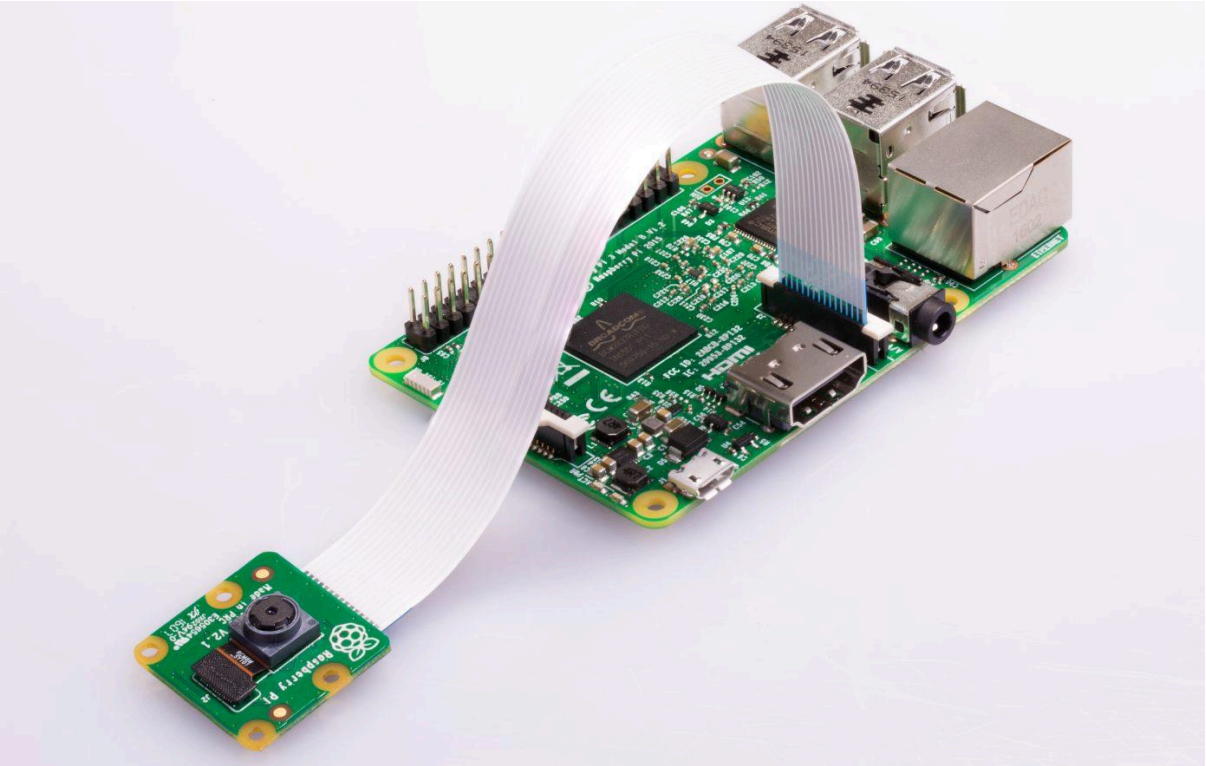

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Problem Statement

One of the biggest challenges our society faces is affording goods and services at a reasonable cost. One of the most valued services provided to businesses and homes is that of security systems. With this in mind, it is hard to afford an average everyday home security system that would survey the perimeter of any unwanted persons. This project is designed to be cost-efficient and equipped with your average home security system features, with a few extra aspects. This project is put into place to try and help everyday citizens have peace of mind knowing who comes to their homes, as well as saving a few hundred dollars on a security camera with installation costs. With this small and cost-efficient design, the security system will require absolutely no external wiring or complex installation. The system runs through the user's home wifi network to connect to the designated access page. This ensures the product viability and security over time as it will require very little, to no maintenance.

Project Functional Features

➔ Live Camera Footage with Facial Recognition

- ◆ The camera is programmed to sense the faces of people near the camera and label them if they are known to the security system.

➔ Live camera rotation control

- ◆ The camera will have the functionality of pivoting from left to right

➔ Notification when motion is detected via email

- ◆ When motion is sensed, an email will be sent to the user with a picture of anyone in the camera's view.

➔ Website to access live video footage

- ◆ Live video footage will be accessible via the website.
- ◆ The website will allow for camera rotation using web controls
- ◆ Designated login page for authentication

Product Specifications

➔ Raspberry Pi model 3B+

- requires 5V and 2.5A power draw
- All components are powered by Raspberry Pi

➔ Raspberry Pi Camera

- Powered by Raspberry Pi
- Produces video footage for security system
- Includes optional facial recognition feature(software)

➔ 180 Degree Servo Motor

- Powered by Raspberry Pi
- Used to change the camera's horizontal viewing angle
- Control functionality will be incorporated via the website

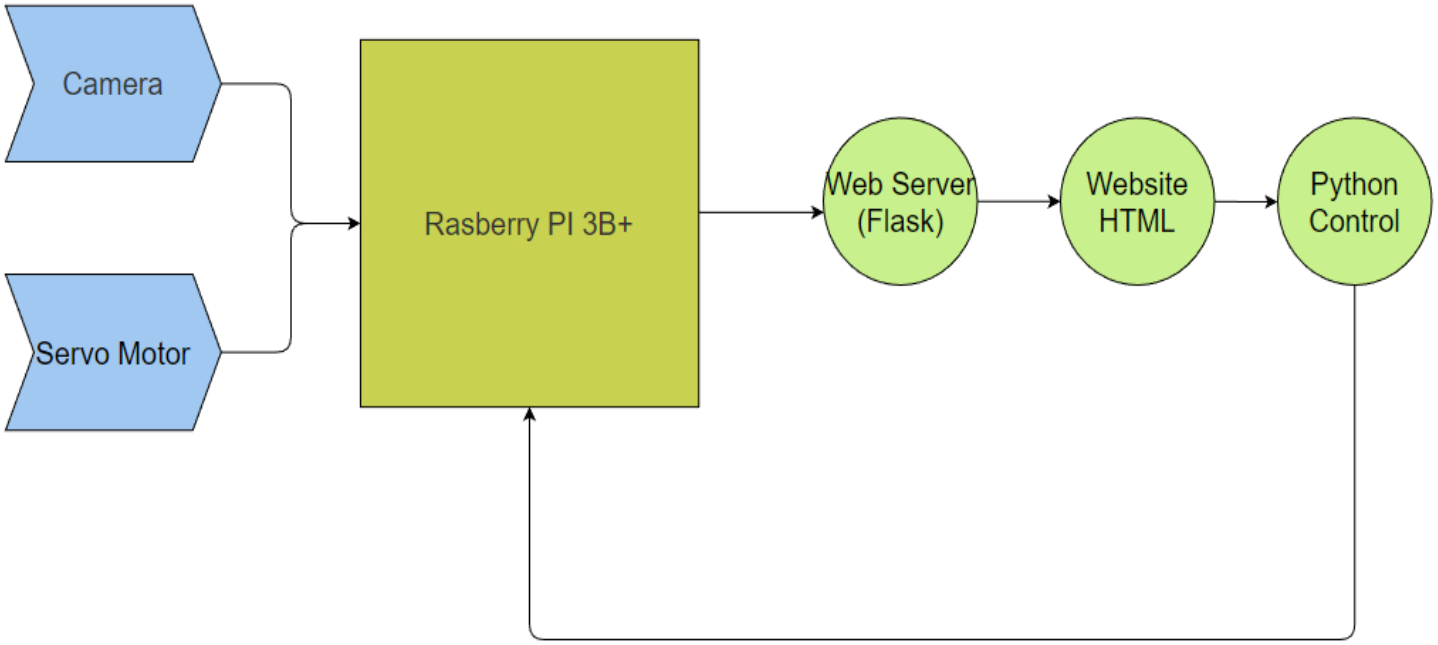
➔ Computer/SmartPhone

- Used to view the live video footage via the website
- Used to change cameras' horizontal viewing angle
- Used to check email notifications

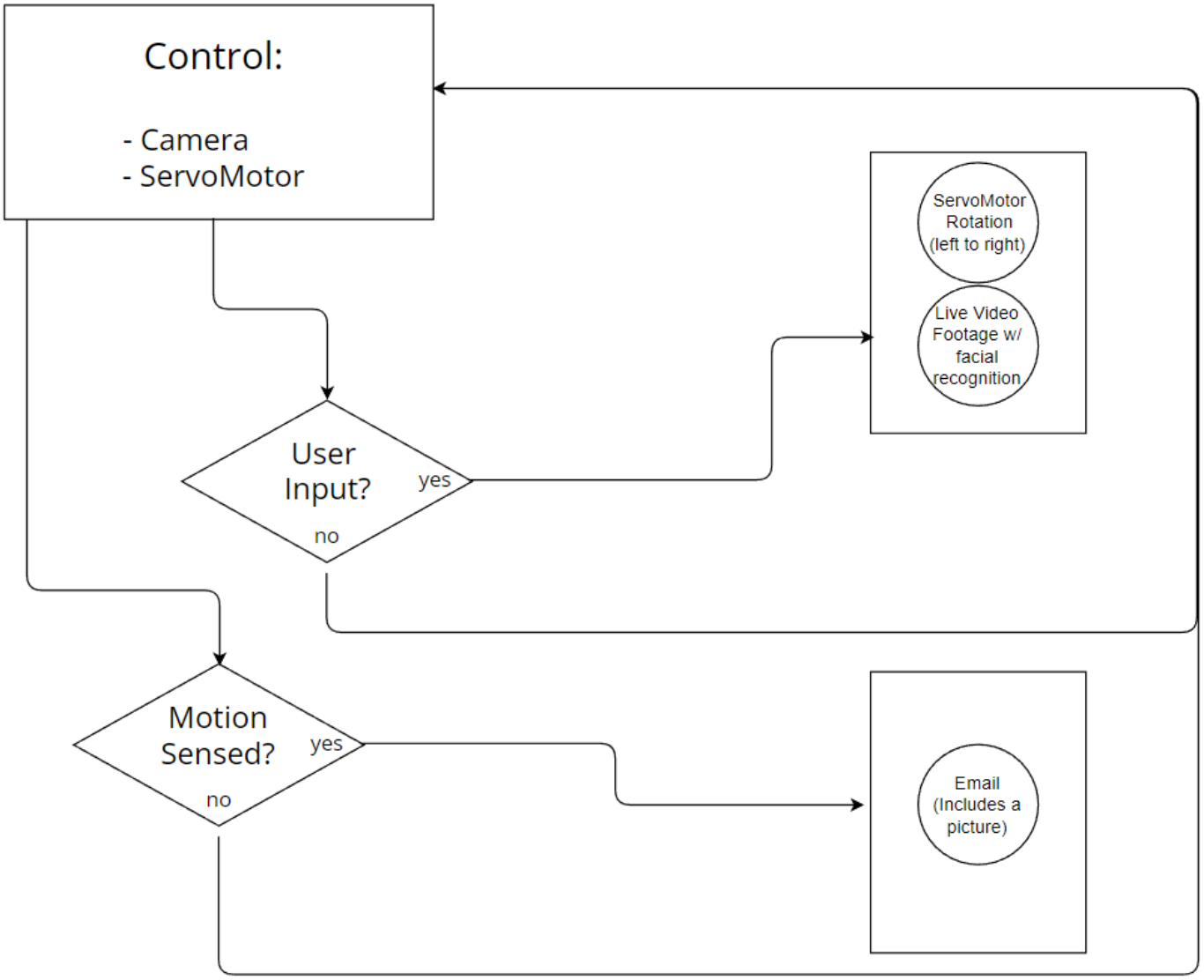
➔ Email account (gmail, yahoo, etc…)

- Used to receive notifications when motion detected
- Includes a picture of the person taken by the camera

Block Diagram



Software Diagram



Project Building Approaches

Software

First off, having a well-developed software system allows for smooth and seamless operation. We would begin by priming our Raspberry PI to interact via a web server. A web framework such as Flask will allow us to create our web server with which the user will interact. We will start by installing Python onto our Raspberry PI and then importing Flask onto the system. We would also take this time to install facial recognition onto our Raspberry PI. The website itself will be programmed using HTML & CSS for the majority of the UI with JavaScript introduced if needed. Our website will prompt the user to log in, once the correct username and password are entered, the user will be granted access to the Raspberry PI security system. Here, the user will have the option to view a live video feed coming straight from the Raspberry PI in real-time. In addition, we will allow the user to pivot the camera angle left and right, the ability to control the hardware interaction will be programmed via Python, as well as other features. In the background, the system will actively wait for motion through the camera, when detected, a picture will be sent to the client's email address. The Website will be accessible by any device on the same network, as long as the IP address is typed into a web browser.

Hardware

The Hardware functionality is a key element for this system to work as intended. We will start by assembling our Raspberry PI with the needed components. We will plug our Raspberry PI camera into our Raspberry, and we will also plug in our Servo motor. The Servo motor will need to be connected to our Raspberry PI GPIO pins. This means we need to switch the male connection to the female pin connection. The process involves stripping the wires and then soldiering to female pins. The Motor will be connected to 5V, GND, and an available GPIO pin. Our PWM wire on our Servo motor will go towards the selected GPIO Pin for PWM control. Next, we need to enable the rotation of our camera. We will drill through our camera enclosure, and screw the servo motor on, via the top screw on the motor. Once complete our Raspberry Pi will be hidden inside the camera enclosure, this way it will be protected from the elements increasing the viability of the product.

Preliminary Project Tasks and Schedule

➔ Setting up Raspberry PI OS and Camera Enclosure

- ◆ Week #4

➔ Setting up Web Server

- ◆ Week #5 - Week #6

➔ Setting up Facial Recognition

- ◆ Week #7

➔ Setting up Hardware Component Control

- ◆ Week #8 - Week #9

➔ Finishing Touches (additional small features and UI)

- ◆ Week #10

➔ Testing/Debugging & Quality Assurance

- ◆ Week #11

➔ Submission

- ◆ Week #12

Project Part list, Cost Breakdown/Total Cost

Components	Quantity	Cost/Unit (CAD)	Total Cost (CAD)	LINKS
Raspberry Pi model 3B+	1	$48.95	$48.95	https://www.pishop.ca/product/raspberry-pi-3-model-b-plus/
Raspberry Pi Power Supply	1	$9.95	$9.95	https://www.pishop.ca/product/wall-adapter-power-supply-5-25v-dc-2-4a-usb-micro-b/
Raspberry Pi Camera Module 3	1	$35.00	$35.00	https://www.pishop.ca/product/raspberry-pi-camera-module-3/
Camera Enclosure	1	$14.19	$14.19	https://www.amazon.ca/Etopar-Security-Waterproof-Flashing-Surveillance/dp/B07Q71FR58/ref=sr_1_24?crid=22C5AYTI16STU&keywords=blupont+cctv&qid=1674437013&s=electronics&sprefix=blupont+cctv%2Celectronics%2C119&sr=1-24
Micro SD Card	1	$9.00	$9.00	https://www.amazon.ca/QUMOX-Micro-Flash-Memory-Class/dp/B07F81QTPP/ref=sr_1_8?crid=1PDMGT9HLSJ10&keywords=micro+sd+card+8gb&qid=1675391384&sprefix=micro+sd+card+8g%2Caps%2C89&sr=8-8
Servo Motor SER0006	1	$5.22		https://www.digikey.ca/en/products/detail/dfrobot/SER0006/7597224

Total Price (CAD): $134.57

Conclusion

With security becoming more essential to the modern home, our security system is a modern solution to a modern problem. The Raspberry Pi security system allows for a functional, reliable, and well-developed security system that grants the user peace of mind without breaking the bank. Thanks to this industry-standard smart system design, you can view live video feeds from your Raspberry PI system on any device wirelessly at home. Our security system allows for a user to interact with the camera and have functional control via a minimalistic and well-designed website. This system is the first step in taking security into your own hands and we believe will serve its purpose for many years to come.

Contact Information

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