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Senior Design Proposal - Home Security

1 Introduction

The objective of our project is to provide a system that allows the user greater security for their home or building that they wish to install the system into. The security provided will provide protection against a variety of threats. The main threat the system defends against are intruders and will utilize cameras to detect when movement occurs as well as capturing an image of the intrusion from a camera which will then be sent to the user. In addition, the system will provide additional security against fire and smoke with sensors that will notify the user should it detect such. All of this information will be available for the user to access through an application and view in an easy to understand format.

2 Problem Description

Homeowners rarely know when their home is at risk. They find out about fires after firefighters have broken into their homes. Break-ins are noticed after valuables are gone if no home security system is implemented. Homeowners should have the ability to immediately know when their property is facing any of these threats without breaking the bank. Specifically, homeowners should be able to decide whether a fire hazard can be prevented before their smoke detector warns the fire department.

Everyone deserves a cheap product to secure their homes and a way to customize it in accordance to their needs and budget.

3 Proposed Solution

Our project aims to notify users if their home is at risk. Rather than a neighbor calling you about a break in or the fire department having to come put out the fire, we aim to facilitate a quicker response from the user in order to better prevent catastrophes at one's home before it is too late.

The center of the product is a website where homeowners can monitor their home through live video feed as they please. Additionally, the user interface allows the user to

activate a siren whenever they want to notify the intruder that their unwanted presence has been detected. Smoke detection is also incorporated into the system. All data acquired by the system is logged into a solid-state drive.

Even though the most basic system includes video surveillance, movement detection, and smoke detection, the beauty of the system lies in its scalability. If a user wants to strategically place a smoke sensor by their stove, it can be incorporated into this monitoring system as long as it's Wi-Fi compatible with the main system.

4 Demonstrated Features

1. Multiplexes video from two cameras (on different spectrum) based on light detection.
2. Smoke detection that alerts the user when smoke is detected.
3. Infrared movement detection in entrances to the house.
4. Hosts the live video feed on a website.
5. Users can interact with the entire system through their website.
6. Saves up to > 24 hours of video to a solid-state drive.
7. Notifies the user when movement is detected.

5 Available Technologies

To solve your problem, there may be particular technologies or parts that you will need to apply. For example, if you are going to have a wireless interface, you will need to find wireless transmitters and receivers to provide this function, or design those items yourself.

This section should include specific technologies that you think might work to provide the functions required in your project. Note that you might not end up using the particular technology listed in this document because over the course of the design you have discovered a better or more appropriate technology.

Remember that you are dealing with limited budgets, so available must include affordable. Each team will have about \$500 to spend on the project. (Note that making a circuit board will cost about \$50.)

This section should have sufficient information to convince me you will be able to do what you are proposing. **Remember that parts availability is still a very big issue.**

- Solid State Drive - (OMSP0S3512Q-00 Kingston) [**\$80**]
- Speaker Amplifier - (LM386 Module) [**\$8**]
- ESP Compatible Camera - (OV2640 Camera) [**\$8**]
- LDR-Photoresistor - (02-LDR1) [**\$0.20**]

- Audio Speaker - (9 Ohm Speaker) [\$10]
- Circuit Board [\$50]

Total price- [\$156.20]

6 Engineering Content

WiFi Module: handles the communication between the different Home Security devices and the user's device (computer, smartphone, etc.).

Wired sensors: receive data from the environment (smoke, movement), processes it and sends it back to the WiFi module.

Camera: records the data and sends it to the WiFi module.

Website: lets the user interact with the different parts of the system, like checking alerts of the sensor, reviewing the camera footage, etc.

Data Storage: allows the system to store the recordings from the camera so they can be accessed by the user later.

Wireless sensor + ESP32 dev board: this easy build serves as a simple proof of concept for the systems scalability. These will both be off-the-shelf so the development team can focus on perfecting the hardware associated with the main system.

7 Conclusions

Our design is useful to the consumer in three primary areas.

Cheap Cost: Oftentimes security systems for homes can be expensive in addition to costs from complementary features such as monitoring services which might be required for the system to properly operate. Our design is more approachable to individuals who make lower incomes who want to be alerted to common household threats.

Scalability: This security system is easily scalable in its capabilities. Should the user have a higher income or want to be alerted to particular types of threats not provided by the current implementation, the system can be amended with the inclusion of additional sensors.

Ease of Use: The user is able to easily view the information and access it with minimal effort. This creates an appeal to older users and those with lower income (who would be drawn to this product with its lower cost initially) in alleviating their fears of not being able to benefit from it due to lack of technical knowledge.