Specification

Automated Home security system

# Introduction

The project I have chosen to do is a smart home security system. When I was smaller I loved watching Home Alone every Christmas, and the scene where the intruders knew that no-one was home, by timing the automated lights gave me inspiration for this project.

The main concept of my project is much like many other home security systems. When the alarms are triggered, a signal will sent to the central unit and an alarm will sound. The difference between this and other systems is, that the motion detection sensors are placed on all openings of the house or building meaning the alarms will be triggered at the moment of entry not allowing time for the signal to be shorted by the infiltrators. Moreover I will not be using wires meaning there is nothing to physically cut.

# Main Features

* Wireless communication
* Timed motors
* Randomization

There are three main features of my project, some of which have been mentioned beforehand in this document. Feature number one is that all sensors and motors will be wireless and will communicate with a central unit (called CU from now on).

The next feature is that the user can program the shades to close automatically at a preset time each day. The given time will be set on the CU and at the given time each day (if set) the CU will give a signal to the motors which will close the shades one after the other.

The last feature that will be implemented in this project will be that the preset time will be randomized in a given interval. As I stated at the beginning of the introduction I got the idea from the film Home alone, where the burglars knew the owners were on a Christmas vacation, because the automated light it up at the exact same time each day. Because of this, my idea was to close the shades at a preset time +/-30min. This way the method used in the movie could not be used on the homes were my security system was installed.

# I/O

The inputs of my system would be a manually set time, set by the user. Further inputs would be the signals from the motion sensors. Outputs would be the motor closing the blinds and a siren sounding if the motion sensors were triggered.

# Used Hardware/Software

* Raspberry Pi B module
* 5V 4 Phase stepper motor
* ULN2003 Driver board
* Easy Driver stepper motor board
* BTM-800 PRX BLE module
* König CSBLUEKEY200

The Raspberry Pi is the core of the whole system(CU). All info will run to it and all commands will be sent from it. It will be the only device interpreting the data, and deciding what to do with the given data. For future data storage and so the flash memory is preserved, a external HDD will be installed on the device The motor will be one of the output devices of the automated system and will be used to drive the shades. When the inputed time of day has arrived, the CU will send a signal via the BLE module to the motor controller board, giving the number of steps and the direction the motor must turn (one step equals a 360° turn). The motor will be linked to the motor controller and the motor controller will be connected to two separate GPIO pins of the BTM-800 BLE module. The BLE module has 12 digital and 3 analog GPIO pins. We will only need to used 3 digital pins (2 for the motor and 1 for the PIR sensor). The BLE module also has a built in chip antenna, so I didn't have to buy and attach one separately. The PIR sensors are the other input devices of our system. They are used to detect motion in different areas of the house, when the occupants are out of the house. The PIR sensor sends a signal to the GPIO of the bluetooth module when the device is triggered and this forwards the data to the CU which triggers the sound alarm. In our case a pair of speakers.

# Verification tests

I will start with the easiest verification test first.

The sound test: The CU will have peripheries linked to it and running a Raspberry Linux OS (Raspbian). From here a sound file will be started, that the end product will use on a multimedia application, and test if the speakers and sound clip work(alarm.mp3).

The motion sensors test: visual and audio tests. First the visual test. A large object will be placed in front of the sensors and if they are activated a LED will flash with a 1 second interval on the CU.

Next the sound test. The same object will be placed in front of the sensors and instead of the LED the speakers will indicate,with the start of the alarm.mp3 file, that the motion sensors are operational and functional.

Additional quality checks can be done via placing smaller objects in front of the sensors and from various angles.

The motors and the timer test. These shall be done together, various times will be set on the timer. The internal clock of the CU will be set to to 31 minutes before the set time. If the timer was correctly implemented the motors will be operational within the hour. For better automation the motion sensors will be placed in front of the shades and when the motors are activated, a loud beeping will indicate this. (Only if time remaining)

# Future/Improvements

* Upgrade to IOT
* Mobile App
* More utilities online
* Increased Security
* Time sync from web and sunrise/sunset times
* Stored info (Energy Usage, App login times)

# Implementation

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