GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

Bachelor of Technology

(Electronics and Communication Engineering)

Industry Oriented Mini Project

TITLE: HOME SURVEILLANCE

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ROLL NUMBER:15241A0461

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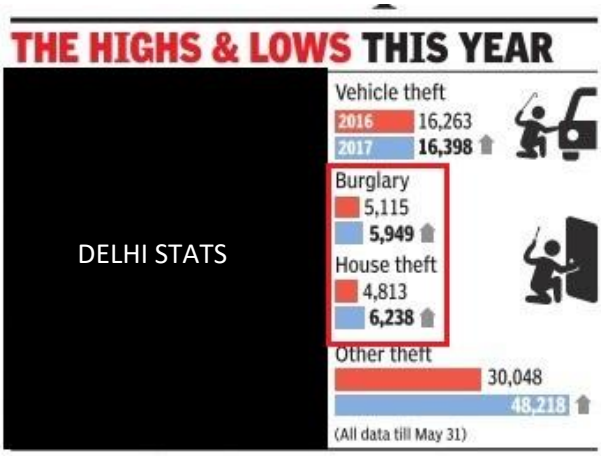
Introduction

Why do we need a home security system? When you look at your family, and your home, you know you want them to be safe, always out of harm's way. When you leave for work, you expect to come back to a smiling family, and to a home that is secure. But as they say, hope is not a strategy. The growing crime rates across cities reflect the bitter reality.

Many people overlook, ignore, and underestimate the need of taking appropriate home security measures. A burglary or theft can lead to devastating consequences, both emotionally and financially. While the financial loss may be recoverable, the trauma inflicted on your family and yourself may last forever.

Do it yourself Home Surveillance it the most financially economic way to keep a tab on the house. It can be done with any old or not in use smart phones, kits like any Raspberry Pi Models, Arduino Models, and webcams.

With the help of smart security system, you can keep hawk's eye in or around your house. Security Cameras and motion sensors prevent your home sweet home safe from intruders.



Design Document

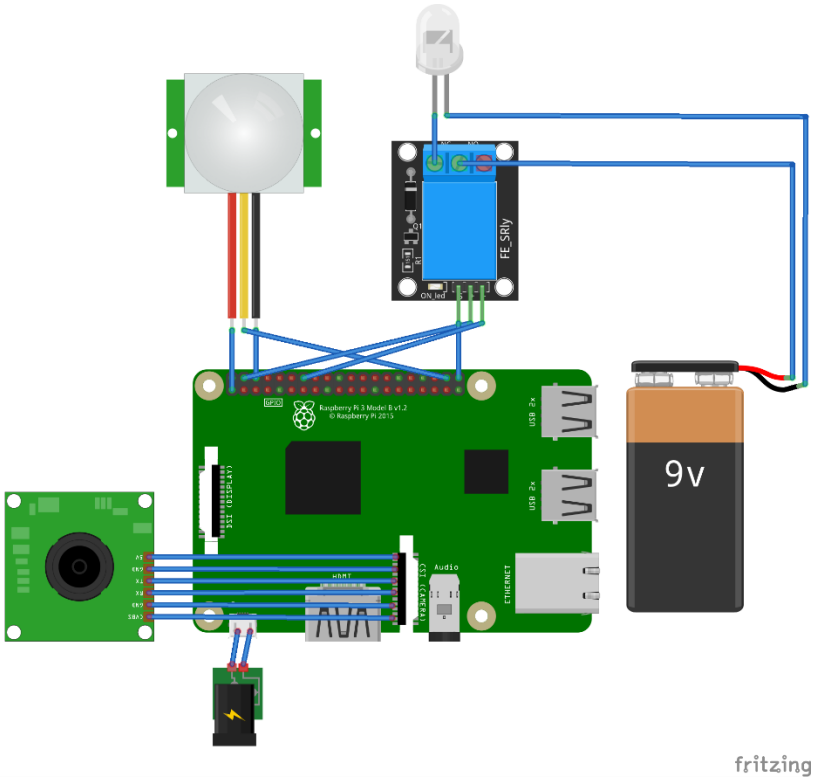
The Home Surveillance with automation project aims to provide the user with the facility to monitor the home using the Raspberry Pi 3 Model B. Motion will be detected via PIR (passive infrared) Sensor, will trigger the PI Camera to take a photo, and along with this system is able to control camera led flash using a relay channel connected to the Raspberry Pi. The captured pictures are viewed via File Transfer Portal on the smartphone app.

The Home Surveillance project consists of the following components:

- **Raspberry Pi 3 Model B**
- **PIR (Passive Infrared) Sensor**
- **Raspberry Pi 5MP Camera Version 1.3**
- **One Channel Relay**
- **Connecting Wires**
- **Custom made board**
- **Power Supplies (9v Battery, Raspberry Pi Power Supply)**

The custom-made board consists of:

- **Raspberry Pi GPIO Pins Header**
- **PIR Pins Header**
- **Relay Pins Header**



Software:

1) Schematic and Board Design will be done on Eagle CAD Software.

2) PHP script is used on server side to interface with the mobile app.

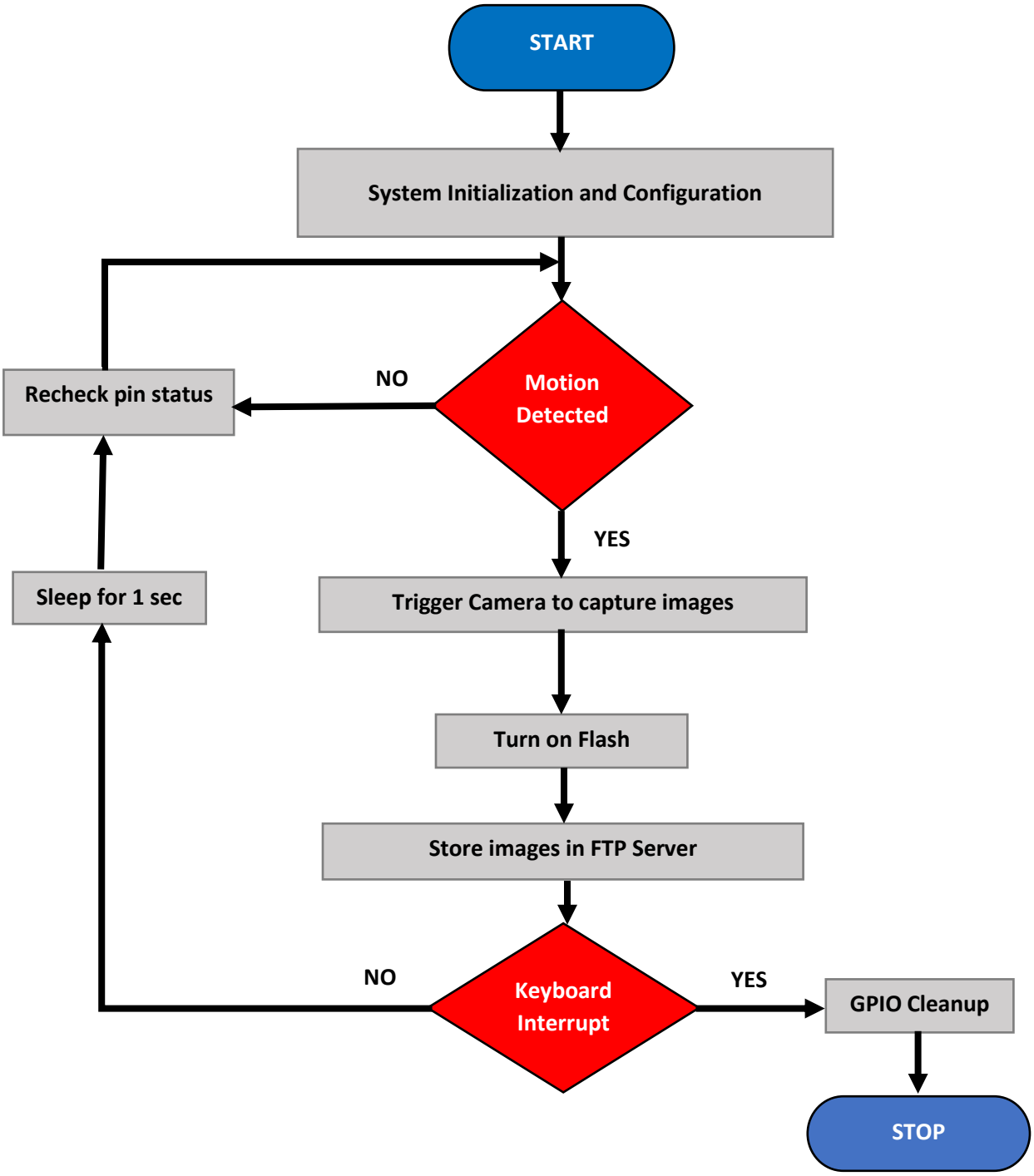
3) The mobile application will be created using MIT App Inventor 2.

Firmware:

The Main Program is in written in python language.

The main object of the python script will be to receive passive infrared sensor high or low output depending on the movement and enable camera to capture picture while the LEDs can be turned on and off accordingly.

Design Flowchart



Project Specifications

Functional Requirements:

- **The System must contain a Raspberry Pi Camera connected to 15-pin MIPI Camera Serial Interface**
- **The System must contain a channel relay to turn on and off LED Lights**
- **The System must contain a PIR Sensor to detect motion**
- **The System must capture image using Pi Camera when motion is detected and store the images in the SD Card.**
- **Images can be viewed using wireless communication interface**

Non-Functional Requirements:

- **The System should be easy to operate.**
- **The System should be compact in size since it should be mounted on wall or ceiling.**
- **The whole unit should be inside a protected concealed case.**
- **Power consumption should be low.**
- **External wiring required should be minimal.**
- **Phone interface should be well designed.**

Deliverables

Hardware:

- **Raspberry Pi 3 Model B**
- **Pi Camera Version 1.3**
- **Passive Infrared Sensor (PIR Sensor)**
- **One Channel Relay**
- **Copper Clad PCB Board**
- **9V Battery**
- **Male Header Pins**
- **5V DC Adapter**
- **Female-Female Breadboard Jumper Wires**
- **Heat Sinks for Raspberry Pi**
- **CCTV Designed enclosure.**

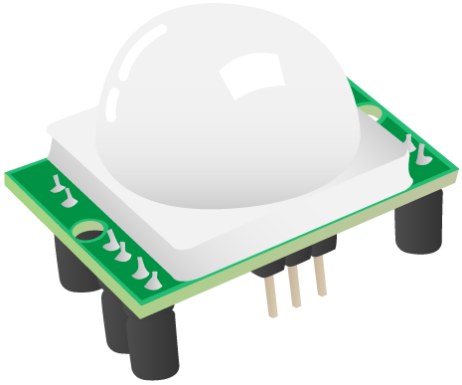
Software:

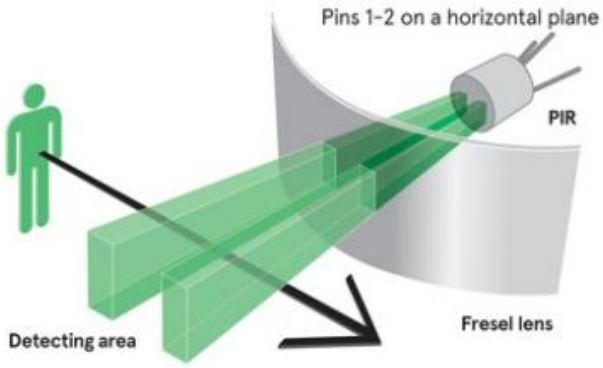
- **Raspbian OS Stretch**
- **Python IDE**
- **Apache Server**
- **PHP libraries**
- **FTP libraries**
- **WiringPi libraries**
- **MIT App Inventor 2**

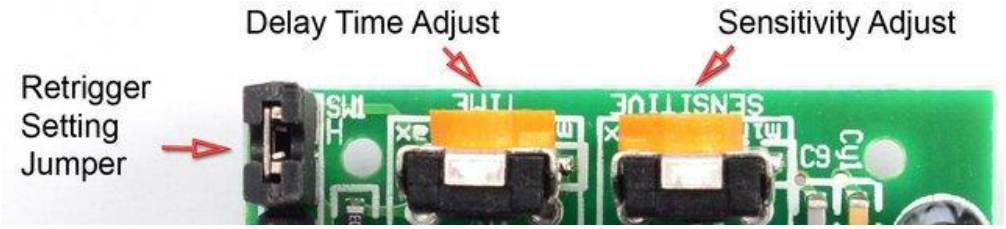
Theory

PIR (Pyroelectric ("Passive") Infrared Sensors):

PIRs are made of a pyroelectric sensor that can detect levels of infrared radiation. Its distance of working is 6 meters with horizontal range of 108 degrees. It has two adjustment knobs which are for adjusting the sensitivity and delay time. The white plastic cover for PIR is known as Fresel Lens

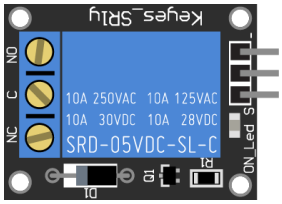






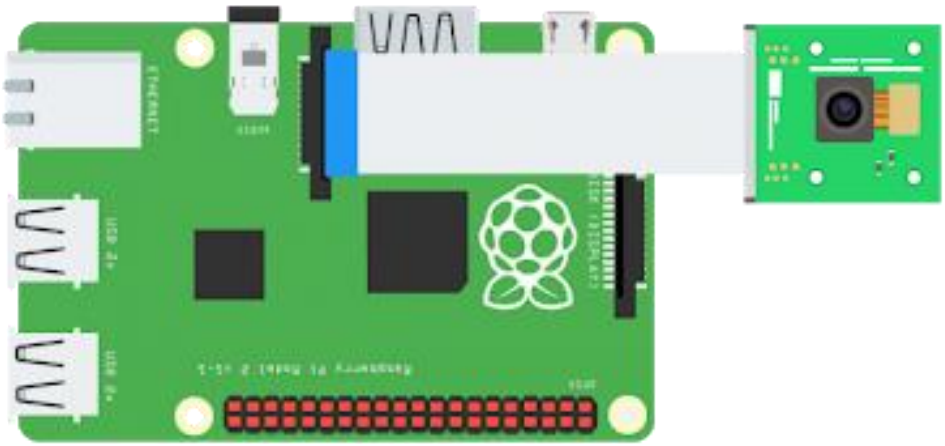
Relay:

A relay is an electromagnetic switch operated by a relatively small electric current that can turn on or off a much larger electric current. Here we used a 5V Relay Module, which can be triggered by 3.3v GPIO Pin.



Raspberry Pi:

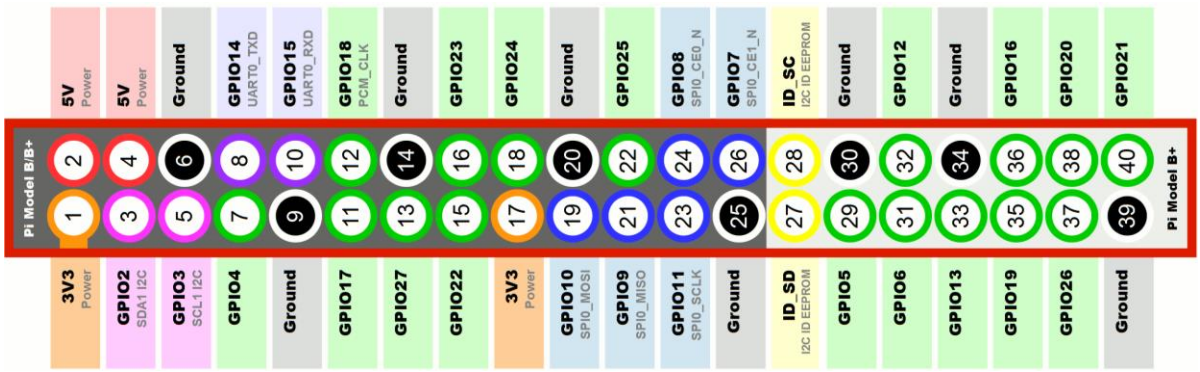
Raspberry Pi 3 Model B is used for the project. It is powered by a 1.2Ghz ARM-Cortex A53 Processor with 1GB SDRAM. The CSI Camera slot and GPIO pins (20, 21, 5v, 3.3v, GND) are used here. The PIR sensor and relay module are connected to the Raspberry Pi GPIO pins and the PI camera v1.3 is connected to the dedicated camera socket. The output of the PIR sensor triggers the camera to capture images and control the lights.



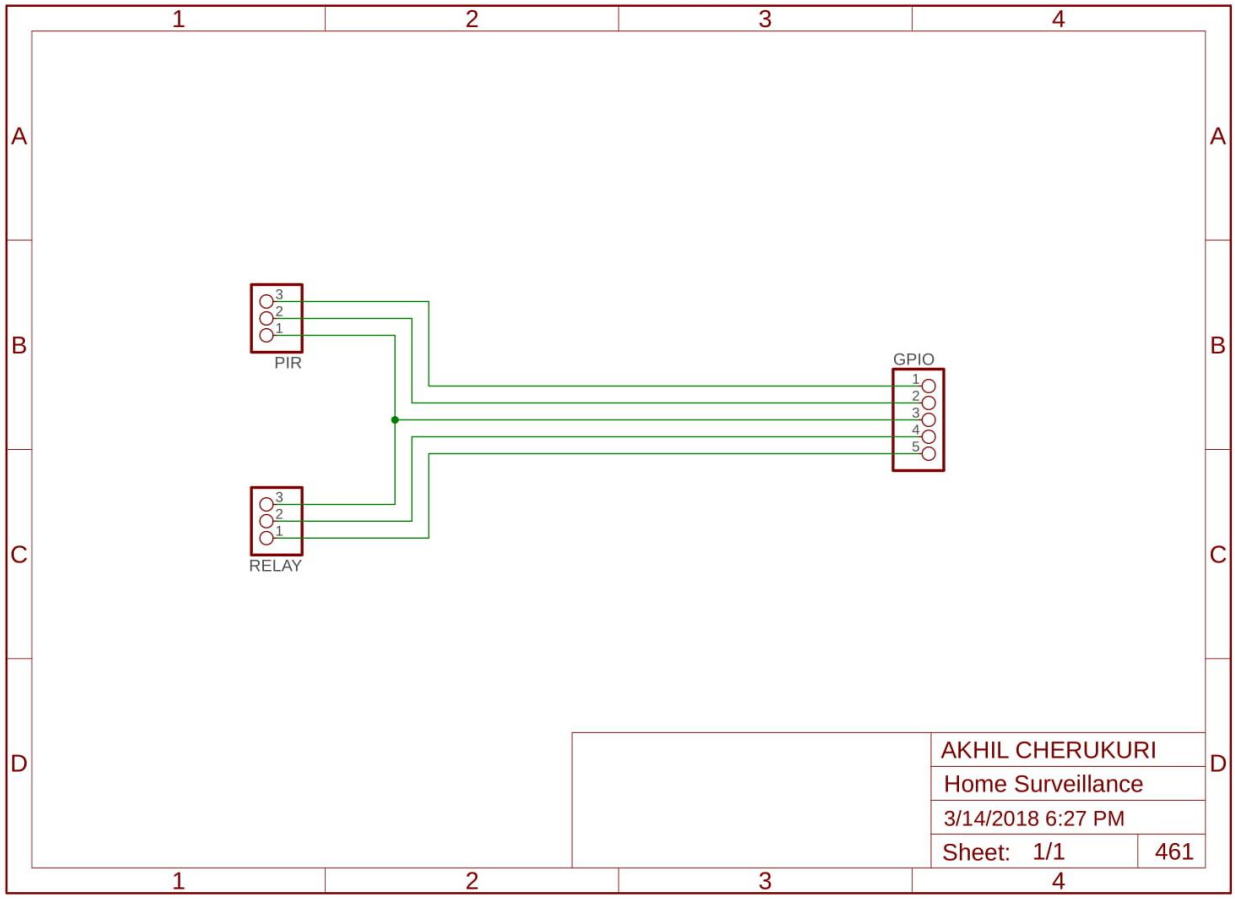
Pi Camera v1.3:

Shoots at 1080p 60fps resolution at 5 Megapixels Omni vision.

Raspberry Pi GPIO PIN LAYOUT



Schematic


1
2
3
4
A
B
C
D
PIR
RELAY
GPIO
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Home Surveillance
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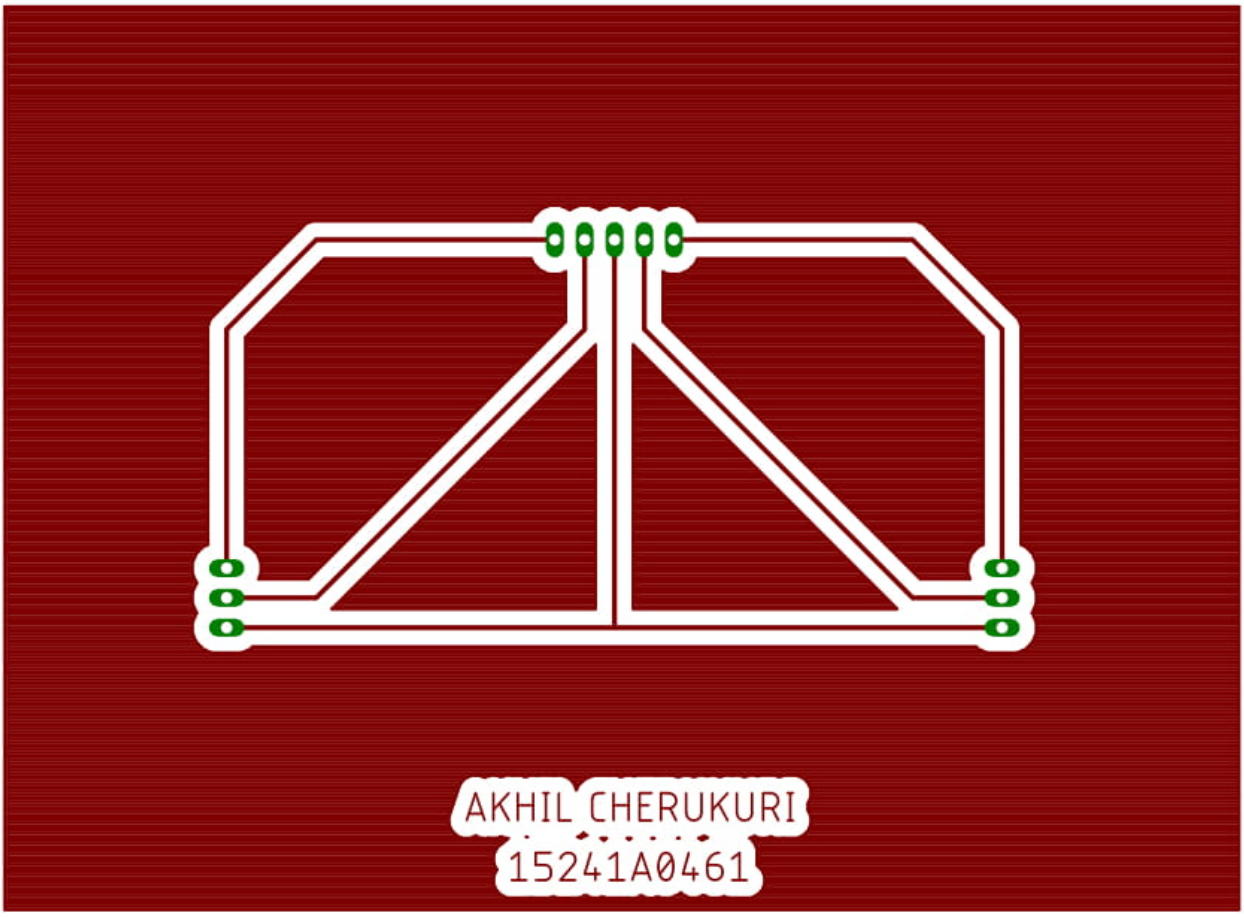
Board Design



Setting Up Raspberry Pi

Step 1: Format SD card

Step 2: Install Raspbian OS Stretch

Step 3: Boot up Raspberry Pi 3

```
Login as: pi
pi@192.168.43.158 password: raspberry
```

Step 4: Change Setting to enable

```
sudo raspi-config
Enable Camera and SSH
```

Step 5: Install the Following Libraries

```
sudo apt-get install apache2 -y
sudo apt-get install php libapache2-mod-php -y
sudo apt-get install pure-ftpd
git clone git://git.drogon.net/wiringPi → cd wiringPi →  ./build
```

Step 6: Give the Pi a static IP address for Apache and FTP interface

```
sudo nano dhcpcd.conf → (ADD)
interface wlan0
static ip_address=192.168.43.158
```

Step 7: Keep the required files in /var/www/akhil/ directory

```
Apache Server: http://192.168.43.158/akhil/
FTP Server: ftp://192.168.43.158/
```

Step 8: Interface app to the files in the directory

Firmware

Python Script:

```
import RPi.GPIO as GPIO
import time
from picamera import PiCamera

GPIO.setwarnings(False)
GPIO.setmode(GPIO.BCM)
GPIO.setup(20, GPIO.IN)
GPIO.setup(21, GPIP.OUT)

camera = PiCamera()

i=0
try:
while True:
i+=1
state = GPIO.input(20)
    if state==0:
                GPIO.output(21, GPIO.LOW)
                  print "NO MOTION, CAMERA IDLE!"
                  time.sleep(1.0)
    elif state==1:
                 GPIO.output(21, GPIO.HIGH)
                  print "MOTION DETECTED, PICTURE TAKEN!"

camera.capture('/home/pi/Pictures/image{0:04d}.jpg'.format(i))
                 time.sleep(1.0)
except KeyboardInterrupt:
    print "Quit"
    GPIO.cleanup()
```

In Apache Server PHP Files are used to interact with the app:

```
//RELAY STATUS
<?php
header("refresh: 1;");
$state[1] = "ON";
$state[0] = "OFF";
?>
RELAY IS CURRENTLY
<?php
$pinStatus =
trim(shell_exec("gpio -g
read 21"));
echo $state[$pinStatus];
?>
```

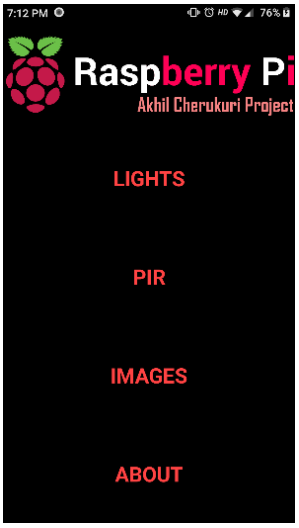
```
//PIR STATUS
<?php
header("refresh: 1;");
$state[1] = " DETECTING
MOTION";
$state[0] = " IDLE";
?>
PIR IS
<?php
$pinStatus =
trim(shell_exec("gpio -g
read 20"));
echo $state[$pinStatus];
?>
```

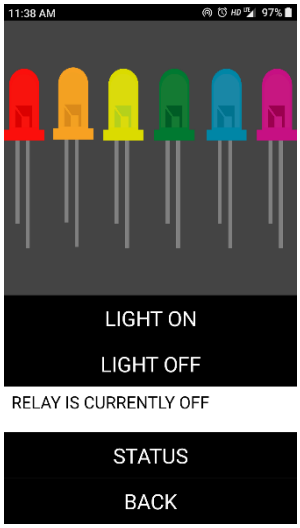
```
//TURN ON RELAY
<?php
system("gpio -g mode 21
out");
system("gpio -g write 21
1");
?>
```

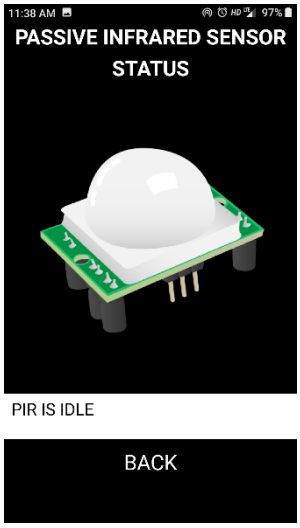
```
//TURN OFF RELAY
<?php
system("gpio -g mode 21
out");
system("gpio -g write 21
0");
?>
```

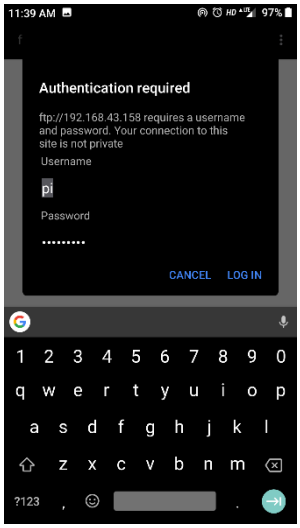
Android Application

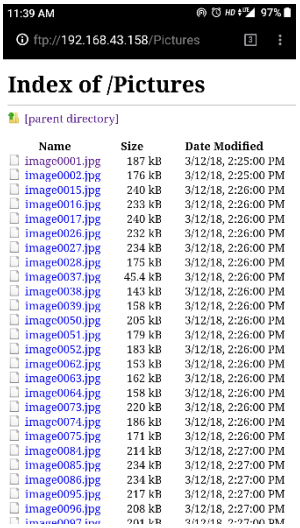
Application complied with MIT App Inventor 2





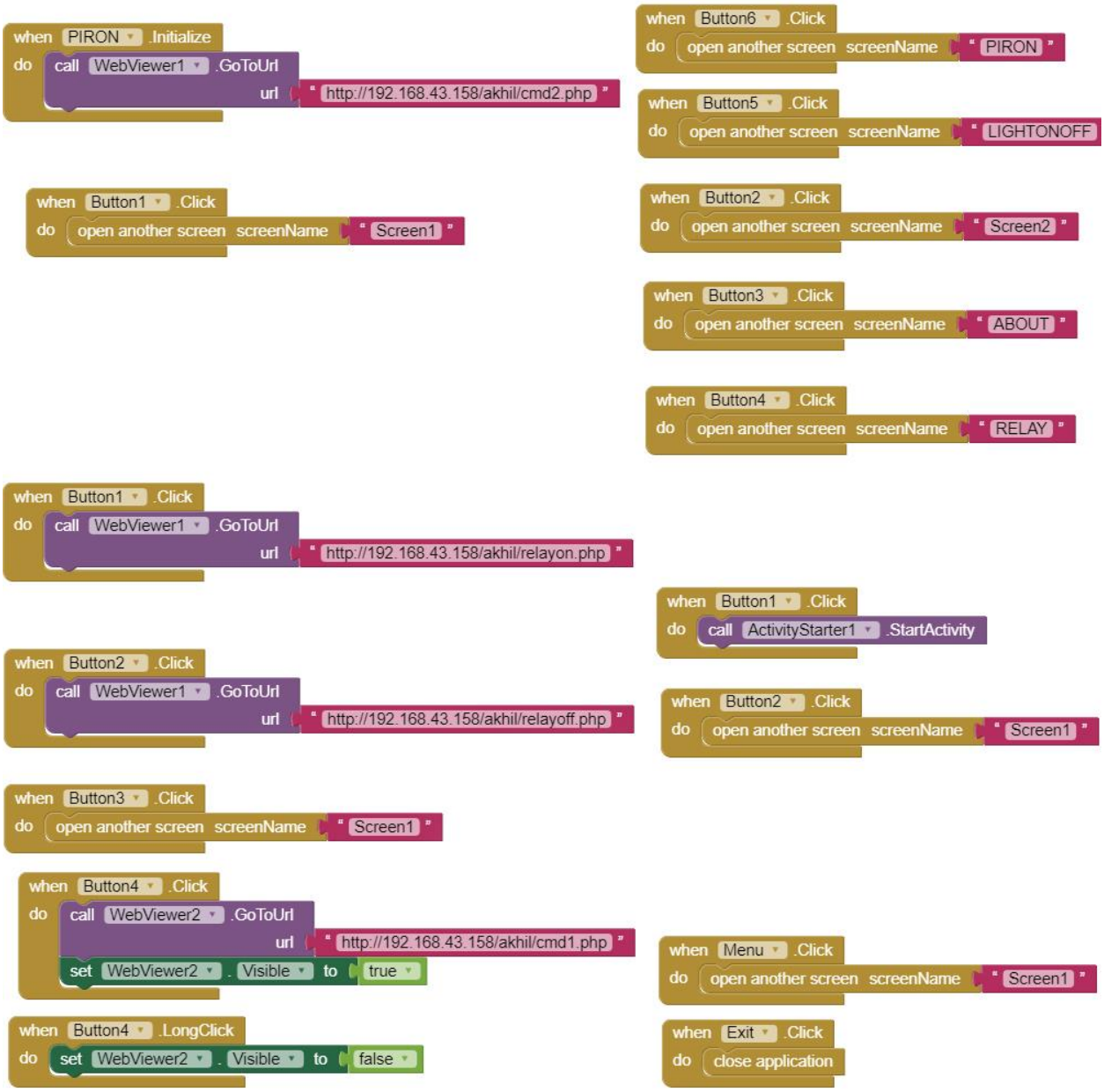






APP BLOCK CODE:

(ALL SCREENS)



Conclusion

The aim of the project is to increase the security and safety of a Home. Besides protecting your home against intruders, there are many advantages in using this home security alarm system:

1. **A Sense of Comfort: The best advantage to having a home security system is that you can go about your life knowing that your household and belongings are secure. Security inside your home and outside your home, when you are home and when you're out enjoying the rest of life!**

2. **Deters Crime: A study found that, as the number of home security systems increased in an area, the number of residential robberies decreased in that area, even for people who didn't have their own security system. Having a security system not only protects you, but helps your neighborhood be a safer place for everyone.**

3. **Protects Valuables: The alarm alone is enough to deter an intruder. However, once the alarm has sounded, the police can be immediately notified and dispatched and catch before escaping so your home is kept safe at all costs.**

Limitations

Generic PIR Sensors are highly sensitive, therefore error probability is high and can mistakenly detect unwanted motion.

References

- **https://www.raspberrypi.org/forums/**
- **https://github.com/sparkfun/SparkFun-Eagle-Libraries/**
- **https://www.autodesk.com/products/eagle/**
- **https://www.youtube.com/**
- **https://httpd.apache.org/**
- **http://wiringpi.com/**

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