Bachelor of Technology (B. Tech.)

Computer and Communication Engineering (CCE)

Amrita School of Engineering

Coimbatore

Academic Year – 2022 - 23

Group 10

S. No	Name	Roll Number
1	T Narun	CB.EN.U4CCE20037
2	Sarath S	CB.EN.U4CCE20054
3	Vignesh KVK	CB.EN.U4CCE20070
4	AR Vishaline	CB.EN.U4CCE20071

Fifth Semester

19CCE301 Internet of Things (IoT) Project

IoT-Based Home Security System Using Raspberry Pi

Faculty In-charge – Peeyush K P

Abstract:

The objective of this model is to present a simple and low-cost design to make our homes smarter and safer. The Raspberry Pi based framework built in this project comprises of PIR sensor and an IR sensor which alert the owner when motion is detected. A video of the incident is recorded and stored locally for security purposes. This video can later be viewed and used as evidence.

Introduction:

Today, security is an important and integral element almost everywhere. Home Security is one such branch of the same tree. Ensuring that our homes are secure is vital in today's world. The development of burglar alert gadgets can limit the event of theft, while it can also identify and record suspicious trespassing. In places with high density like railroad stations an schools we can install ace acknowledgement innovation which can identify hoodlums and suspicious people. To defeat the disadvantages of conventional burglar alarms, like infrared microwave indicators, glass break finder, microwave target movement locator, we propose this model.

The home security systems today have transformed from a straightforward lock and key to executing refined security systems utilizing cameras, amplifiers, contact sensors, closeness sensors, cautions, quiet alerts and so on. Also, the task of CCTV observation is round the clock inspection with human labour.

This project demonstrates the design and implementation of a Home Security System using Raspberry Pi. The system records a video on sensing intrusion and sets off an alarm. Since it is connected to the cloud, the alarm can be deactivated by entering the correct password in the Adafruit Keypad.

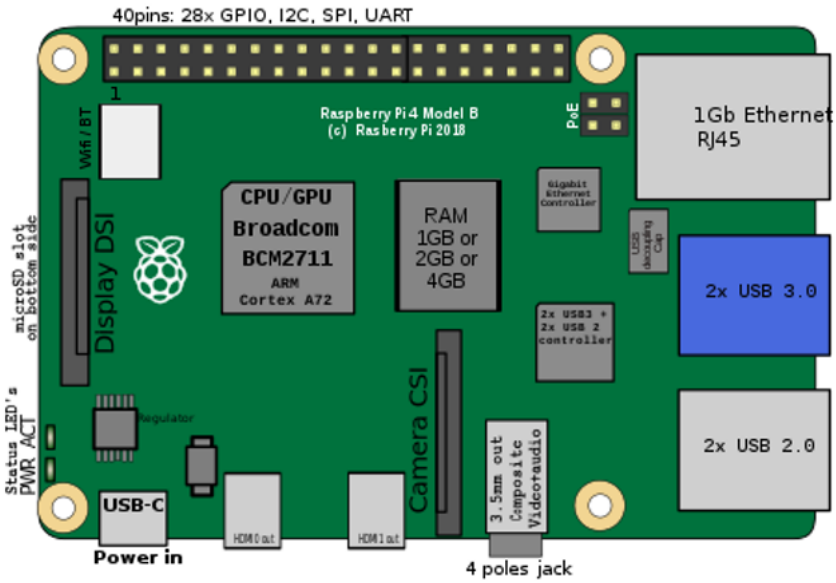
Hardware Components:

- Raspberry Pi 4 Module B
- IR Sensor
- Pi-Camera Module rev1.3
- LED

Raspberry Pi 4 Module B:

The Raspberry Pi is a very cheap computer that runs Linux, but it also provides a 28 GPIO (general purpose input/output) pins, allowing you to control electronic components for

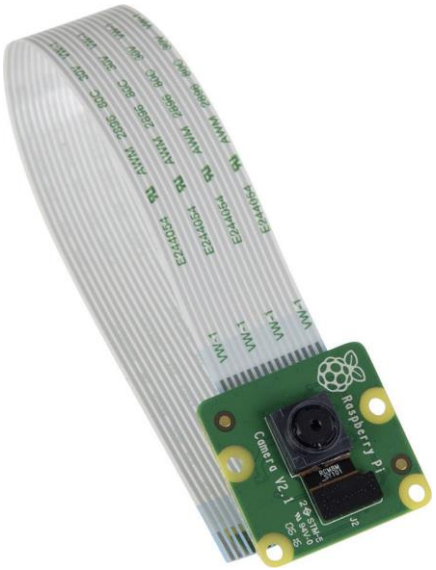
physical computing and explore the Internet of Things (IoT). Raspberry Pi 4 comes with Gigabit Ethernet, along with onboard wireless networking and Bluetooth. The Raspberry Pi 4 Module B has two built-in USB 2 ports and two USB 3 ports that provide enough connectivity for a mouse, keyboard or anything else the RPi needs. It also has one micro USB ports, two HDMI ports. It also has a separate slot for microSD port for loading the OS and storing data. It also has a CSI camera port for connecting the Pi Camera.



Pi Camera Module rev1.3:

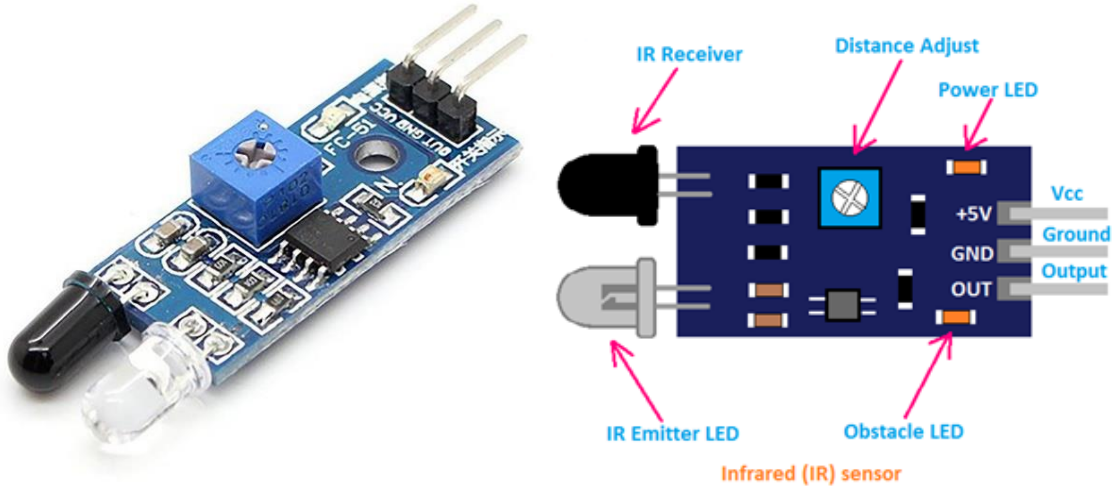
The Raspberry Pi Camera Board plugs directly into the CSI connector on the Raspberry Pi. It's able to deliver a crystal clear 5MP resolution image, or 1080p HD video recording at 30fps. The module attaches to Raspberry Pi, by way of a 15 Pin Ribbon Cable, to the dedicated 15-pin MIPI Camera Serial Interface (CSI), which was designed especially for

interfacing to cameras. The CSI bus is capable of extremely high data rates, and it exclusively carries pixel data to the BCM2835 processor. The sensor itself has a native resolution of 5 megapixel, and has a fixed focus lens onboard. In terms of still images, the camera is capable of 2592 x 1944 pixel static images, and also supports 1080p @ 30fps, 720p @ 60fps and 640x480p 60/90 video.



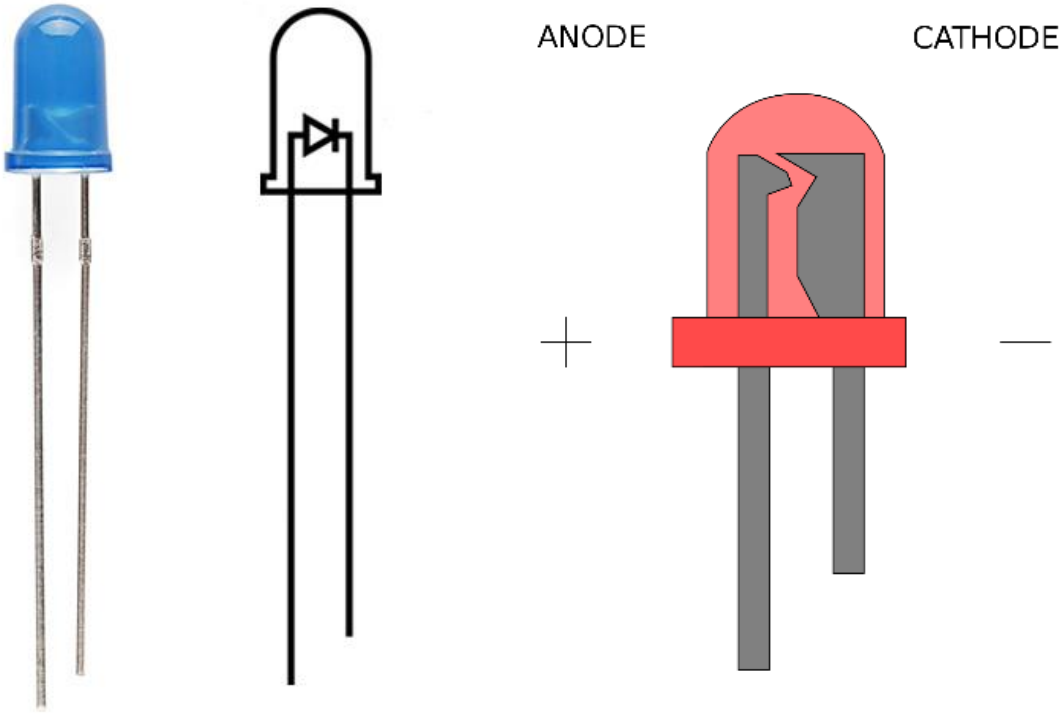
IR Sensor:

An infrared sensor is an electronic device, that emits to sense some aspects of the surroundings. IR sensor is an electronic device, that emits the light to sense some object of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. IR transmitter transmits IR signal, as that signal detects any obstacle in its path, the transmitted IR signal reflects from the obstacle and received by the receiver.

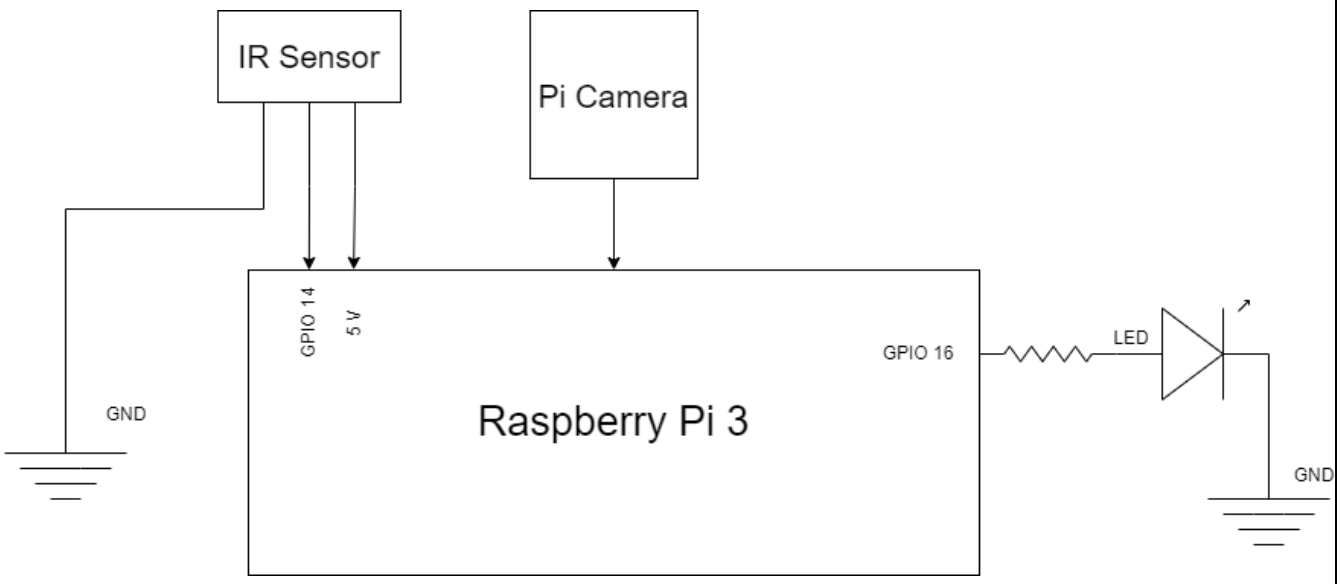


LED:

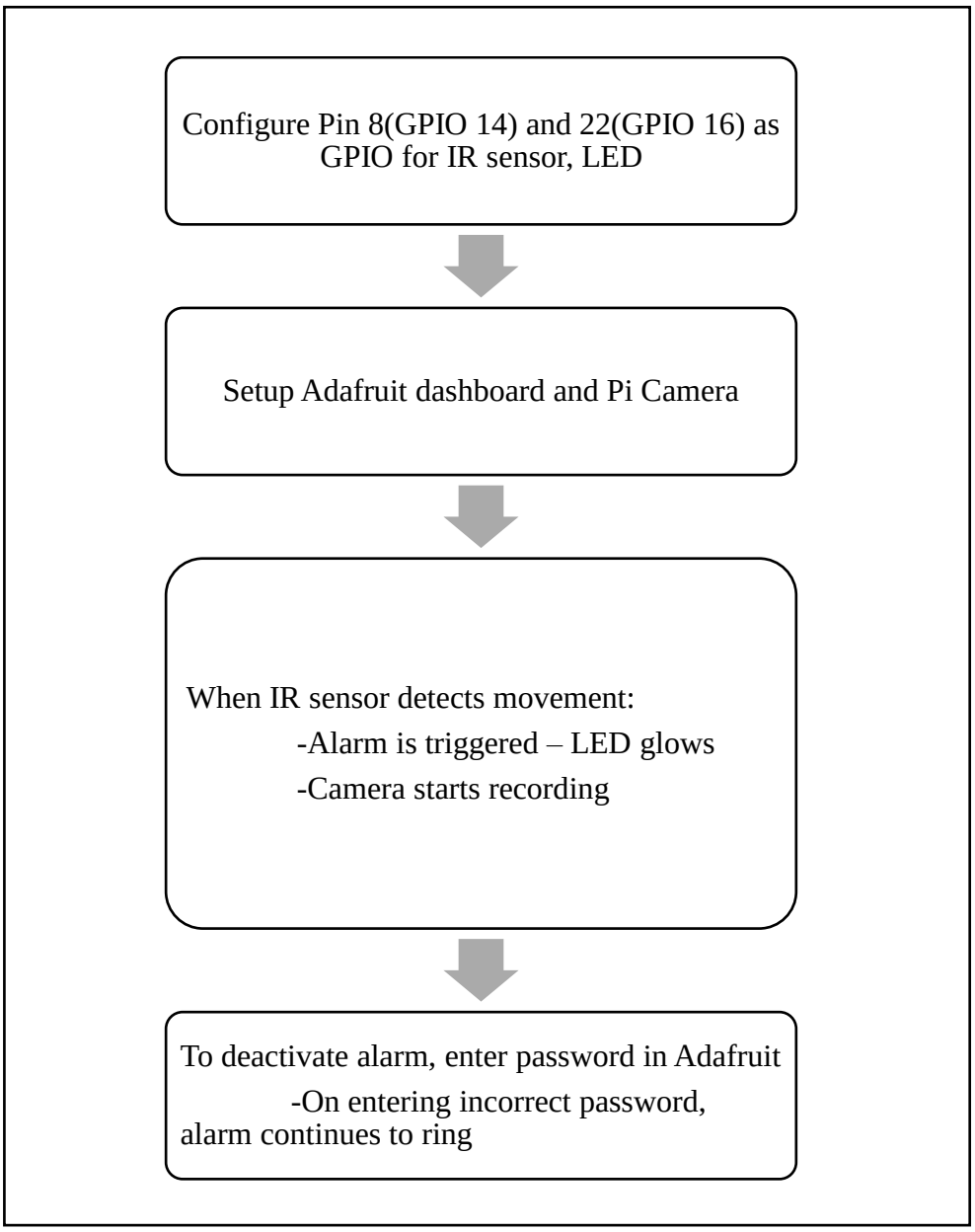
A light-emitting diode (LED) is a semiconductor device that emits light when an electric current flows through it. When current passes through an LED, the electrons recombine with holes emitting light in the process. LEDs allow the current to flow in the forward direction and blocks the current in the reverse direction.



Block Diagram:



Algorithm:



Working:

An IR Sensor and a PIR sensor are placed to detect any movement. When movement is detected, the Pi Camera begins capturing images. The alarm goes off, i.e. the LED indicating an intrusion. The pictures are sent to the cloud (AdaFruit) to be viewed by the owner which can later serve as evidence. The owner can turn off the system from the cloud server by entering the correct password. in case of a false alarm. If the user enters the wrong password, the LED continues to glow.

Code:

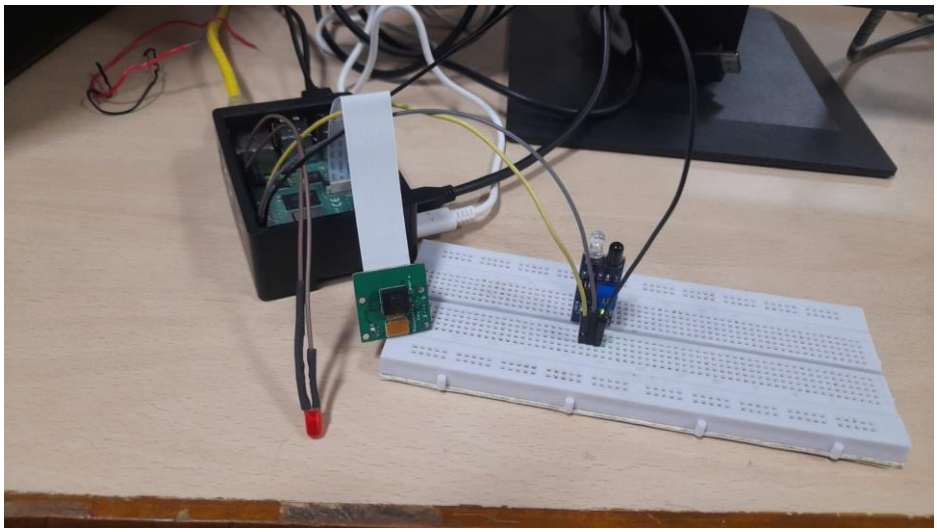
```
from Adafruit_IO import Client, Feed
from Adafruit_IO import MQTTClient
import RPi.GPIO as GPIO
import picamera


def connect(c):
    c.subscribe(feed_id)

def disconnect(c):
    c.unsubscribe(feed_id)

#Setting up the password system
def message(client,feed_id,payload):
    password ='0000'
    global p
    global ep
    p=p+payload
    ep+='*'
    aio.send(lcd_feed.key,ep)

    if (payload == '#'):
        if (password+'#' == p) :
            aio.send(lcd_feed.key,"Alarm Off")
            p=''
            ep=''
            GPIO.output(l,False)#LED turns OFF
            client.disconnect()
        else:
            aio.send(lcd_feed.key,"Wrong Password")
            p=''
            ep=''

#Setting up the camera to record video
def cam():
    print("Motion Detected")
    picam.start_preview(alpha=200)
    picam.rotation=180
    picam.capture('cam.jpg',resize=(600,600))
```

```
    picam.stop_preview()

    picam.resolution = (640, 480)
    picam.start_recording('my_video.h264')
    picam.wait_recording(10)
    picam.stop_recording()

    GPIO.output(l,True)#LED turns ONN
    c.connect()
    c.loop_blocking()

l=36#LED
ir=8#IR SENSOR
p=''
ep=''

GPIO.setwarnings(False)
GPIO.setmode(GPIO.BOARD)
GPIO.setup(l, GPIO.OUT,initial=GPIO.HIGH)#GPIO=16
GPIO.setup(ir,GPIO.IN) #GPIO=14

ADAFRUIT_IO_USERNAME = "Vish2002"
ADAFRUIT_IO_KEY = "aio_SXuZ39JsWt7mJjaI5T0zD2NoNOvA"

#Connecting to Adafruit
feed_id='key'
c = MQTTClient(ADAFRUIT_IO_USERNAME, ADAFRUIT_IO_KEY)
c.on_connect=connect
c.on_disconnect=disconnect
c.on_message =message

#Sending data to Adafruit
aio = Client(ADAFRUIT_IO_USERNAME, ADAFRUIT_IO_KEY)
cam_feed=aio.feeds('cam')
lcd_feed=aio.feeds('screen')
aio.send(lcd_feed.key,'Temp')

#configuring Pi Camera
picam=picamera.PiCamera()
```

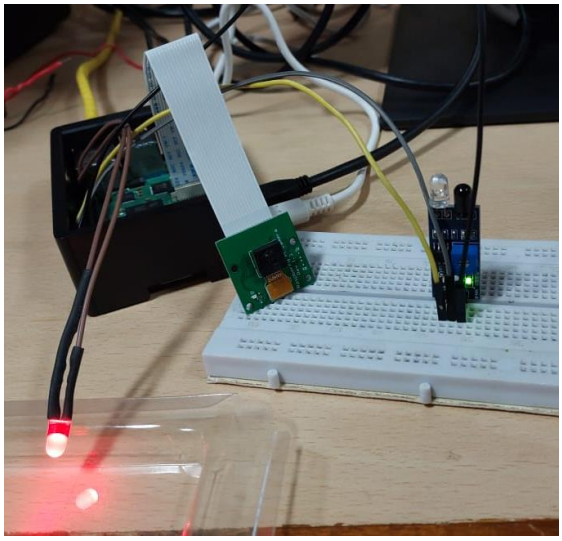
```
while True:
    status=GPIO.input(ir)
    #IF MOTION DETECTED
    if (status==0):
        aio.send(lcd_feed.key,"Enter Password: \n#-->enter")
        cam()#START RECORDING

    else:
        GPIO.output(l,False)
```

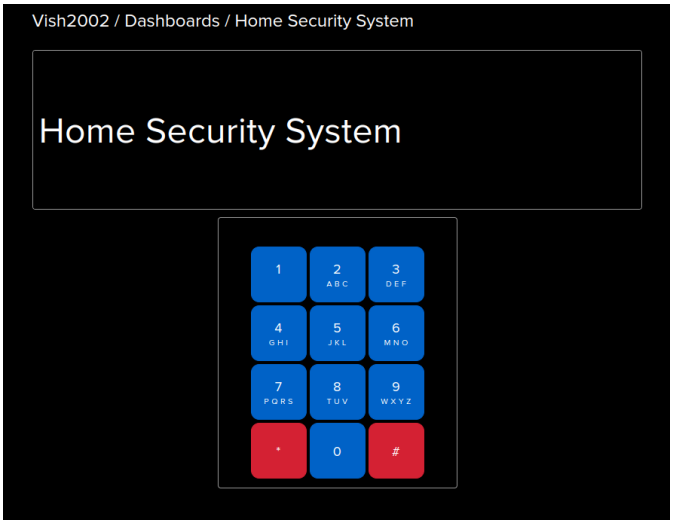
Output:

1. Initially, the LED is OFF

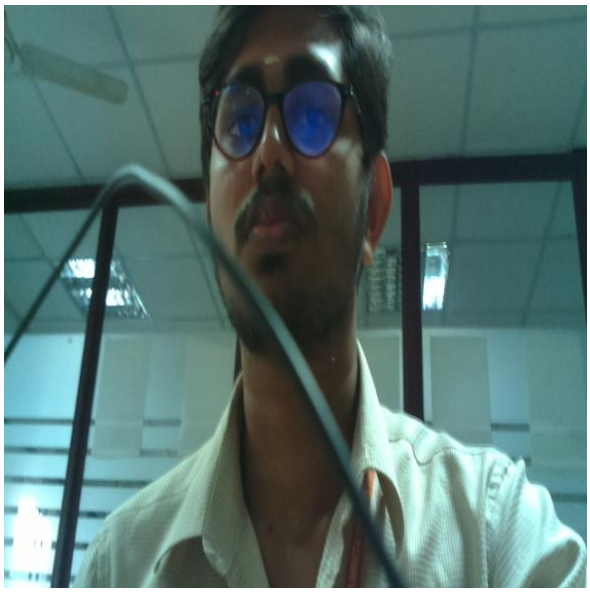


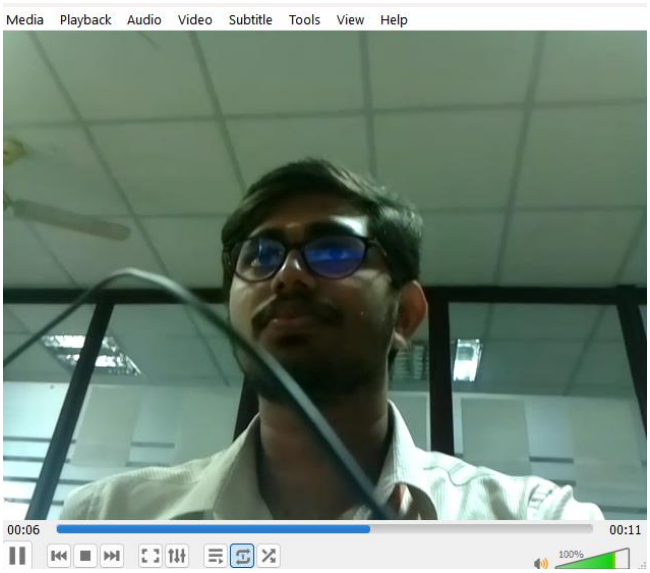
2. On detecting movement, the screen in Adafruit turns on and the LED glows



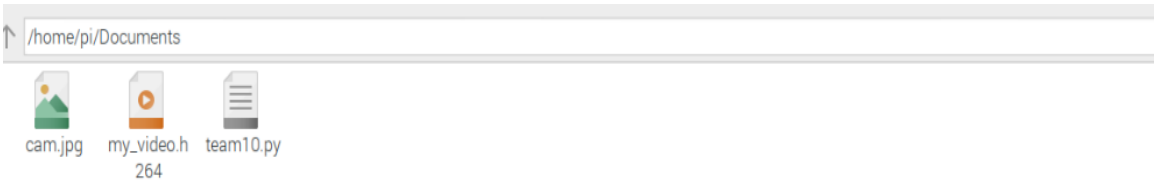


The Camera captures an Image and video recording starts

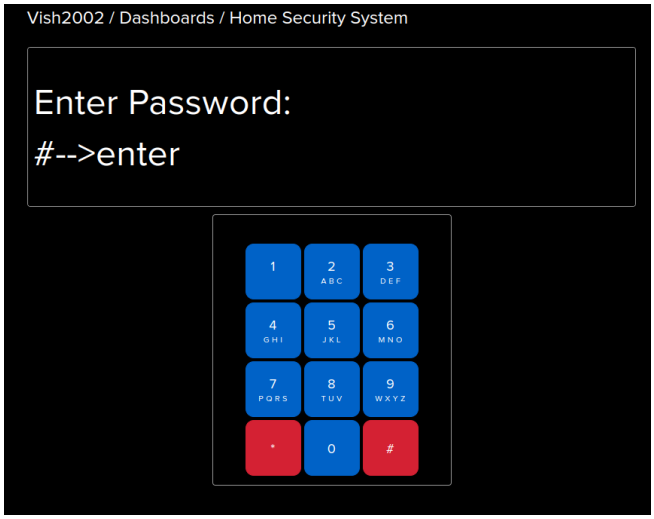


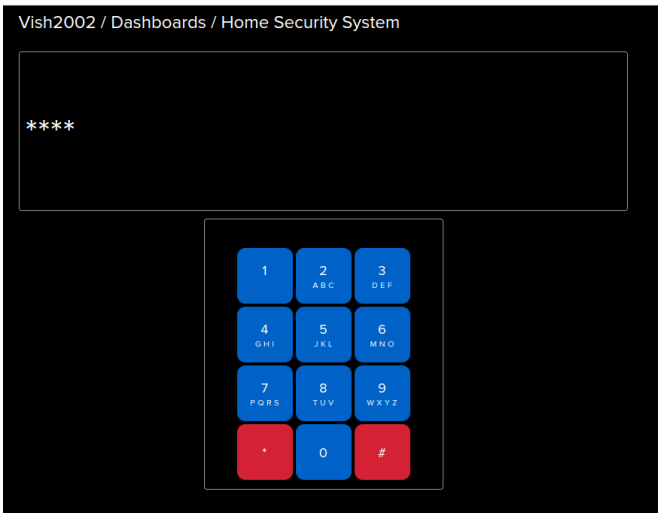


The video is stored locally in a folder

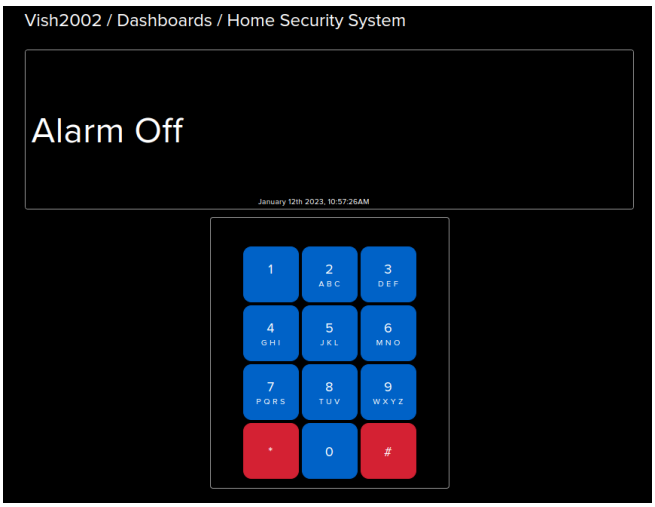


3. Entering Password



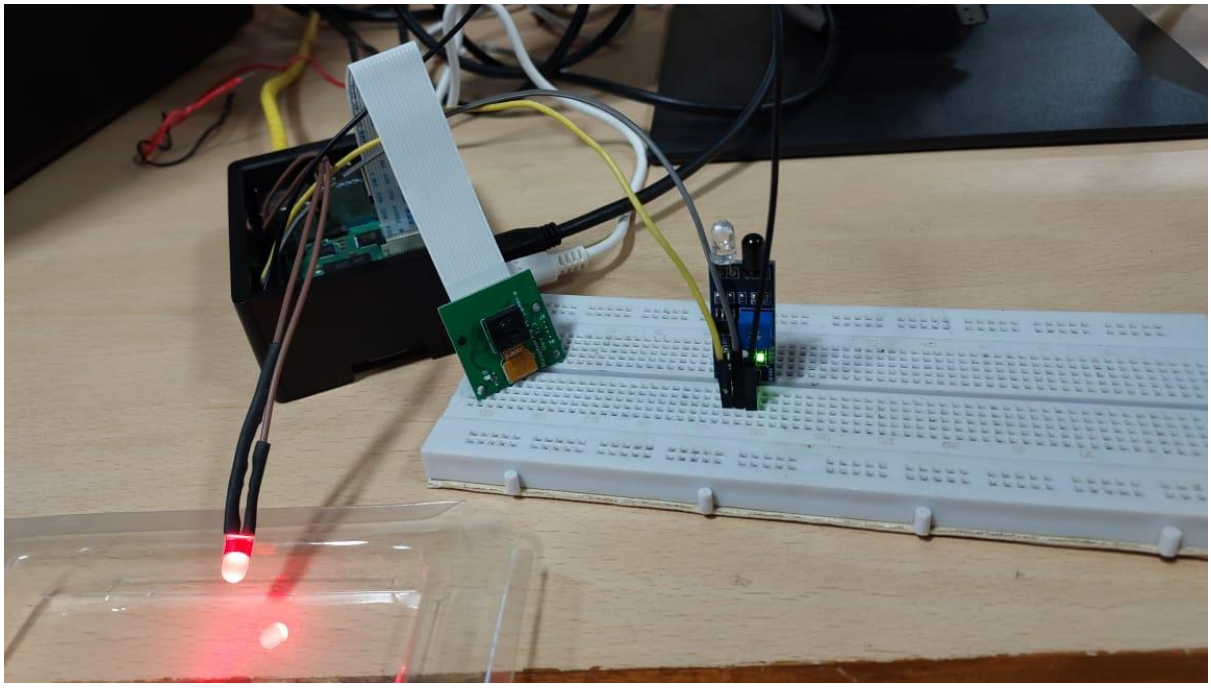


Alarm Off



4. If incorrect password is entered

A message is displayed



The LED continues to glow