CSE1901 - Technical Answers to Real World Problems (TARP)

Project Report

Anti-theft Flooring System

By

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Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

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DECLARATION

I hereby declare that the report titled "IOT based Anti-theft Flooring System using Raspberry Pi**"** submitted by 19BCE1676 Aditya Pokhriyal, 19BCE1690 Shreya Agrawal, 19BCE1692 Shubham Jindal, 19BCE1850 Vivek Kumar, 19BCE1860 Nimisha Swain to VIT Chennai is a record of bona-fide work undertaken by me under the supervision of **Dr Geetha S**, School of Computer Science and Engineering, Vellore Institute of Technology, Chennai.

Signature of the Candidate

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Shreya Agrawal (19BCE1690)
Shubham Jindal (19BCE1692)
Vivek Kumar (19BCE1850)
Nimisha Swain (19BCE1860)

CERTIFICATE

Certified that this project report entitled "IOT based Anti-theft Flooring System using Raspberry Pi**"** is a bonafide work of Aditya Pokhriyal 19BCE1676, Shreya Agrawal 19BCE1690, Shubham Jindal 19BCE1692, Vivek Kumar 19BCE1850, Nimisha Swain 19BCE1860 and they carried out the Project work under my supervision and guidance for CSE1901 - Technical Answers to Real World Problems (TARP).

Dr. Geetha S
SCOPE, VIT Chennai

ACKNOWLEDGEMENT

The satisfaction and euphoria that accompany the successful completion of any task would be incomplete without the mentioning of the people whose constant guidance and encouragement made it possible. We take pleasure in presenting before you, our project, which is result of studied blend of both research and knowledge.

We express our earnest gratitude to our internal guide, Assistant Professor Dr. Geetha S, Department of SCOPE, our project guide, for her constant support, encouragement and guidance. We are grateful for her cooperation and her valuable suggestions.

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ABSTRACT

Security and safety have always become a basic necessity for the urban population. With the rapid urbanization and development of big cities and towns, the graph of crimes is also on the rise. To secure and guard our house in our absence, this system came up with the rescue. This system is secure flooring tile connected with IOT when we go out of house, the system is on, then whoever comes inside the house it passes the information over IOT. This system powered is by Raspberry pi it includes, two tiles for demonstration purpose, Piezo sensor. Whenever the thief enters in the house, and steps on the floor immediately it will send a message on IOT system.

CONTENTS

1. Introduction

1.1 Objective and goal of the project

Now-a-days, Security has become the most challenging task. Everyone wants safety but in present scenario, nothing is safe not even in their own houses. Home is a place where we keep our assets and our capital. But we can never be sure about the security of that as set behind us and the possibilities of intrusion are increasing day by day. We generally lock houses when going out of the house. But just locking the home is not enough, there must be a system which safety our home, belongings and income from theft is the necessary requirements for home security system and keep track of the activities and report to the owner accordingly and works according to the response of the owner.

One single step anywhere on the floor is tracked and user is alarmed over IOT. This system is secure flooring tile connected with IOT when we go out of house, the system is to be turned on, then whoever comes inside the house it passes the information over IOT. This system powered is by Raspberry pi it includes, two tiles for demonstration purpose, Piezo sensor, camera, Wifi modem. Whenever the thief enters in the house, and steps on the floor immediately it is sensed by the sensor which passes on the signal to raspberry pi controller. The controller in turn processes it to be valid signal and then moves the camera to the area where movement was detected and then transmits it over the Internet for the home owner to check the image. We here use IOT Gecko for the web based GUI of IOT system which sounds an alert and shows the image captured to user.

1.2 Problem Statement

Anti-Theft Detection And Alert System Using RPi:

Whenever the thief enters in the house, and steps on the floor immediately it is sensed by the sensor which passes on the signal to raspberry pi controller. Thecontroller in turn processes it to be valid signal andthen moves the camera to the area where movement was detected and then transmits it over the Internet for the home owner to check the image.

1.3 Motivation

1.3.1 The device was capable in distinguishing between human and animal intrusion using sensor for body temperature detection.

1.3.2 It was using an alarm system which uses to alert the owner by making sound.

1.3.3 It was convenient in use, relatively free from false alarms and does not require Frequent user action to arm and disarm the system.

1.4 Challenges

1.4.1 The use of sensor for body temperature detection increases the cost of the project.

1.4.2 The sound was made by device will not be recognized by the owner, if he/she is not present there.

2. Literature Survey

This project demonstrates the design and development of Wi-Fi connectivity based anti theft flooring system using Raspberry Pi and an IoT Module reducing continuous human monitoring and controlling with enhanced performance and effective results. Adding wireless fidelity to embedded systems will open up various feasibilities such as worldwide monitoring and control, reliable data storage etc. This system comprises of wireless piezo sensor for surveillance. Modular design is followed so that any number of nodes can be added or removed. The user is warned after an unusual behavior is occurred and an image is sent which shows the events captured by the camera. The IoT module eliminates the need of a microcontroller and wireless transceiver module in sensor node, thus it makes the node compact, cost effective and easy to use. The biggest advantage of the system is that the user can seek surveillance from anywhere in the world and can respond according to the situations.[1]

The main of this paper is for instance the technology used for security purpose. This paper presents the event process in security system that uses cctv for security purpose. This security system is implemented using raspberry pi B. By combining the software's and camera this technique is employed as an intelligent monitoring sytem. Total security is provided to owner during a face of image at any instant during which area it's implemented. Image is send through IOT(on 'Gmail account of owner').Technology has reached a stage where mounting cameras to capture video imagery is reasonable ,but finding available human resourse's to take a seat and watch is imagery. Like other systems it does'nt require continuous surveillance of human resourse's, machine will do the entire work.[5]

The proposed research methodology aims to style a generally implementable framework for providing a house owner/member with the immediate notification of an ongoing theft (unauthorized access to their premises). For this purpose, a rigorous analysis of existing systems was undertaken to spot research gaps. the issues found with existing systems were that they will only identify the intruder after the theft, or cannot distinguish between human and non-human objects. Wireless Sensors Networks (WSNs) combined with the utilization of Internet of Things (IOT) and Cognitive Internet of Things are expanding smart home concepts and solutions, and their applications. this research proposes a completely unique smart home anti-theft system which will detect an intruder, albeit they need partially/fully hidden their face using clothing, leather, fiber, or plastic materials. The proposed system also can detect an intruder within the dark employing a CCTV camera without night-sight capability. the elemental idea was to style an economical and efficient system for a private to be ready to detect any quite theft in real-time and supply instant notification of the theft to the house owner. The system also promises to implement home security with large video data handling in real-time. The investigation results validate the success of the proposed system.[4]

3. Requirements Specification

3.1 Hardware Requirements

- Raspberry Pi
- Peizo Sensor
- Wifi Modem
- Buzzer
- Resistor
- Capacitors
- Transistors
- Cables and Connectors
- Diodes
- PCB and Breadboards
- LED
- Transformer/Adapter
- Push Buttons
- Switch
- IC
- IC Sockets

3.2 Hardware Description

1. RaspberryPiCamera

Camera module is Pi camera interfacing to the raspberry pi module. Its resolution is 5-megapixel and still picture resolution 2592 x 1944, Max image transfer rate 1080p: 30fps, this Pi camera module is used for captures an image and send captured image to the Raspberry pi module.

Fig.2 Pi Camera

2. ServoMotor

Attach the servo to a GPIO(weselectedGPIO17here) of the Raspberry pi and control its rotation utilizing pulse-width modulation.The servo is powered by a 6V-battery pack. SG90 is a small servo motor with standard functionality and working. This servo motor rotates180 degrees, 90 degrees in each direction. Controlling this motor is not so much difficult like it does not require any motor controller and can be controlled by any servo code or library, most suitable for beginners.The motor comes with 3 arms and hardware. Being a digital servo motor it receives andprocesses PWM signal.

Fig.3 Servo Motor

3. PIZO Sensor

A piezo electric sensor, also known as a piezo electric transducer, is a device that uses the piezo electric effect to measure changes in pressure, acceleration, temperature, strain or force by converting these into an electrical charge. The prefix piezo is Greek for press or squeeze. The ability of piezo electric material to convert mechanical stress into electrical charge is called a piezo electric effect. Generated piezo electricity is proportional to the pressure applied to solid piezo electric crystal materials.

4. RASPBERRYPI3(MODELB+)

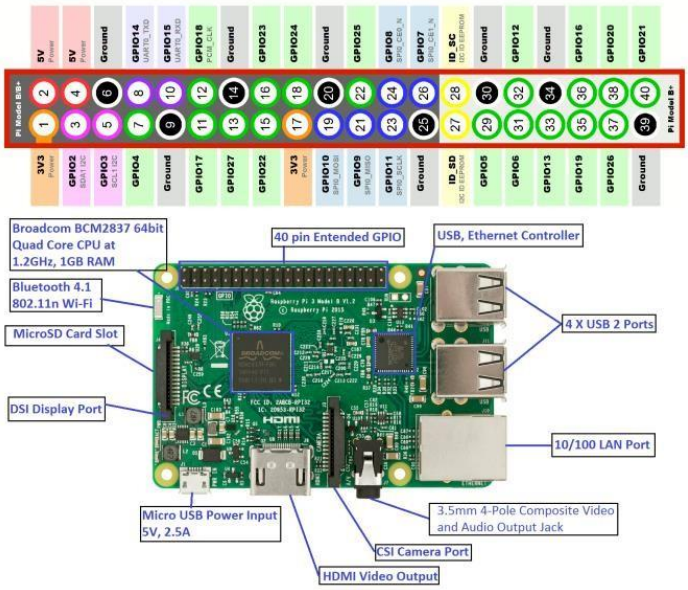


Fig.3 PaspberryPi 3B+

Raspberry pi is Broadcom BCM283764bitARMv7 Quad Core Processor powered Single Board Computer running at1.2GHz.

In-built:

- BCM 43143 WiFi onboard
- Bluetooth Low Energy (BLE) on board
- Micro SD port for loading your operating system and storing data
- 1GB RAM
- 40 pin extended GPIO
- 4 x USB 2 ports
- 4 pole Stereo output and Composite video port
- Upgraded switched Micro USB power source (nowsupportsupto2.4 Amps)
- CSI camera port for connecting the Raspberry Pi camera.

5. NODEMCU

Node MCU is an open-source firm ware and development kit that helps you to prototype or buildIoT products. It includes firmware that runs on the ESP8266 Wi-Fi So C from Espress if Systems, and hardware which is based on the ESP-12 module. The firm ware uses the Lua scripting language. It is based on the Lua project and built on the Espress if Non-OSSDK for ESP8266.

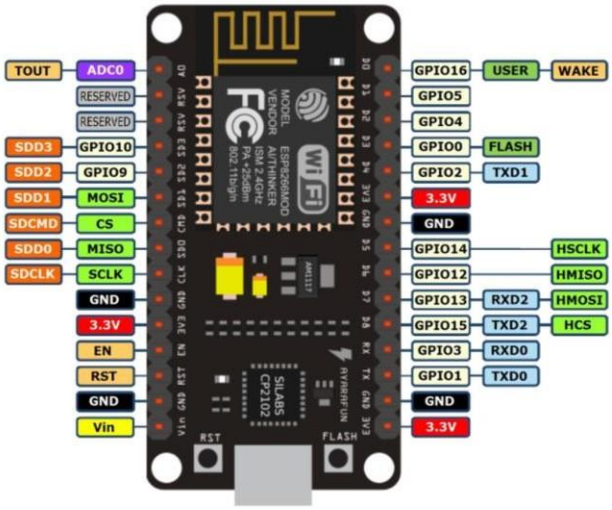


Fig.4NODEMCU

3.3 Software Requirements

3.3.1 Python 3 compiler
3.3.2 Programming Language: Python

3.4 Software Description

The software components are used for the project has been mentioned below:

3.4.1 Raspbian OS:

Raspbian is an unofficial port of Debian Wheezy armhf with compilation settings adjusted to produce optimized "hard float" code that will run on the Raspberry Pi. This provides significantly faster performance for applications that make heavy use offloatingpointarithmeticoperations.Allotherapplicationswillalsogainsomeperformanceth roughthe use of advanced instructions of the ARMv6 CPU inRaspberryPi.

Although Raspbian is primarily the efforts of Mike Thompson (mp thompson) and Peter Green (plug wash), it has also benefited greatly from the enthusiastic support of Raspberry Pi community members who wish to get the maximum performance from their device.

3.4.2 PYTHON:

Python is an easy to learn, powerful programming language. It has efficient high-level data structures and as imple but effective approach to object-oriented programming. Python's elegant syntax and dynamic typing, together with its interpreted nature, make it an ideal language for scripting and rapid application development in many areas on most platforms.

The Python interpreter and the extensive standard library are freely available in source or binary form for all major platforms from the Python Website, https://www.python.org/,and may be freely distributed. The same site also contains distributions of and pointers to many free third party Python modules, programs and tools, and additional documentation.

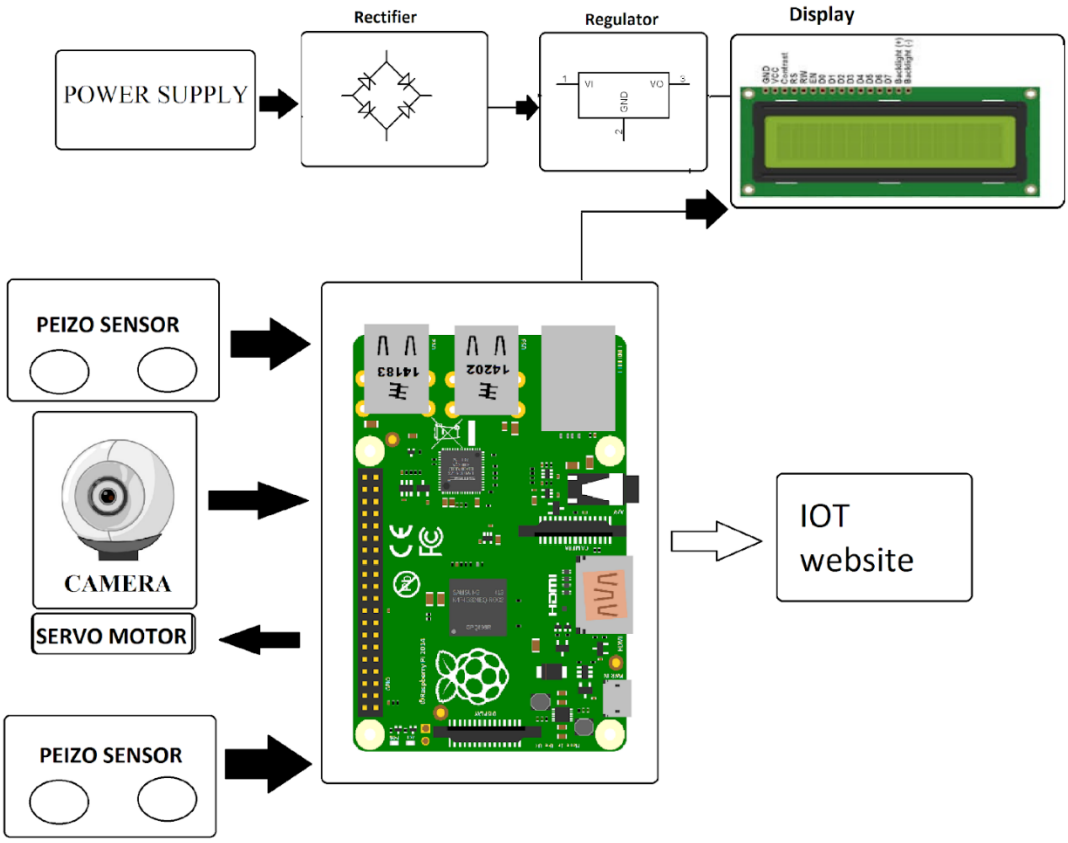
The Python interpreter is easily extended with new functions and data types implemented in C or C++ (or other languages call able from C).Python is also suitable as an extension language for customizableapplications.

3.4.3 OPENCV:

OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products. Being a BSD-licensed product, OpenCV makes it easy for businesses to utilize and modify the code. It is free for both commercial and non-commercial use.

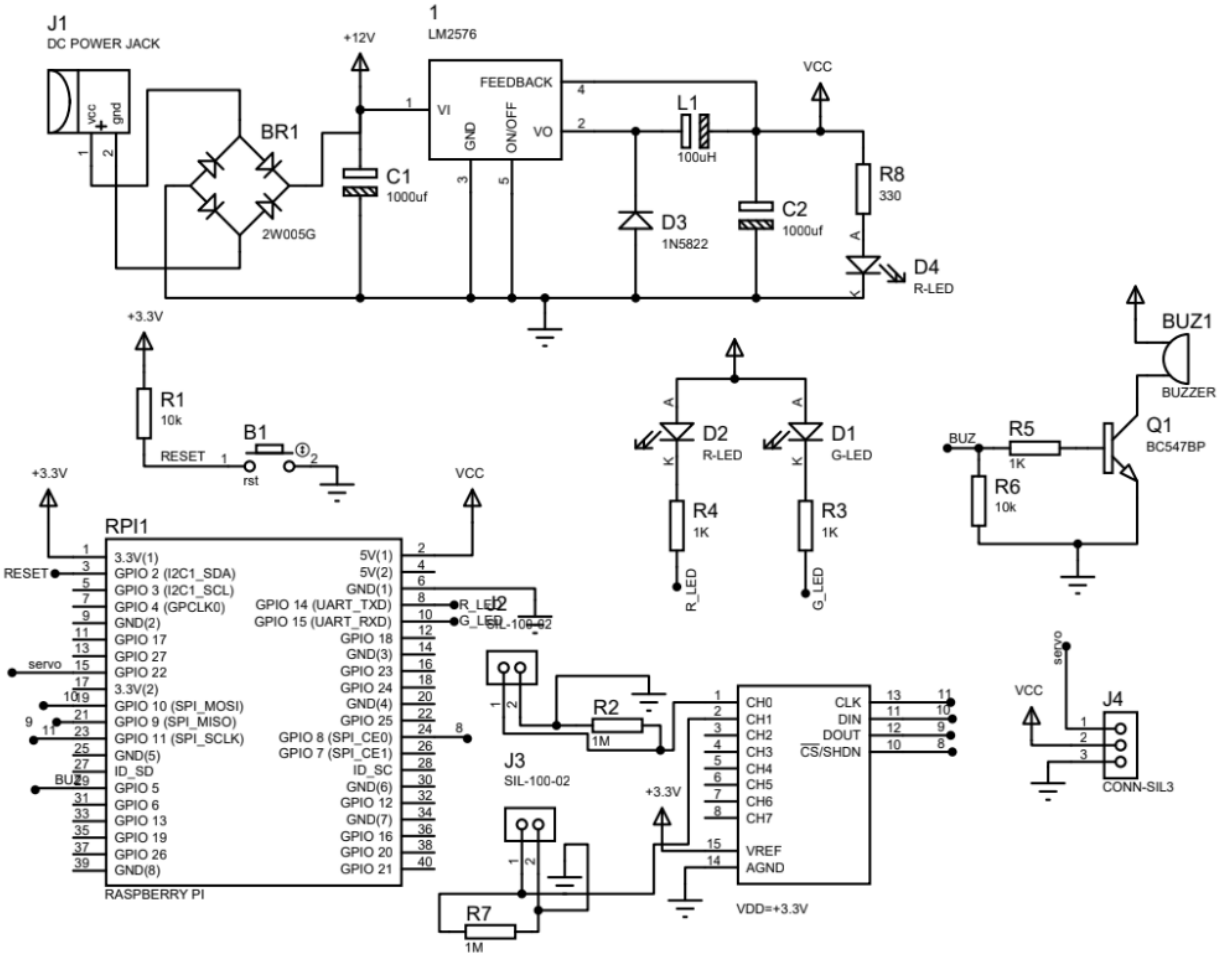
4 System Design

4.1 Block Diagram

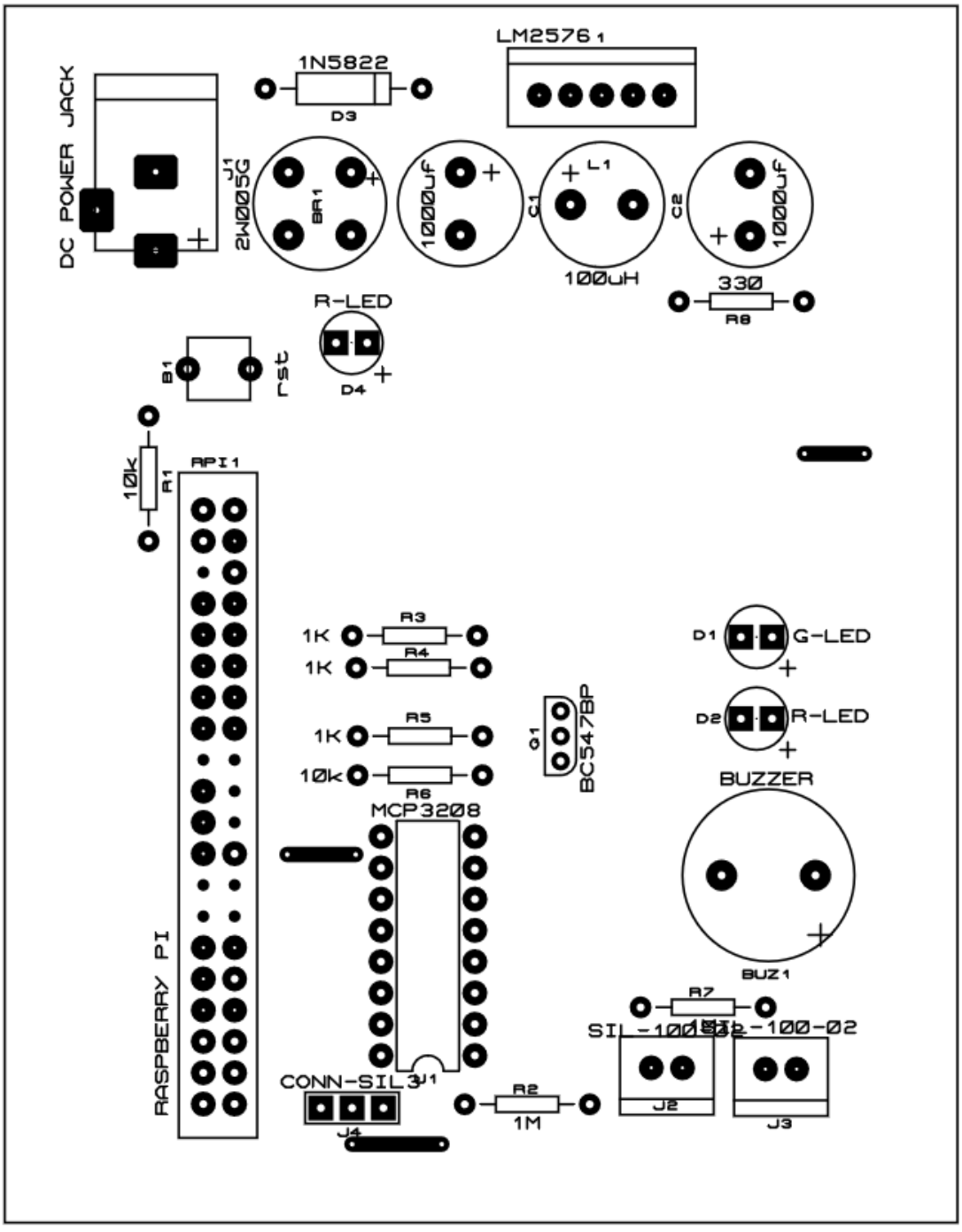


4.2 Circuit

A circuit is actually any loop through which matter is carried. For an electronic circuit, the matter carried is the charge by electronics and the source of these electrons is the positive terminal of the voltage source .When this charge flows from the positive terminal, throughout the loop and reaches the negative terminal, the circuit is said to be completed. However this circuit consists of a number of components which affects the flow of charge in many ways. Some may provide hindrance to the flow of charge, some simple store or dissipate charge. Some require external source of energy, some supply energy.


J1
DC POWER JACK
vcc
gnd
BR1
2W005G
+12V
1
LM2576
VI
GND
ON/OFF
FEEDBACK
VO
C1
1000uf
L1
100uH
VCC
R8
330
D3
1N5822
C2
1000uf
D4
R-LED
+3.3V
R1
10k
B1
RESET
rst
D2
R-LED
D1
G-LED
R4
1K
R3
1K
R_LED
G_LED
BUZ1
BUZZER
BUZ
R5
1K
Q1
BC547BP
R6
10k
RPI1
3.3V(1)
GPIO 2 (I2C1_SDA)
GPIO 3 (I2C1_SCL)
GPIO 4 (GPCLK0)
GND(2)
GPIO 17
GPIO 27
GPIO 22
3.3V(2)
GPIO 10 (SPI_MOSI)
GPIO 9 (SPI_MISO)
GPIO 11 (SPI_SCLK)
GND(5)
ID_SD
GPIO 5
GPIO 6
GPIO 13
GPIO 19
GPIO 26
GND(8)
5V(1)
5V(2)
GND(1)
GPIO 14 (UART_TXD)
GPIO 15 (UART_RXD)
GPIO 18
GND(3)
GPIO 23
GPIO 24
GND(4)
GPIO 25
GPIO 8 (SPI_CE0)
GPIO 7 (SPI_CE1)
ID_SC
GND(6)
GPIO 12
GND(7)
GPIO 16
GPIO 20
GPIO 21
RASPBERRY PI
RESET
servo
BUZ
J2
SIL-100-02
J3
SIL-100-02
R2
1M
R7
1M
CH0
CH1
CH2
CH3
CH4
CH5
CH6
CH7
VREF
AGND
CLK
DIN
DOUT
CS/SHDN
VDD=+3.3V
J4
CONN-SIL3

4.3 PCB


LM2576-1
1N5822
D3
DC POWER JACK
J1
2W005G
BR1
1000uF
C1
L1
100uH
C2
1000uF
330
R8
R-LED
D4
B1
rst
10k
R1
RPI1
1K
R3
1K
R4
1K
R5
10k
R6
MCP3208
Q1
BC547BP
D1
G-LED
D2
R-LED
BUZZER
BUZ1
R7
SIL-100-02
J2
J3
RASPBERRY PI
CONN-SIL3
J4
R2
1M

4.4 Architectural Flow of System

Following Figures shows the architectural flow of system installation process and working of the proposed system which will lead to prevention of Theft.

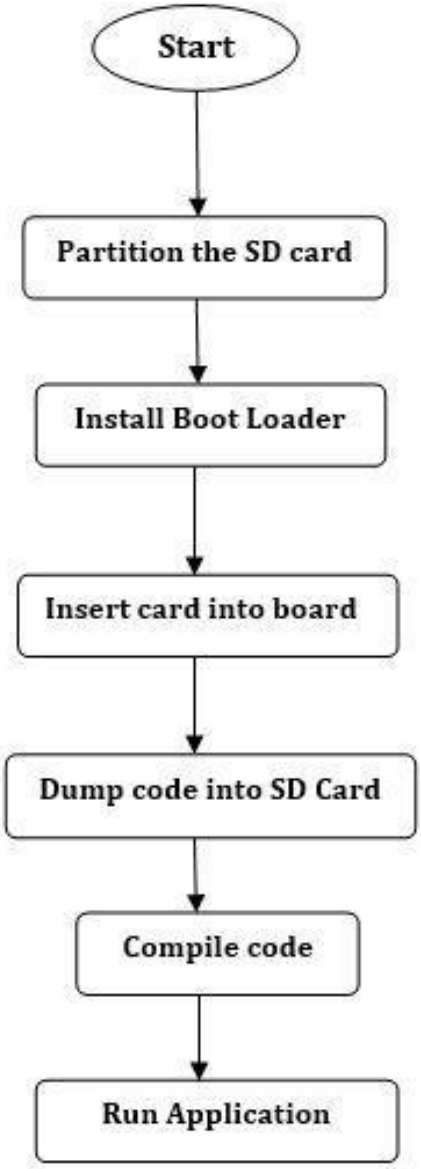


Fig.5 Installation Process

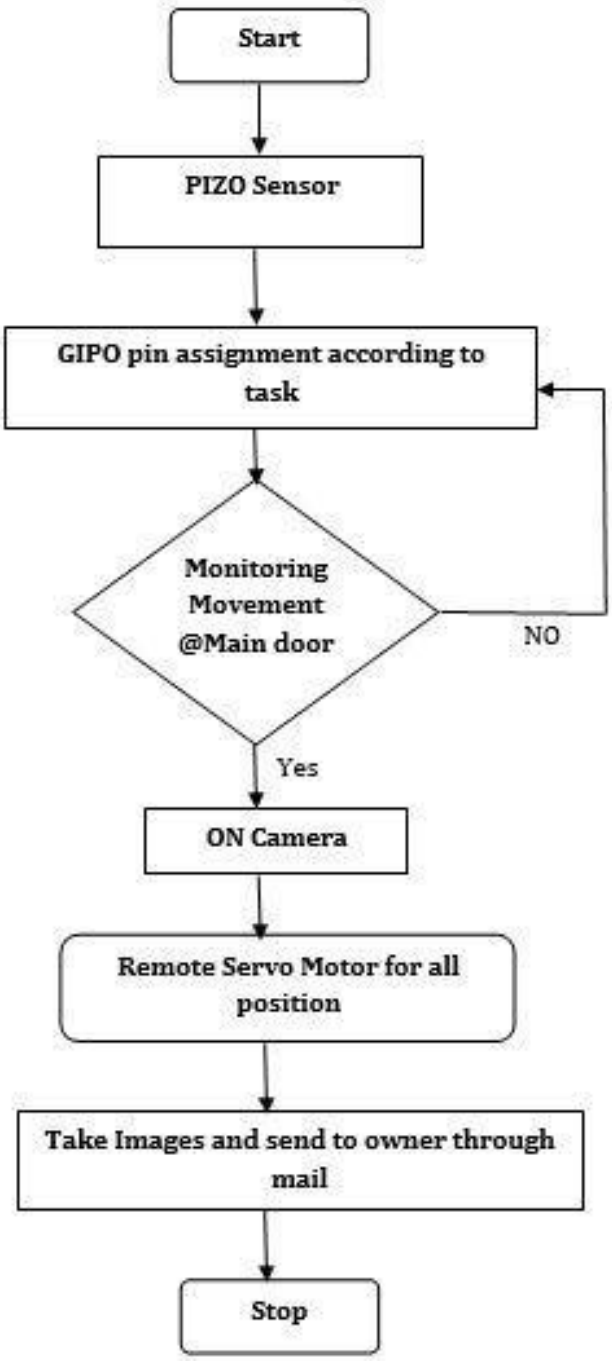


Fig.6 Flow Chart

5. Implementation of System

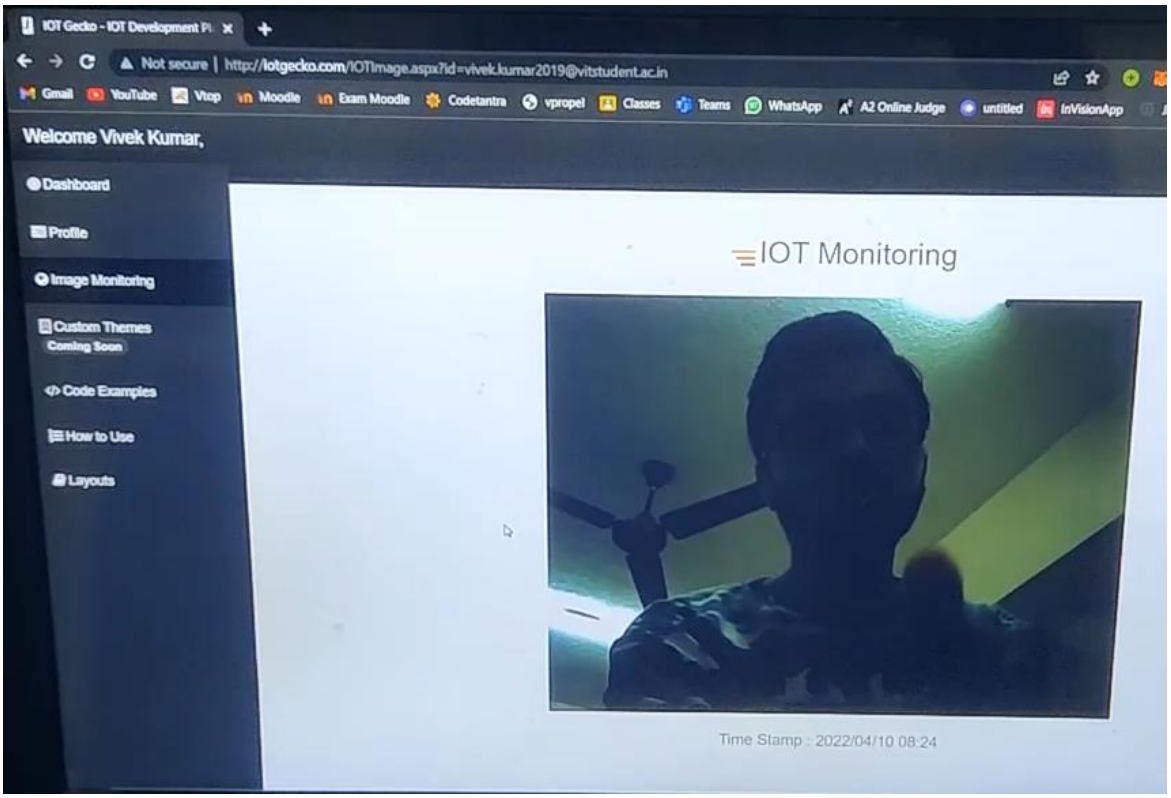
In this project raspberry pi 3B+ (model)has been used as heart of system. This proposed system is an intelligent system and it eliminates the need of continuous by human resource. Thus, any human extra work is ruled out.

This system continuously checks the status of place by sensors that Is any one entering in the shop or not. And sends the alert message to the owner with live images by rotating camera with different angles.

In this security system human bodies are detected by PIZO sensor.

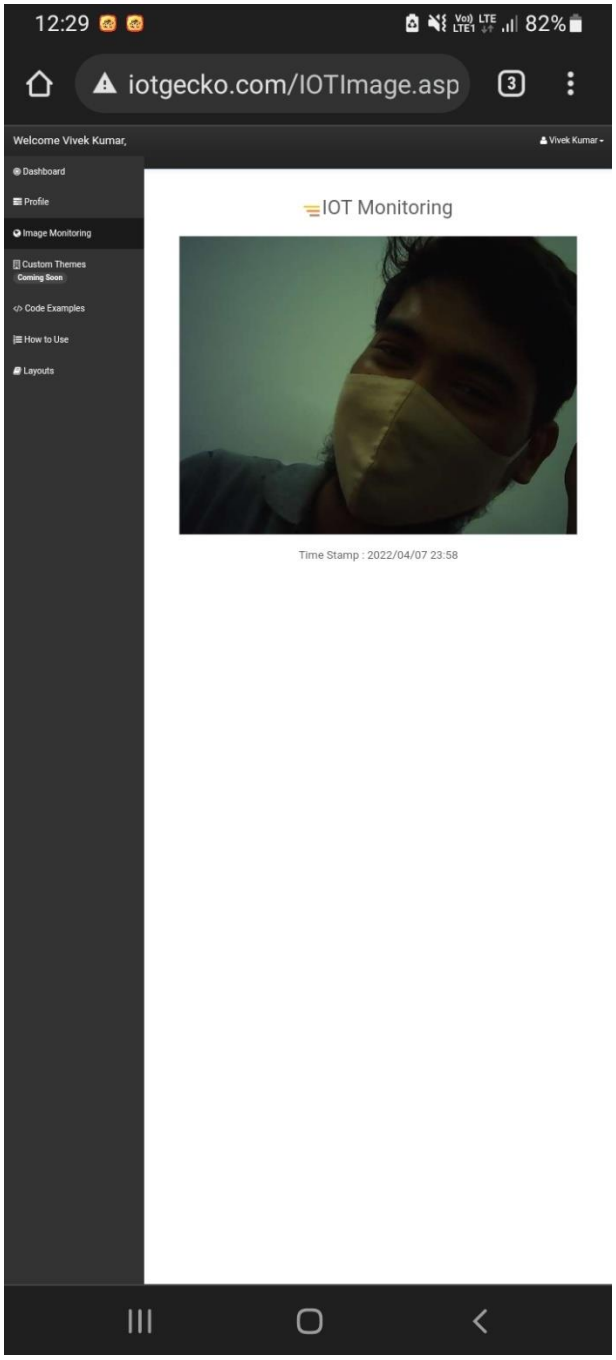
The main aim of this project is to make an automated security system for Banks and jewelry shops.

The project consists of Raspberry Pi with sensor and camera. The whole system is placed in that place. If system detect someone in Bank/shop it sets the capture the live images and sent it one-mail.



6. Results and Discussion

This system is secure flooring tile connected with IOT when we go out of house, the system is to be turned on, then whoever comes inside the house it passes the information over IOT. After passing the information to the IOT with image, the owner receives the image which has been captured by the system with the time.



7. Conclusion and Future Work

There search work that will be carried out in this thesis would be mainly focused to design and develop efficient and convenient motion detection surveillance i.e. an Anti-Theft device to solve security problems which will help to reduce/stop theft. This system is suitable for small personal area surveillance, i.e., personal office cabin, bank locker room, parking entrance. Whenever the motion is detected through. The main Advantage of the project is Easy to implement, Low cost with High quality.

8. REFERENCES

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[2] DIXIT SURAJ VASANT, BABAR APEKSHA ARUN and MEHER PRIYA SHIVAJI, "RASPBERRY-PI BASED ANTI-THEFT SECURITY SYSTEM WITH IMAGE FEEDBACK", *Ejournal.aessangli.in*, 2017.

[3] DR.M.SURESH, A.AMULYA, M.HARI CHANDANA, P.AMANI and T.LAKSHMI PRASANNA, "ANTI THEFT FLOORING SYSTEM USING RASPBERRY PI USING IOT", *Ijceng.com*, 2021.

[4] D. Pavithra; Ranjith Balakrishnan, “IOT based monitoring and control system for home automation”, IEEE Explore, Communication Technologies (GCCT), 2015 Global Conference on.

[5] IOT based Raspberry Pi Home Security System with Email Alert, Circuit Digest.com, and Saddam.

APPENDIX

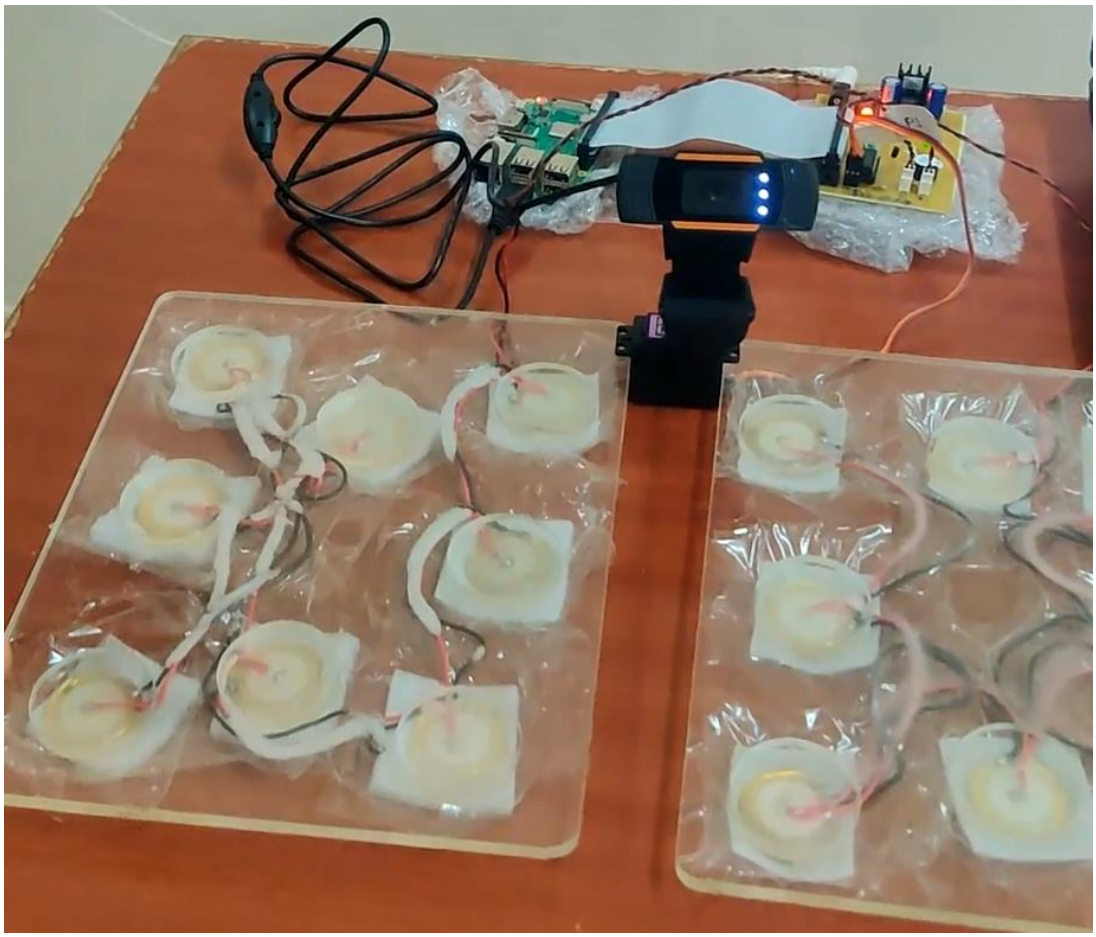
CODE

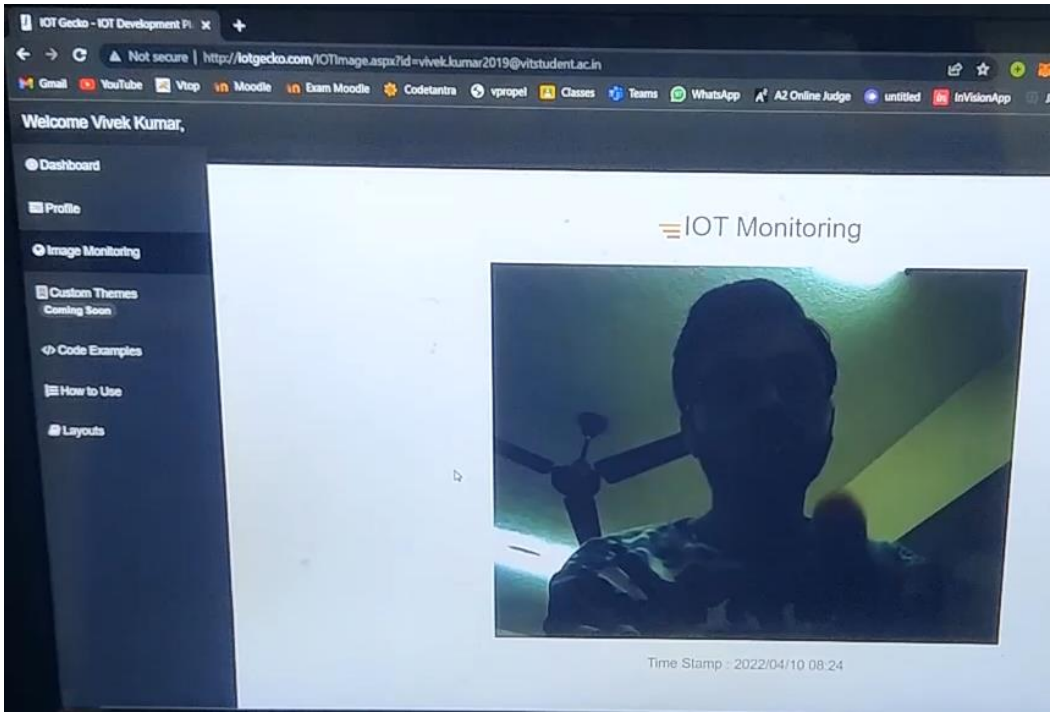
```
from PIL import Image
import base64
import Adafruit_CharLCD as LCD
import RPi.GPIO as GPIO
import time
from datetime import datetime
import os
import math
import cv2
import time
import shutil
import sys
from glob import glob
from subprocess import check_output, CalledProcessError
from servosix import ServoSix
import time
import requests

from urllib.request import urlopen
import spidev # To communicate with SPI devices
from numpy import interp       # To scale values
from servosix import ServoSix

ss = ServoSix()
servo1 = 4 #for gpio 22

url =
'http://iotgecko.com/IOTHit.aspx?id=ali.shahid1@jgc.com&pass=8560&data='

GPIO.setwarnings(False)
GPIO.setmode(GPIO.BCM)

red = 14
green = 15
button = 18
buzzer = 5
reset = 2

GPIO.setup(reset,GPIO.IN)
GPIO.setup(red,GPIO.OUT)
GPIO.setup(green,GPIO.OUT)
GPIO.setup(buzzer,GPIO.OUT)

GPIO.output(green, True)
GPIO.output(red, True)

spi = spidev.SpiDev() # Created an object
spi.open(0,0)
```

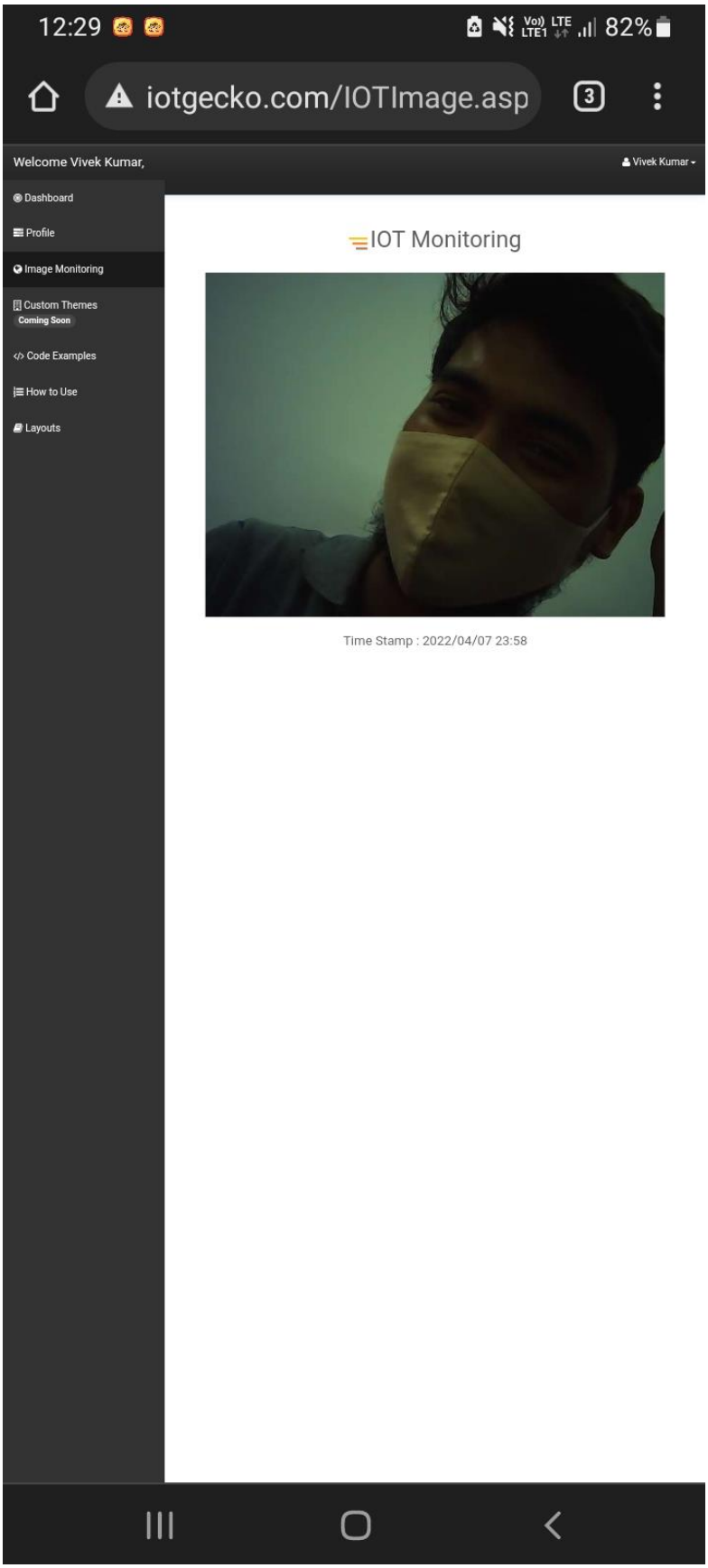
```
def analogInput(channel):
spi.max_speed_hz = 1350000
adc = spi.xfer2([1,(8+channel)<<4,0])
  data = ((adc[1]&3) << 8) + adc[2]
  return data

def check_connectivity_internet():
    try:
urlopen(url,timeout = 2)
        return True
    except:
        return False

def check_connectivity():
    camera=cv2.VideoCapture(0)
time.sleep(3)
request_site = url + '1'
    ret, frame = camera.read()
time.sleep(1)
    print ('sending sample image')
    cv2.imwrite("pic2.jpeg", frame)
    with open('pic2.jpeg', 'rb') as f:
en = base64.b64encode(f.read())
    data = {'img':en}
    r = requests.post(request_site, data= data)
    data = r.text
time.sleep(0.5)
    print(data)
    if data.find("Label1") > 0:
        index1 = data.find("Label1") + 8
        index2 = data.find("</span>")
resp = data[index1:index2]
        print(resp)
time.sleep(1)
camera.release()

def response():
req_site = url + '2' #+ '*' + '5' + '*' + '5'
    response = urlopen(req_site,timeout = 10)
    html = str(response.read())
    print (html)
    if html.find ("Label1") > 0:

        index1 = html.find("Label1") + 8
        index2 = html.find("</span>")
        resp1 = html[index1:index2]
        print(resp1)
    return resp1

while True:
GPIO.output(green, True)
    main = 1
time.sleep(2)
print("Connecting to\nInternet ...")
time.sleep(1)
    main = 1
    t1 = datetime.now()
```

```
    while not check_connectivity_internet():
        t2 = datetime.now()
        delta = t2 - t1
time_elapse = delta.total_seconds()
        if time_elapse> 10:
            print ("error check you internet connection")
            main = False
            while GPIO.input(reset) == True:
print('Press reset to\nrestart')
time.sleep(0.5)
            break
        else:
            main = True

    if main == True:
check_connectivity()
        print('connected')
        t3 = datetime.now()

    while True:
GPIO.output(green, False)
      output = analogInput(0) # Reading from CH0
      output2 = analogInput(1)
print("Input 1: {}, Input 2: {}".format(output,output2))
time.sleep(0.1)
      if output2 >= 100:
ss.set_servo(servo1, 130)
GPIO.output(buzzer, True)
GPIO.output(red, False)
check_connectivity()
time.sleep(1)
elif output >= 100:
ss.set_servo(servo1, 30)
GPIO.output(buzzer, True)
GPIO.output(red, False)
check_connectivity()
time.sleep(1)
      else:
ss.set_servo(servo1, 75)
GPIO.output(buzzer, False)
GPIO.output(red, True)
```

SCREENSHOTS



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82%
iotgecko.com/IOTImage.asp
Welcome Vivek Kumar,
Vivek Kumar
Dashboard
Profile
Image Monitoring
Custom Themes
Coming Soon
Code Examples
How to Use
Layouts
IOT Monitoring
Time Stamp : 2022/04/07 23:58