INTERNSHIP PROJECT REPORT ON:

IOT BASED ENERGY AWARE SMART DEPARTMENT AUTOMATION

SUBMITTED BY:

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[3GN18EC050]

SUBMITTED DATE: 25-10-2021

UNDERTAKING

I declare that the work presented in this project titled "**ENERGY AWARE SMART DEPARTMENT**", submitted to the All India council of robotics and Automation, for the award of the Internship in **INTERNET OF THINGS**, is my original work. I have not plagiarized or submitted the same work for the award of any other Internship. In case this undertaking is found incorrect, I accept that my Project may be unconditionally withdrawn.

October,2021

SUDEEP SHERIKAR

CERTIFICATE

Certified that the work contained in the project titled **“ENERGY AWARE SMART DEPARTMENT”, by SUDEEP SHERIKAR** , has been carried out under my supervision and that this work has not been submitted elsewhere for an Internship

All India Council of Robotics and Automation

Internet Of Things

Delhi-110020

ABSTRACT

Energy conservation is the key element of energy management. We can reduce the energy consumption by adopting various ways of energy conservation which includes efficient use of technologies and avoiding energy wastages. 5 to 10% of electricity is wasted every month due to inefficient usage.The various causes of energy wastage in our department includes the following reasons: Leaving the electrical appliances switched on while leaving the room.When the number of appliances switched on is not proportionate with the number of persons inside the room.Energy isn't free. Wasting energy isn't good for the environment either. Most of the energy sources we depend on, like coal and natural gas, can't be replaced.Efficient use of energy doesn’t not only reduces cost but also helps in sustainable usage of resources.This project mainly concentrates in saving energy in our department by implementing automation through Internet Of Things (IOT)This project is achieved by using Raspberry pi as a processor , sensors to indicate the presence of human beings , relays to control automatic switching on and off of the lights and fans and face detection technique to ensure human occupancy. The above implementation is monitored as well. These data are stored in a cloud server and retrieved whenever the need occurs.

saving of the power is the main concern, which is the basic aim of this project. To save the power consumption, we have proposed the smart, energy efficient home automation system using IoT. Thus, aim of this research to save the power consumption (reducing the electricity bills) and at the same time provide the safety and security of the home equipments.

COMPONENTS :

HARDWARE :

Intel Galileo gen 2, Arduino mega - board used for practice.

Raspberry pi - used for implementing the entire project.

Laptop with Linux OS.

IR sensor - to detect the Infrared rays emitting from human beings.

Relay circuit - to control the power circuit.

Breadboard, LED , jumper wires, etc.

SOFTWARE :

Arduino IDE

Raspbian OS

Python

OpenCV.

IR SENSOR BASED OCCUPANCY DETECTION:

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings.

PRINCIPLE :

An IR sensor can measure the heat of an object as well as detects the motion.These types of sensors measures only infrared radiation, rather than emitting it. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes, that can be detected by an infrared sensor.The emitter is an IR LED (Light Emitting Diode) and the detector is an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light received.

WORKING :

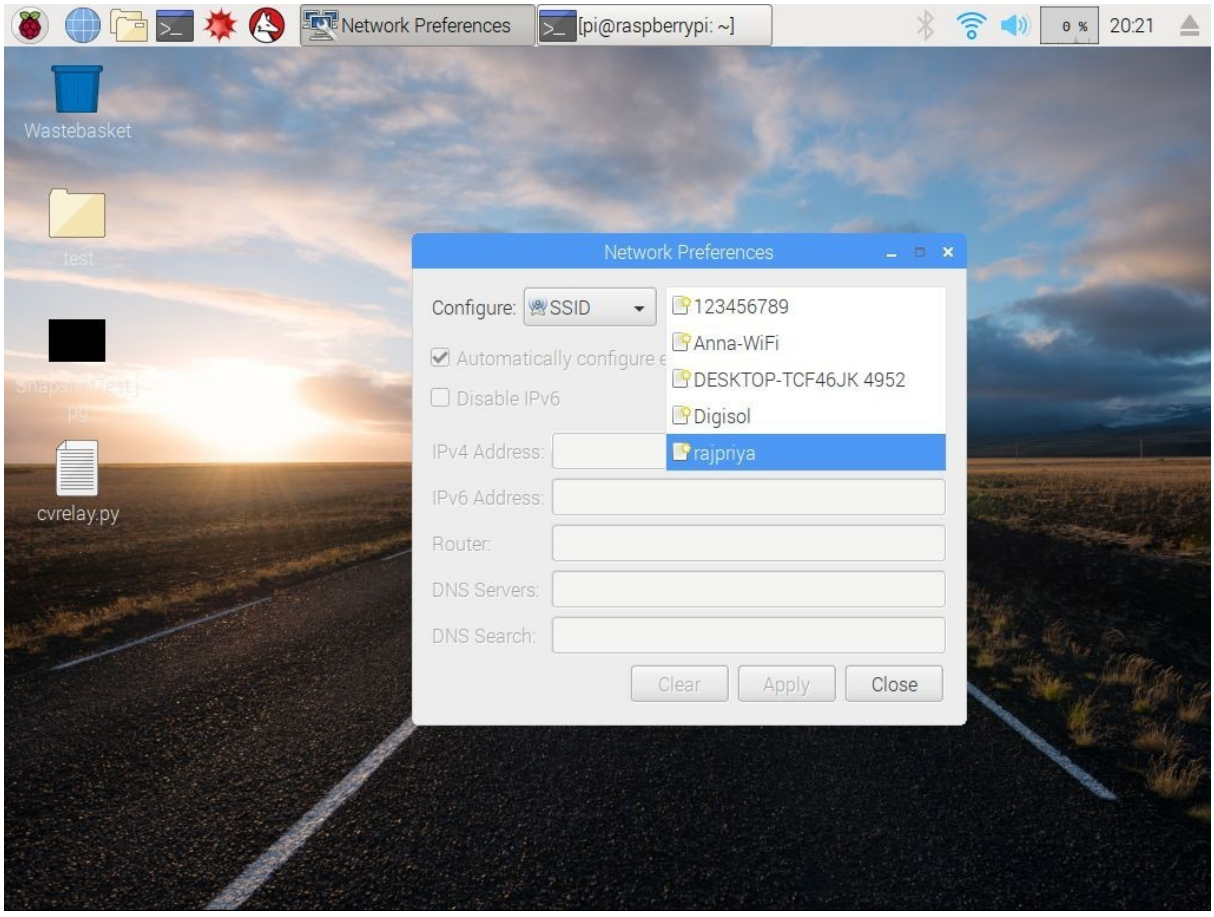
In this implementation, we use this sensor to sense the presence of a person in a closed environment. In addition to this we identify the number of persons as well. This saves energy by using the above implementation by switching on/off the relay which controls the entire power circuit. The main aim of this sensor part is to control the CCTV camera placed in a specific range.

IMPLEMENTATION :

A bootable SD card is loaded with Raspbian OS and inserted into a Raspberry pi. Using two IR sensors, Relay board and LCD display we achieve the below given circuit and through which we detect humans. LCD display is an additional display used to display the count. The overall implementation code is done in python programming language and is run in raspbian environment. The data obtained is stored in Firebase and the detailed information needed for the user is displayed in dashboard.

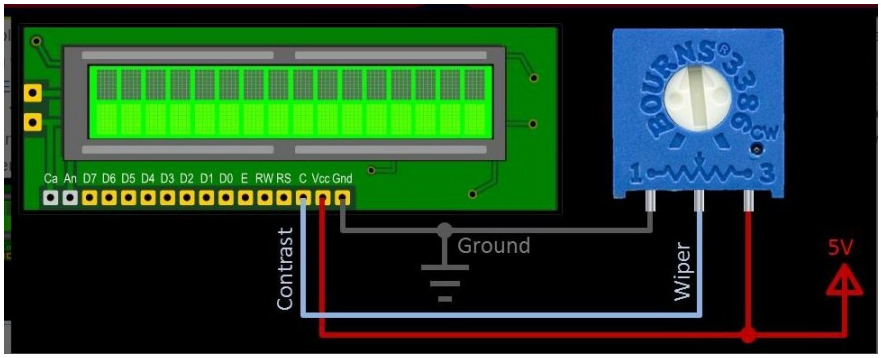
PROCEDURE :

Initially, the bootable SD card with Raspbian OS is inserted into the Raspberry Pi and the Pi is connected to the PC using HDMI cable.

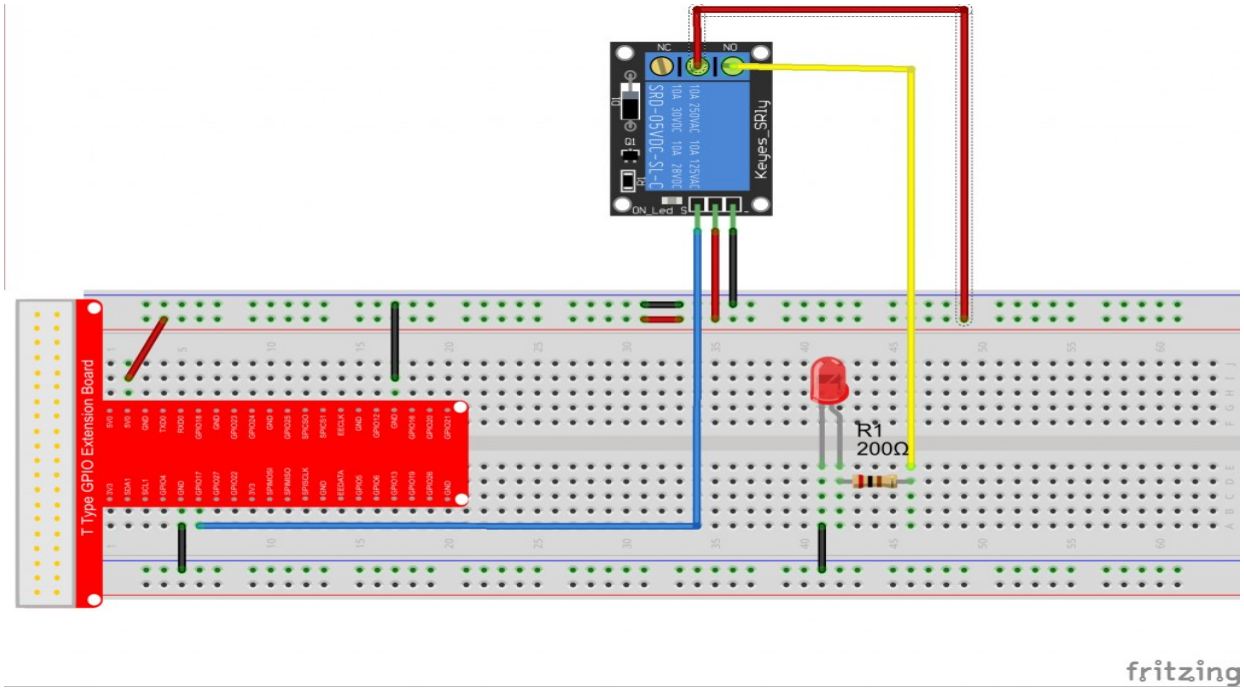


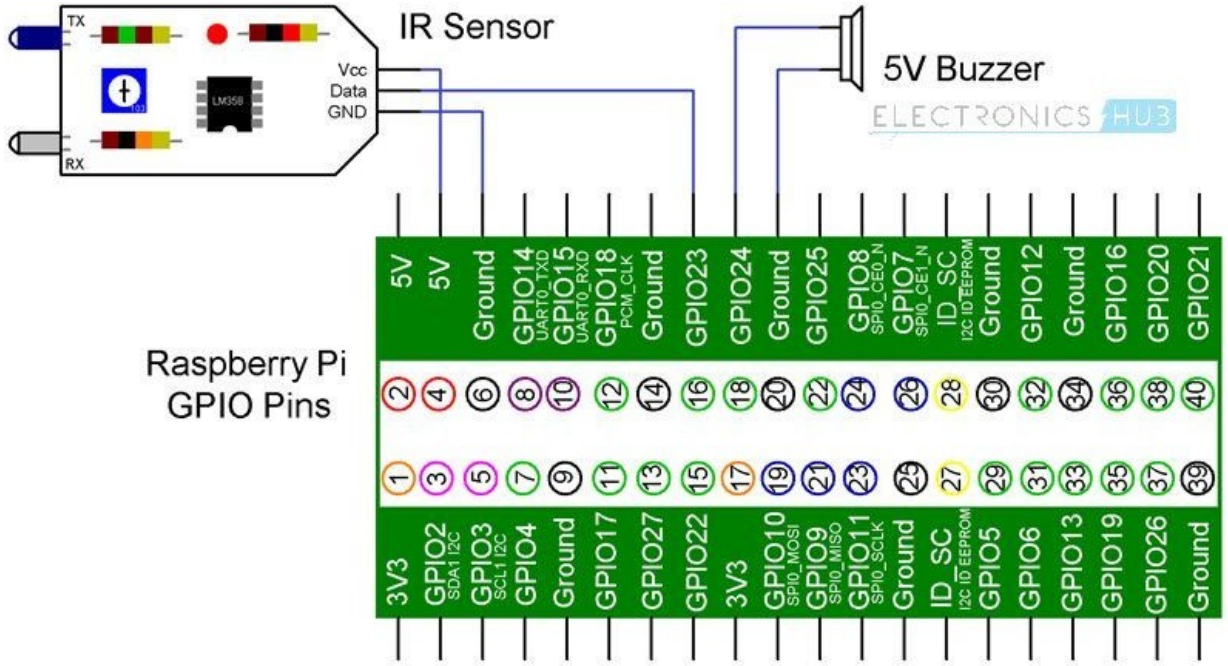
The Raspberry pi can also be connected to a laptop through ethernet or wifi. The picture below refers to the terminal command-line of Linux OS.

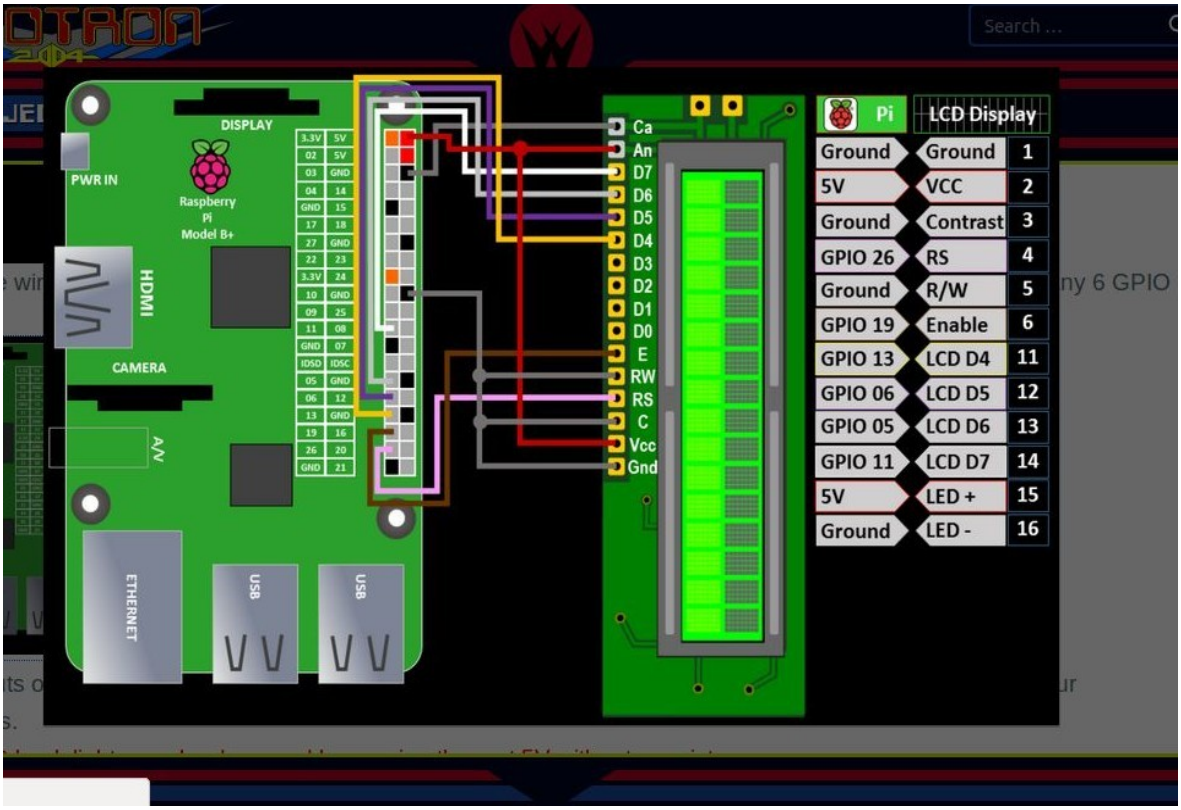
The Raspberry pi is connected with IR sensor and LCD display. The potentiometer is used to adjust the contrast of the LCD. The pin configuration is given below.

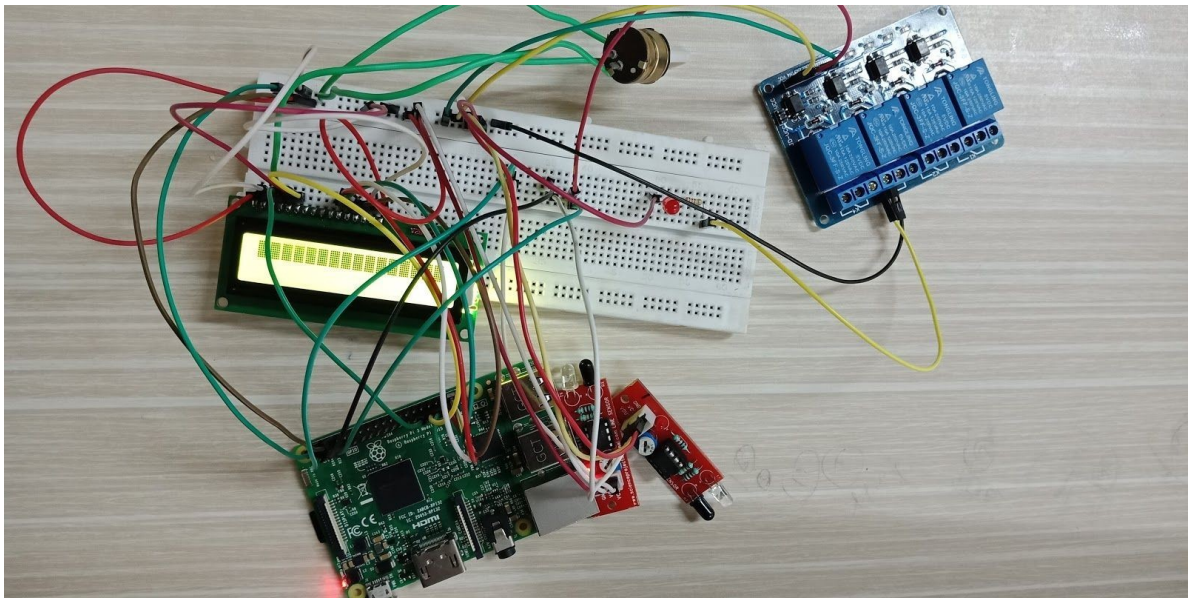


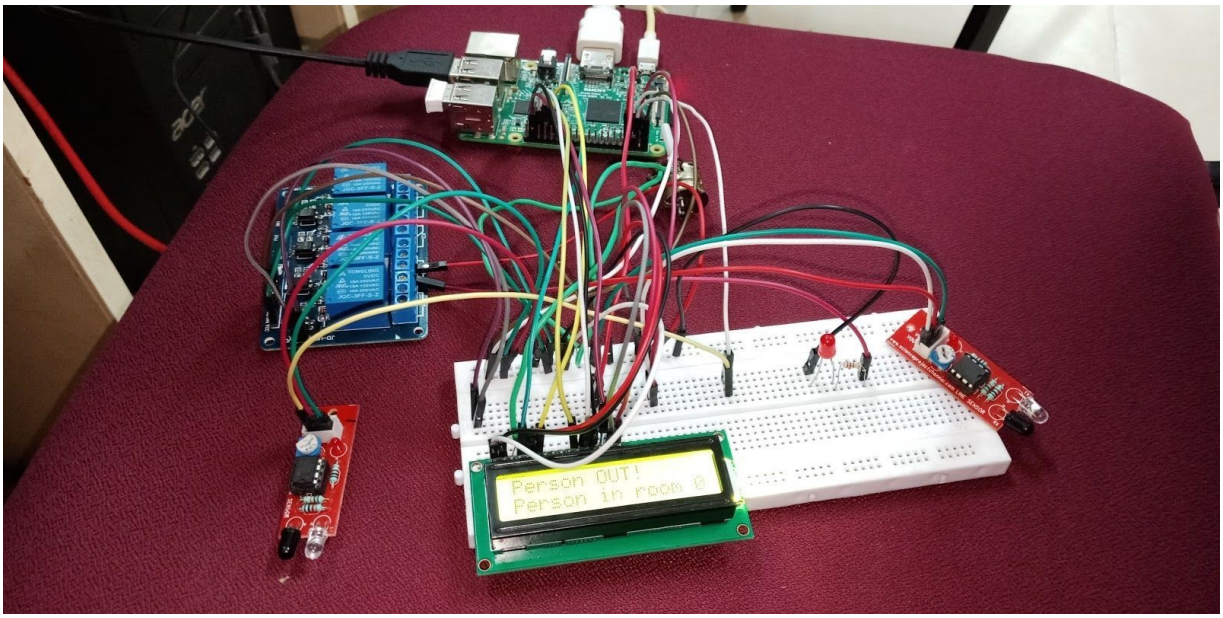
The above circuit is further connected to a Relay circuit followed by an LED to check the circuit. The complete image of the overall circuit is given for reference.






DISPLAY
PWR IN
Raspberry
Pi
Model B+
HDMI
CAMERA
A/V
ETHERNET
USB
USB
Ca
An
D7
D6
D5
D4
D3
D2
D1
D0
E
RW
RS
C
Vcc
Gnd
Pi
LCD Display
Ground Ground 1
5V VCC 2
Ground Contrast 3
GPIO 26 RS 4
Ground R/W 5
GPIO 19 Enable 6
GPIO 13 LCD D4 11
GPIO 06 LCD D5 12
GPIO 05 LCD D6 13
GPIO 11 LCD D7 14
5V LED + 15
Ground LED - 16

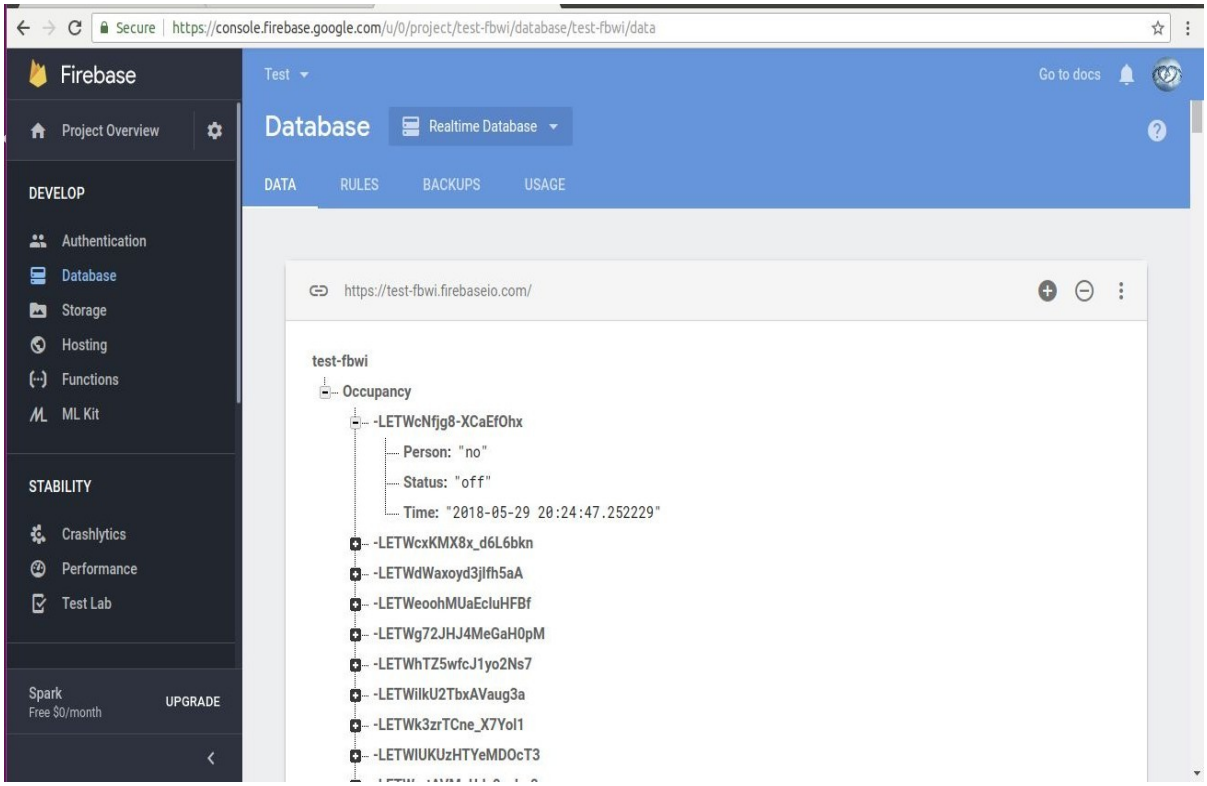



Person OUT!
Person in room 0

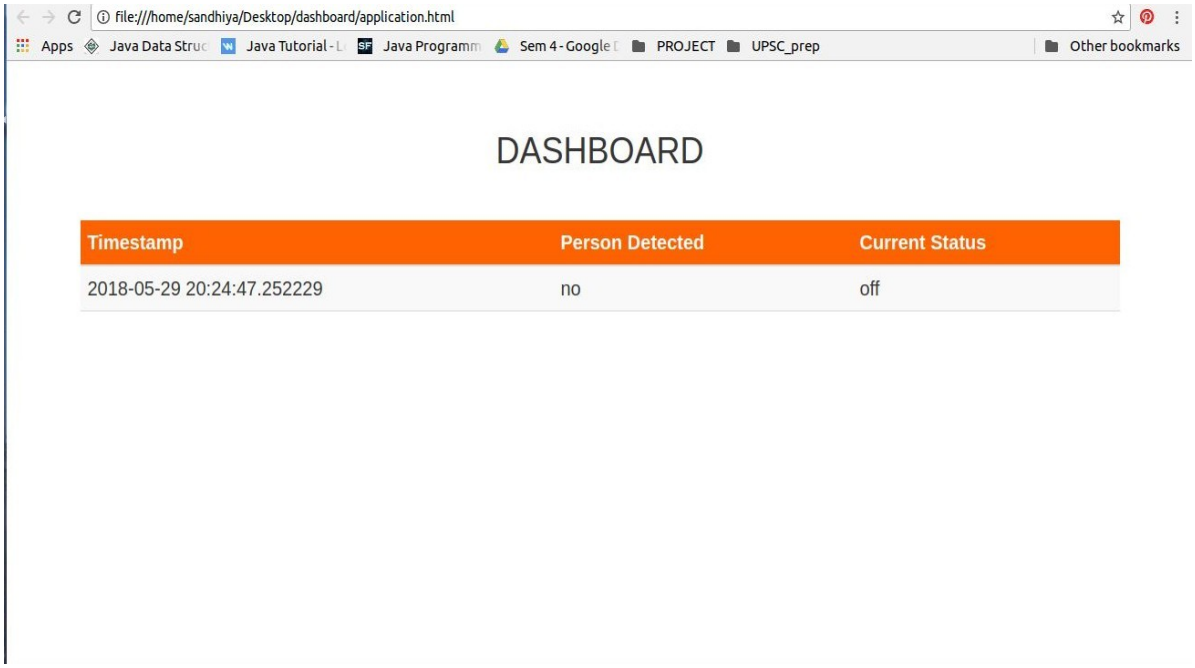
Once the connections are made, Relay circuit performs as a switch while receiving signal from IR sensor. In addition to that,LCD acts as the screen to display the count. Human detection is thus identified and the power circuit is automated.

In order to make the system effective, we integrate face detection with the aforesaid circuit. This is achieved through a software known as OpenCV.OpenCV (Open Source Computer Vision) is a library of programming functions mainly aimed at
real-time computer vision. In simple language, it is library used for Image Processing. It is mainly used to do all the operation related to Images. Face detection is added as an additional component to optimize the circuit.

This data is stored in Firebase and is retrieved through dashboard.Firebase is a backend platform for building Web, Android and IOS applications. It offers real time database, different APIs, multiple authentication types and hosting platform. This is an introductory tutorial, which covers the basics of the Firebase platform and explains how to deal with its various components and subcomponents.



This is how data gets stored in firebase console and the latest data gets updated in the dashboard (user interface).


file:///home/sandhiya/Desktop/dashboard/application.html
Apps
Java Data Struc
Java Tutorial - L
Java Programm
Sem 4 - Google D
PROJECT
UPSC_prep
Other bookmarks
DASHBOARD
Timestamp
Person Detected
Current Status
2018-05-29 20:24:47.252229
no
off

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REFERENCES

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2. Download the Yocto image to computer from the link given below: http://iotdk.intel.com/images/iot-devkit-latest-mmcblkp0.direct.bz2

3. Tutorial for LCD display:

https://www.rototron.info/lcd-display-tutorial-for-raspberry-pi/

4. OPENCV Documentation:

https://docs.opencv.org/3.0-beta/doc/py_tutorials/py_tutorials.html