

IOT based Industry Security Management

1st Vijaya Aher
Prof. EnTC Department
Vishwakarma Institute of Information Technology
Pune,India
vijaya.aher@viit.ac.in

2nd Onkar Gaikwad
Department of EnTC
Vishwakarma Institute of Information Technology
Pune,India
onkar.21911166@viit.ac.in

3rd Om Gandhal
Department of EnTC
Vishwakarma Institute of Information Technology
Pune,India
om.21911123@viit.ac.in

4th Yash Lalage
Department of EnTC
Vishwakarma Institute of Information Technology
Pune,India
yash.21911101@viit.ac.in

Abstract: In this paper, we present a view on the industrial security. This project ensures the complete security for the industry. This is achieved with the use of advanced sensors. Unauthorized access, Temperature increment , IR detection can be monitored by the status of each individual sensor. The main control system implements wireless technology to provide remote access from smartphone, laptop or from PC. The output of sensor is conditioned and fed into the mobile app or to laptop by means of microcontroller(ESP8266).The alert system included in this project are IR sensor which detects motion of object ,Ultrasonic sensor to detect and measure the distance of object, Potentiometer and DC motor.

Keywords - IOT, Arduino , Node MCU , WI-FI, Smart phone

I. INTRODUCTION

In day to day life Industrial Security is very important factor. It is trending issue in 21st century. Security is primary concern everywhere and for everyone. Every person wants his home, industry ,bank, etc to be secured. This project describes security system that can detect the motion of person and also measure the distance of the object. This is useful and simple security system. Here, our application uses Microcontroller(ESP8266) as its controller and detects the person entering or leaving using ultrasonic and IR sensor. This system can operate using cellular phone or laptop with the help of application Thinger.io .This system is to implement microcontroller based control module that receives it's instructions and command for cellular phone. This microcontroller then will carry out the issued commands and then communicate the status given applicants or device back to the smart phone.

Due to advancement of wireless technology, there are several different connections are introduced such as GSM, WIFI, and Bluetooth. Each of the connection has their own unique specifications and application. Among the four popular wireless connections that often implemented in Automation projects, WIFI is being chosen with its suitable capability. The capabilities of WIFI are more than enough to be implemented in the design.

Sensor that we have connected to microcontroller ESP8266 gives input to microcontroller. Microcontroller is the brain or we can say primary component of the project. The data received from sensors is given to cloud using thinger.io. Also we can control the DC motor or other electronic devices. We can access the sensors data and control sensors anytime anywhere using cloud. We can give commands to microcontroller from cloud.

II. EASE OF USE

A. Motivation

Application security is the process of developing, adding, and testing security features within applications to prevent security vulnerabilities against threats such as unauthorized access and modification.Maintaining the Integrity of the Specifications .As talking about the industry security application, Reduces risk from both internal and third-party sources.

III. LITERATURE SURVEY

Smart Home Automation Security: This paper presents a comprehensive description about different home automation systems and technologies from a security standpoint. The work highlights various security flaws in existing home automation systems. In our work, we address how the concept of security and the meaning of the word “intruder” have evolved over time. We examine the challenges in home automation security from the point of view of both the homeowner and security engineer. The work goes on to explain why home automation systems are such attractive targets for an attacker. We point out the role of user interfaces in security. Various home automation technologies considered in our work include context-aware home automation systems, central controller-based home automation systems, Bluetooth-based home automation systems, Global System for Mobile communication or mobile-based home automation systems, Short Messaging Service-based home automation systems, General Packet Radio Service-based home automation systems, Dual Tone Multi Frequency- based home automation systems, an d Internet- based home automation systems. The work concludes by explaining future directions home automation Security Research could take.

The work focuses on security aspect of existing home automation system.This paper identifies and prevents intruders in home environment.[1]

A Review on Ultrasonic Radar Sensor for Security system: The basic consequences of this project is 100% efficient security system based on ultrasonic sensor technology as the customer require simple, reliable and high performance core system. The ultrasonic sensor module includes a transmitter and a receiver mounted on a rotating motor. A motor is used to allow the sensor to cover 360 degree. The ultrasonic sound energy is transmitted from transmitting device into an area of interest and this further reacts to a change in the reflected energy pattern. Basically it works on the principle of echo. The microcontroller accepts this signal and continuously monitors the receiver output of the ultrasonic transmitter. Once the distance is calculated the microcontroller checks whether the object is within the range specified within microcontroller for initiating the alert. If the object is within the minimum range the microcontroller initiates a sound alarm and also the GSM modem to send a SMS to the concerned person and camera will capture the image of object to the storage element.

The outcome of research and demonstration project on ultrasonic radar sensor detects human and object interference in small space.[2]

IoT Based Anti-Theft Detection and Alarm System Using NodeMCU and Blynk Application :The purpose of building this system is to prevent the loss of property due to theft that we face in our daily lives. This system includes NodeMCU with Esp8266 Wi-Fi module based on microcontroller, PIR sensor to use the motion detection, ultrasonic sensor to know the

distance from the obstacles, buzzer to use the alarm system, Blynk application to use the reporting message and light bulb to illuminate around the environments. When sensor detected the movement of objects, sends a message to phone, lights up the bulb, and then alert alarm because Esp8226 Wi-Fi module is connected to Blynk application. The problems found with existing systems were that they can only identify the intruder after the theft, or cannot distinguish between human and non-human objects. So, this system will be essential for every building because it is not just easy to use but is also inexpensive.

This paper helps people across the country to reduce the theft. It has provided wireless sensing system for detection of intruder as well as instant notification of intrusion to prevent theft.[3]

IOT Based Industrial Security Control and Monitoring System Using NodeMCU: There are many sudden accident is happened in various industries recently. So now a day's security has become an important issue in everywhere. Developing this trend a new intelligent smart security system of industry based on various wireless sensor/actuator, Node MCU microcontroller with IoT network is proposed in current research paper. This innovation namely IoT Based Industrial Security Control and Monitoring System Using NodeMCU detect any Chemical overflow or leakage, Gas leakage, Fire/Boiler explosion or short circuit and sensing temperature, humidity, undesired sound by various smart sensor. So it can measure any environmental deviation and monitored the update condition of the industries and inform the proprietor by Email &SMS through internet. A traditional security system gives the signal by alarms. Here Internet of Things is used to communicate with the device for sending and receiving required information and data through internet. So it can be controlled and monitored from anywhere & anytime through computer, mobile or any smart device.

This security System is cheaply made from low-cost available components and can be used to control more than others. This system is easily adjustable at any industry.[4]

Development Of An Internet Of Things(IOT) Based Industrial Security And Safety System Using Arduino: The proposed system uses a combination sensor network with a system architecture and concept implementation, which are described mainly for an industrial safety monitoring scenario. The information is gathered by the deployed sensor network with focus on four main factors: temperature, fire, gas leakage and light intensity, and according to the readings derived from the sensors, a signal of threat or precaution along with the monitor readings will be sent to the desired user.

The application of ARDUINO UNO greatly simplifies the design of peripheral circuit, and makes the whole system more flexible and extensible. The system is able to collect sensor data and respond intelligently as per given situations.[5]

Industry Protection System Using Node MCU and IoT: With the rapid elevation in the internet users over the past decade has made internet a part of life internet of things is the advanced internet technology. Automatic systems are beginning adopted over manual system because of their self-regulation behavior. The system consists of three sensors interfaced with NodeMCU. The sensors data is constantly scanned to record values and checked. The scanned sensors data is sent to the ThingSpeak IOT platform using the NodeMCU to the client webserver API. The sensors used in this project are MQ-2 (gas sensor), LM35 (temperature sensor), LDR (light sensor).

By implementing this system we can access the live data. The cost of system is less compared to previous purposed system like using board like Arduino UNO, Arduino with ESP module and single monitoring system using NodeMCU.[6]

HOME AUTOMATION AND SECURITY SYSTEM WITH NODEMCU USING IOT: This project presents the overall design of Home Automation System (HAS) with low cost and wireless system. In this project, the development of a firmware for smart control which can successfully be automated minimizing human interaction. The main control system implements wireless technology to provide remote access from smart phone. . The status of the appliance would be available, along with the control on an android platform.

Notifications are sent to user through the app BLYNK installed in smart phone. User can operate wirelessly or home appliances can be automated by using several sensors like temperature sensor, LDR etc. All these together forms a complete capable, flexible smart home control and monitoring system, based on IOT technology.[7]

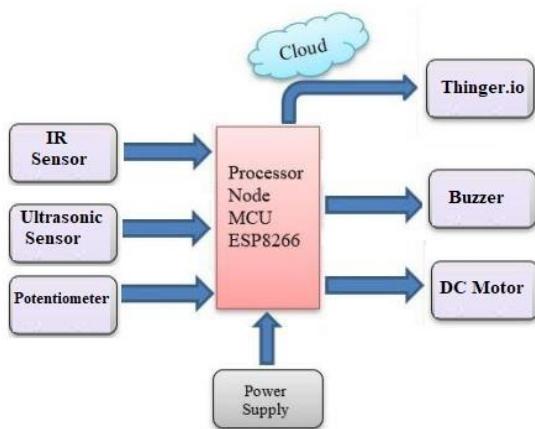
IOT BASED MOTION DETECTOR USING NODE MCU AND BLYNK APP: This paper is about the development of an Internet of Things (IoT) based smart wireless home security system, which sends an alert on intrusion. A PIR sensor is used to detect the motion of any human being in its vicinity. NODE MCU ESP8266 is used to connect the system to internet through WiFi. Whenever a movement is detected by the PIR sensor, a message is sent to a smart phone by the NODE MCU.

The sensors placed on the door inform the home owner as soon as the door is opened by sending a Push notification. The user will get this notification irrespective of whether the phone is locked or unlocked or even if any other app is opened at the moment.[8]

IV. OBJECTIVES

- To provide industry-leading system design resources, unparalleled technology options with flexible networking capabilities and best-in-class customer support tools to ensure reliable, long-term solutions for the perimeter protection challenges of our company.
- Controlling the machines and other electronic/electrical components via an application (using IOT based system) and hardware (manually) and to develop an application that includes the features of cloud and manual switches.
- To detect the unknown person or theft by using different types of sensors(IR and Ultrasonic Sensor)

V. BLOCK DIAGRAM



ESP8266 microcontroller is the main component. The different sensors(IR,Ultrasonic,Potentiometer) are connected to input of NodeMCU. The output of NodeMCU is connected to buzzer and DC motor. Power 3.3V given to NodeMCU. Data received from different sensors are given to cloud (Thingier.io) via NodeMCU.

VI. METHODOLOGY

The ESP8266 has 17 GPIO pins (0-16). However we can only use 11 of them because 6 pins(GPIO 6-11) are used to connect the flash memory chip. The ESP8266 has a single analog input with a range of 0-1V. If you supply 3.3V it will damage the chip. So to get an easier 0-3.3V range we have an onboard register voltage divider. Ultrasonic sensor has 4 pins : VCC, ground, Trigger and Echo. Trigger is connected to D3 of GPIO pin of controller and Echo pin is connected to D2 GPIO pin of controller. It operates in 3-5V. It has adjustable sensing range up to 20cm. IR sensor: It has 3 pins output, ground and VCC. output of IR sensor is connected to D5 GPIO pin of controller. It has adjustable sensing range up to 20cm. And it has 5V dc operating voltage. Potentiometer: It has 3 pins voltage supply, signal output and ground. 18 Output is connected to GPIO pin A0 of microcontroller . L293D : Dc motor needs 12V power. By using L293D we are converting 5V-12V. Input of L293D is 5V using adapter. A buzzer has 2 pin positive and negative. Positive is connected to GPIO pin D6 of controller is ESP8266 and negative terminal is Ground. First we have connected different sensors to microcontroller ESP8266 by using GPIO pins . IR SENSOR and ULTRASONIC sensor gives input to the controller . After detecting object within its range the alarm with buzzer on and if object does not detect then no tone buzzer on . Another sensor (Ultrasonic sensor) detect object and measures distance (upto 400cm) and this detection of object and distance then we can see on thinger.io cloud . Dc motor gives output upto 12v.

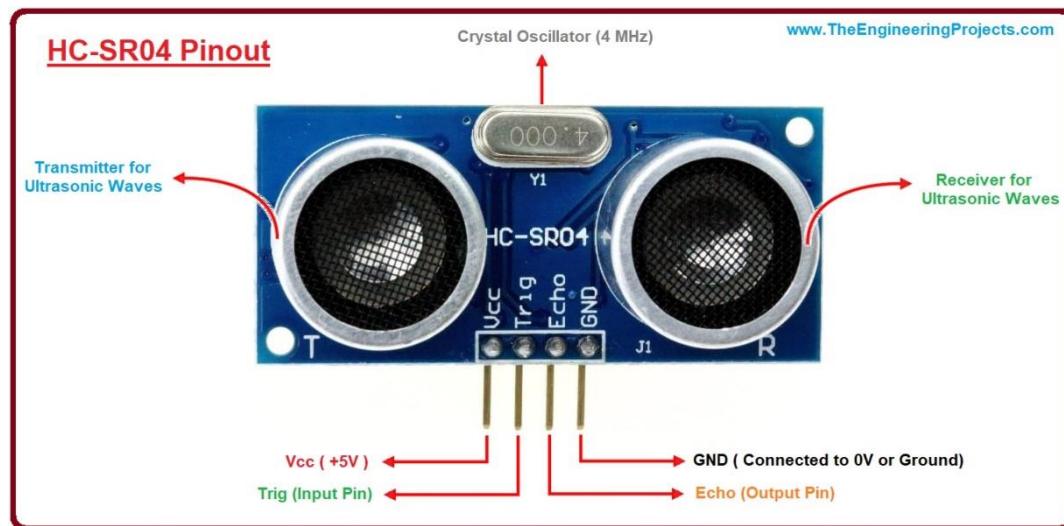
Components we have used in this project are Microcontroller(ESP8266),sensors(Ultrasonic,IR,DC motor and potentiometer). This sensors has different applications and specification. Ultrasonic sensors transmits sound signal and after detection of object this signal is reflect back to the receiver of ultrasonic sensor. This input is given to ESP8266 and controller gives this data came from sensor to cloud which any person can access this, those who have given access link. This sensor gives output in the form of analog value ,so actual distance of object from ultrasonic sensor ,that is also display on cloud i.e.Thinger.io . Then IR sensor also do the same. It transmit IR radiation and if object comes within its range,it gives digital output to ESP8266 and controller send this information to cloud that we can access from anywhere. By using different sensors, we can give security to industry,home,etc. Controller plays very important role in this type of project i.e.security related project.

VII. HARDWARE DESCRIPTION

Ultrasonic Sensor -An ultrasonic sensor is a device that measures the distance of an object by using sound waves. It measures distance by sending out a sound wave at a very specific frequency and listening for that same sound wave to bounce back. By measuring the time between the sound wave being sent and sound wave received back, it is possible to calculate the distance between the ultrasonic sensor and the object.

Specification for Ultrasonic sensor

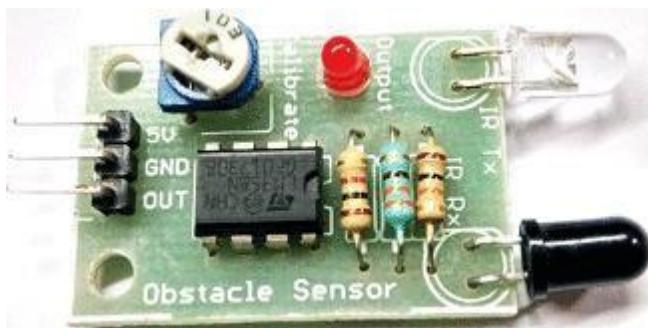
- working voltage -DC 5v
- working current - 15mA
- working freq - 40Hz -40KHz
- min range - 2cm-400cm



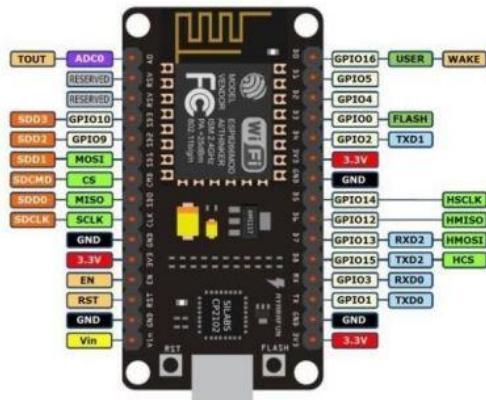
IR Sensor- An infrared sensor is used to sense some objects by emitting the infrared ray in its surrounding. An IR sensor is used to detect the motion of the object and also measure the heat of an object. These type of sensors measures only infrared radiation . It is a simple electronic device that emits and detects IR radiation, so that it can detect object or obstacles in its range. **Potentiometer**- It has 3 pins - Voltage supply , Signal output and ground. Output is connected to GPIO pin A0 of microcontroller ESP8266

IR Sensor Module Features

- 5VDC Operating voltage
- I/O pins are 5V and 3.3V compliant
- Range: Up to 20cm
- Adjustable Sensing range
- Built-in Ambient Light Sensor
- 20mA supply current
- Mounting hole



Microcontroller – ESP8266- Node MCU is an IOT module based on the ESP 8266 WI-FI chip module. It is 32 bit microcontroller and has 17 gpio pins. It operates on 3.3 V Dc. ESP8266 has ability to process and store capabilities allowing it to be integrated with sensors. This chip has a lot in common with Arduino – Both of this microcontroller – armed prototyping in boards can be configured using the Arduino IDE. This device is especially useful for IOT applications due to its small footprint built in Wi-Fi support.

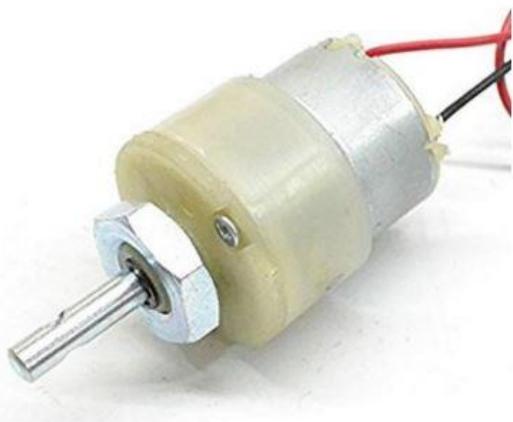


- ESP8266 Opensource Community Type : Single-board microcontroller
- CPU : ESP8266
- Memory : 128kBytes
- Storage : 4Mbytes
- Power By : USB Power Voltage : 3v ,5v (used with 3.3v Regulator which inbuilt on Board using Pin VIN)
- Code : Arduino Cpp
- IDE Used : Arduino IDE GPIO : 10

- **DC MotorA** DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy.

Specification of DC motor

- RPM – 150
- Shaft Diameter – 6mm (with internal hole)
- Weight - 125gms 30 • Torque – 4 kgcm
- Voltage – 6 to 24 (Nominal Voltage – 12v)
- No-load current = 60 mA(Max)
- Load current = 300 mA(Max)



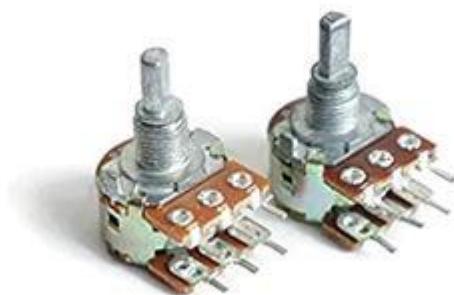
L293D Motor driver

Specification for L293D motor driver

- Power Supply : Over FRC connector 5V DC
- External Power 9V to 24V DC
- Temperature Range : 0°C to +70 °C

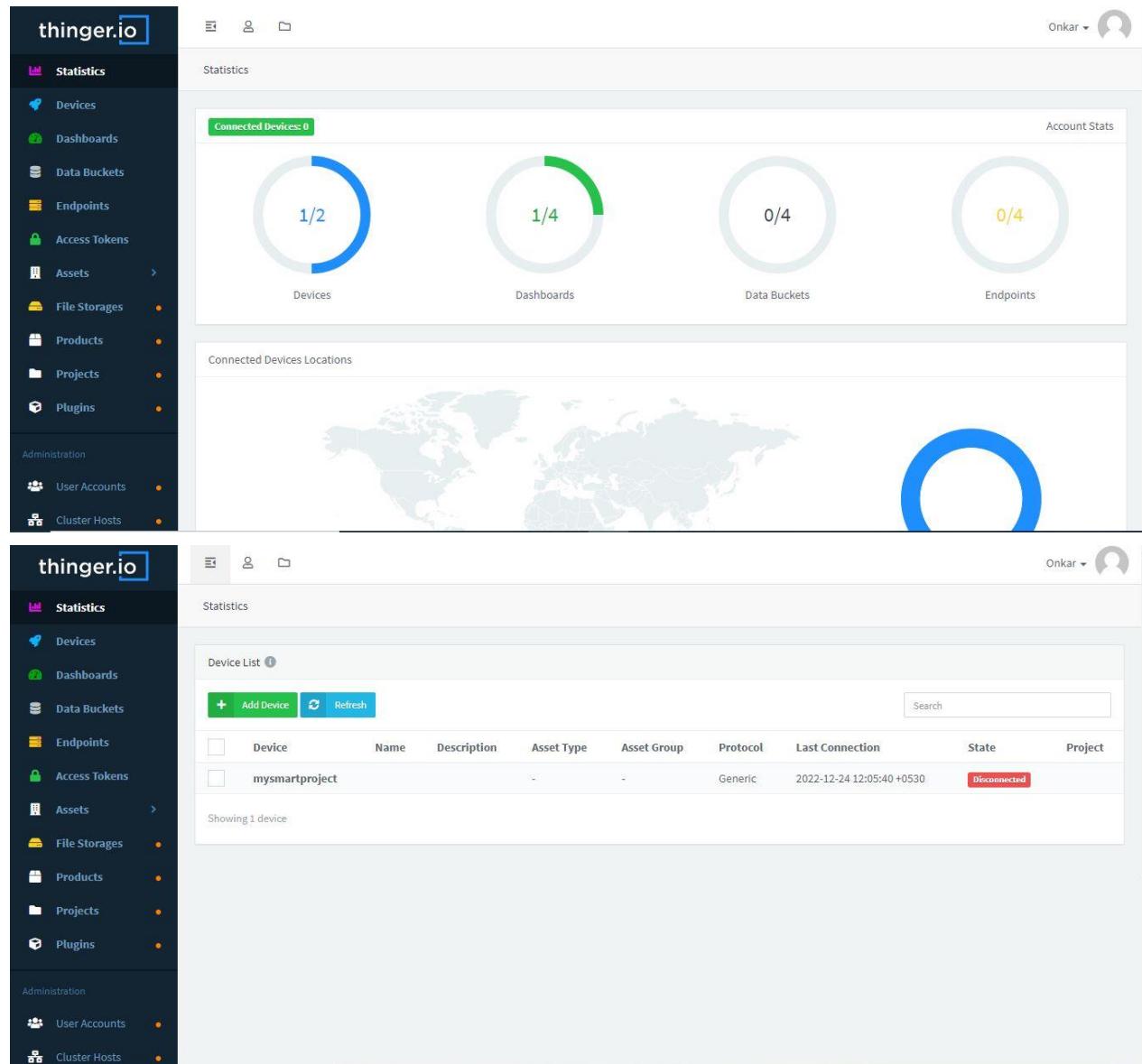


Potentiometer The potentiometer is the most common variable resistor. It functions as a potential divider and is used to generate a voltage signal depending on the position of the potentiometer.



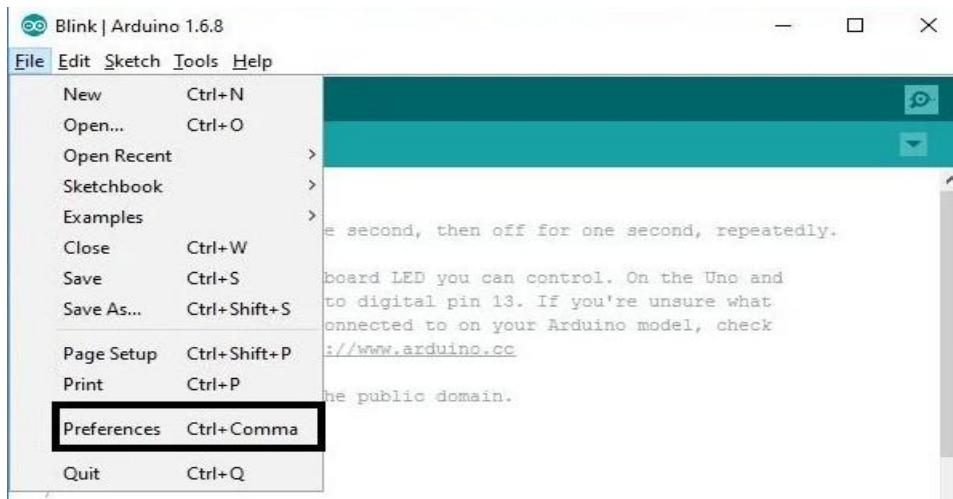
VIII. SOFTWARE

1.Thinger.IO – Thinger.io is cloud is a cloud IOT platforms, provides every tool to prototype , scale and manage connected products in a very simple way. We can access information from any device, from anywhere and anytime by sharing the barcode and link of our dashboard that we have made in thinger.io.



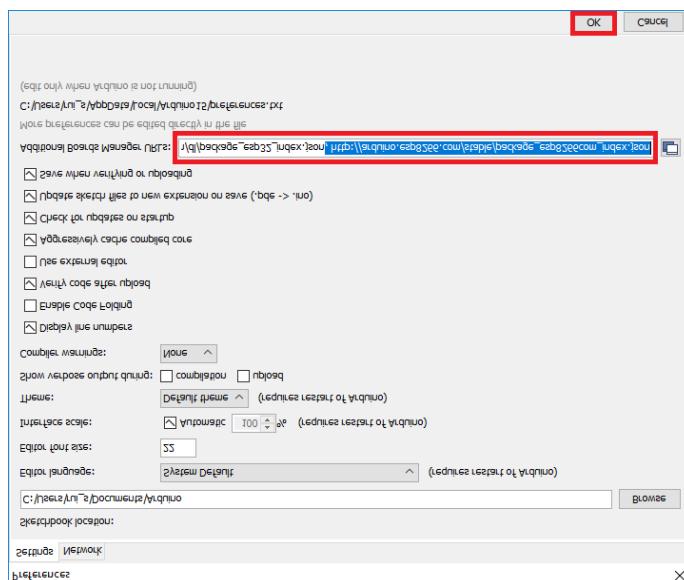
2.Arduino IDE – The Arduino Integrated Development Environment is cross platform application. That is written in functions from c and c++. This is used to write an upload programs to Arduino compatible board. The Arduino IDE supports the languages c and c++. Using special rules of code structuring.

To install the ESP8266 board in your Arduino IDE, follow these next instructions



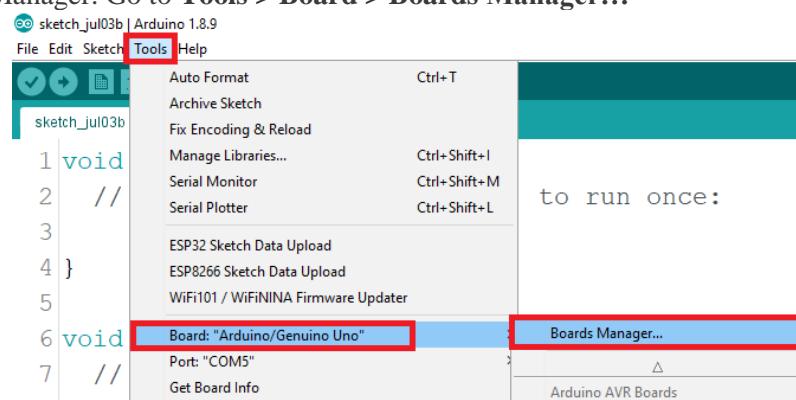
Arduino IDE, select preference

Enter http://arduino.esp8266.com/stable/package_esp8266com_index.json into the “Additional Boards Manager URLs” field as shown in the figure below. Then, click the “OK” button



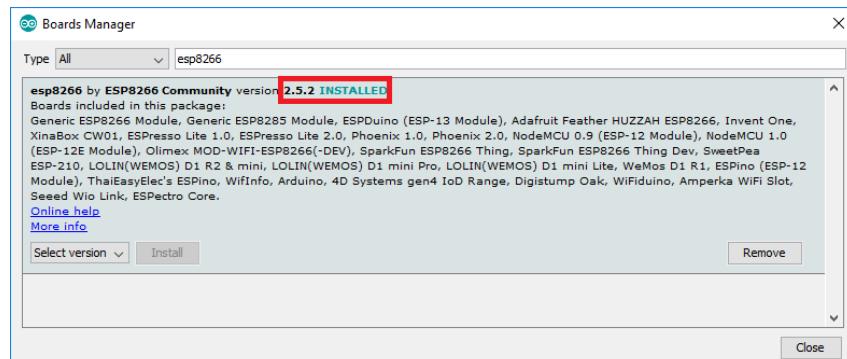
Arduino IDE, preferences settings

Open the Boards Manager. Go to Tools > Board > Boards Manager...



Arduino IDE, Boards Manager...

Search for **ESP8266** and press install button for the “**ESP8266 by ESP8266 Community**“



Arduino IDE, Installation of esp8266

Configuration of thinger.io

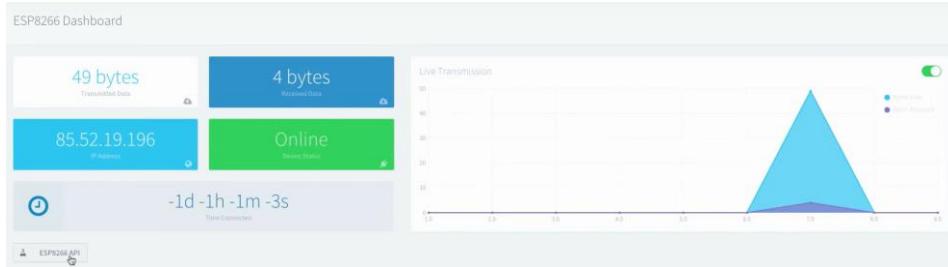
Create Device

Using "Devices" menu tab, just click in "New device" button, and fill the form with the device ID, description and Credentials you prefer.



Connecting Node MCU with thinger.io

After provisioning the device at Thinger.io cloud, it is the moment to configure it in the Hardware device. There are many different hardware supports and communication technologies.



IX. RESULT

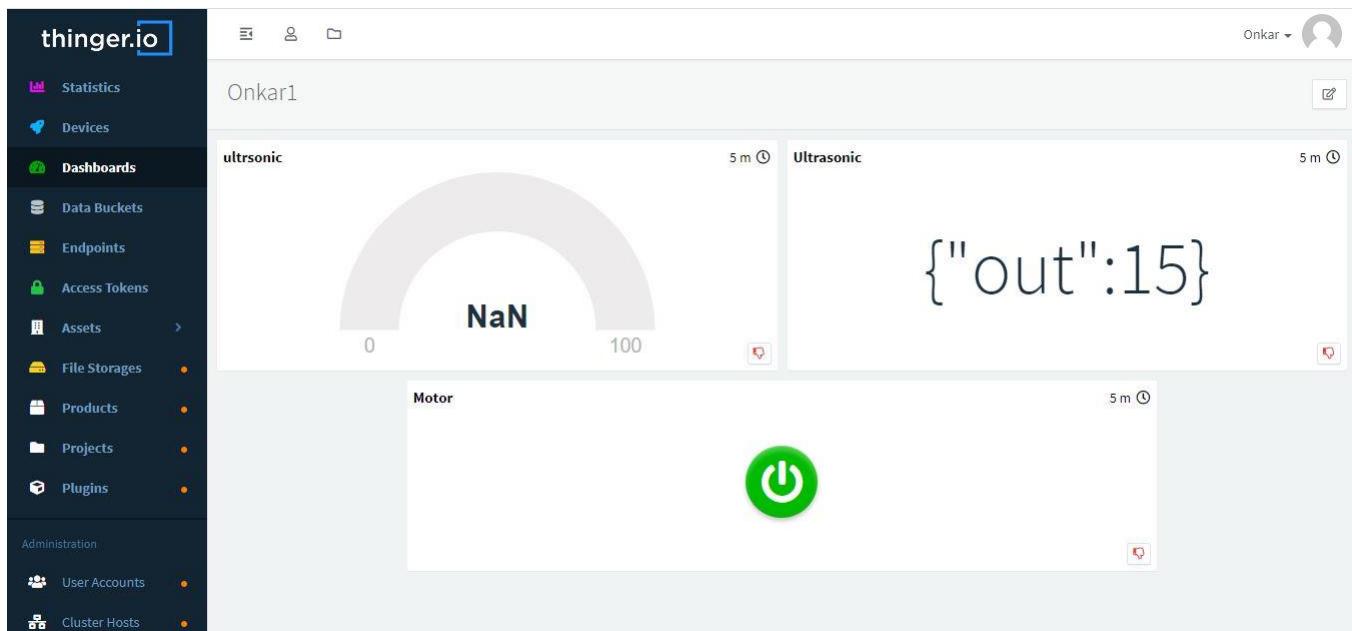
The experimental model was made according to the circuit diagram and the results were as expected. The loads are switched on when the Node MCU gets the signal correctly from user and it drives the particular load relay correctly. The loads are switched off only when the Node MCU gets the OFF signal from the user. after taking advantages of applications and specification of different sensor we see different results. first ultrasonic sensor gives output in the form of analog value i.e. actual distance of object from sensor which we can see on cloud. next, ir sensor gives digital output i.e. object id detected or not and buzzer will on automatically, this result of ir sensor also viewed on cloud.

CONCLUSION

The aim of the project was to design industrial security system using microcontroller and cloud. The research on this system mainly focused on solving the security problems. It is hoped that it will help people across the country reduce theft. It has provided a novel wireless sensing system for the surveillance and detection of a human intruder as well as instant notification of the intrusion to prevent theft. This system is suitable for small personal area surveillance, i.e., offices, departments, classrooms, homes and buildings. The main advantage of the system is easy to use, low cost with high quality. The use of Node MCU which has inbuilt Wi-Fi module to control relays locally as well as globally. It is one of the easiest and most pocket-friendly automation control system based on IOT. The project proposes an efficient implementation for IOT (Internet of Things) used for monitoring and controlling the devices via World Wide Web. Industrial automation system uses the portable

devices as a user interface. They can communicate with automation network through an Internet gateway, by means of low power communication protocols like Wi-Fi, Bluetooth. The user here will move directly with the system through a web-based interface over the web are remotely controlled through easy website. The server will be interfaced with relay hardware circuits that control the appliances running in a factory.

The distance which is measured by Ultrasonic sensor is displayed on dashboard of thinger.io, which we have created .Also we can see the object distance on gauge. We can also operate DC motor .We have created a Button on Dashboard to operate DC motor.



FUTURE SCOPE

1.IOT is the best tool for the healthcare facilities to patient ,researchers and doctors.Smart diagnosis patient management, wearable device for tracking health, etc are the facilities provided by IOT .These healthcare devices send the health of patients data to doctors over safe network.By using this healthcare devices (IOT Based) get proper treatment on time and patient get clear idea about his/her health through gadgets. Also using IOT gadgets we can reduce cost, along with other hospital charges and patient can be diagnosed from their respective locations.

2.Agriculture Industry-Now a days agriculture industry is facing many challenges and weather conditions and climat impact hugely to agriculture industry. so industry has adopted technology to increase productivity , it includes the use of precision farming ,gricultural drones and smart forming applications.

REFERENCES

1. Arun Cyril Jose and Reza Malekian, "Smart_Home_Automation_Security_A_Literature_Review", Vol 5,no. 4, August 2015
2. Abhay Pratap Singh, Akhilesh Kr. Sharma, Amrit Pandey, Prof. Kriti, "A Review on Ultrasonic Radar Sensor for Security system", April 2016, Volume 3, Issue 4
3. Md. Romzan Ali, Abdullah Al Zubaer, Md. Ariful Islam, Sabrina Ferdous, Md. Habibur Rahman, "IoT Based Industrial Security Control and Monitoring System Using NodeMCU", Volume V, Issue IX, September 2020
4. Zin Min Htike, Ko Ko Aung, Shwe Khine Pyone, Khin Sandar Lin, Kyaw Saw Win, Naung Naung, "IoT Based Anti-Theft Detection and Alarm System Using NodeMCU and Blynk Application", Volume: 09 Issue: 08 | Aug 2022
5. Shubham Banerjee ,Sandipta Mondal,Arnab Jyoti Mandal,Prakash Banerjee, "Development Of An Internet Of Things(IOT) Based Industrial Security And Safety System Using Arduino",Volume-10,Issue-6
6. A.Sunanthal1, S.Saicharan2, "Industry Protection System Using Node MCU and IoT", June 2019, Volume 6, Issue 6
7. Dr. Anto. A. Micheal, Md. Talha Umair, Nikhil Saud,N. Gopala Krishna, "HOME AUTOMATION AND SECURITY SYSTEM WITH NODEMCU USING IOT", Volume:04/Issue:07/July-2022
8. S Ramakrishnan ,S Suma, "IOT BASED MOTION DETECTOR USING NODE MCU AND BLYNK APP"