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Warehouse Management Using IOT Sensors

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ABSTRACT –
A warehouse management system is a setup to eliminate the problems of time-consuming storing and product management duties across different warehouses. Sensors usually help warehouse managers to achieve better control of the goods in and out of the warehouse. With the applicationof sensors into the supply system managers can easily keep track of items in any delivery step and monitor temperature, humidity, etc. Store managers can be usedgenerallyfor sensing light movement, moisture, and temperature. It is one of the proactive method to minimize supply chain risk.IOT has granted many types of sensors which are used for different purposes in warehouse management. IOT Microcontroller has been used to send Warehouse data to IOT server for monitoring all data using Thing Speak Server. All sensors (Infrared, DHT11 & MQ2) data can be used to monitor anywhere on earth using IOT cloud server, MQ3 is gas sensor which is used to sense the gases & smoke to detect the fire. DHT11 Sensor is used to monitor Warehouse Temperature & Humidity. For turning ON & OFF Warehouse appliances using counter function with the help of Ultrasonic sensor. The ESP8266 is a microcontroller and IOT module also. All Sensors are interfaced with ESP8266, and ESP sends all data to IOT cloud platform. Limit switch is used for read the status of ware house doors. In case of fire is happen in warehouse Alarm & Fire Extinguisher is ON and update the status on IOT platform. Temperature, humidity, Door Status, Alarm signals, Person counter all the data is monitored by user using IOT platform.

Key Words:sensor, warehouse management, IOT.

I. INTRODUCTION

Agriculture has been the world's longest running profession, one-third of the working population obtains their livelihood from agriculture. In India alone, as per Registrar General of India and Census report 2011 the total number of farmers in India is 118.7 million and 144.3 million people are agricultural workers/laborers which consists 31.55% of the total rural population. So, a lot of people depend on agriculture as a means to earn income. However, a lot of the food produced at farms usually does not make it to the consumers. This can happen due to many reasons including damage of the produce at the farm, during transport or during storage. India is the second largest producer of vegetables and fruit but unfortunately, 25 to 30 percent of it is wasted due to inadequate logistical support, lack of refrigerated storage, supply chain issues and bottlenecks, improper transport and underdeveloped marketing channels. Twenty-one million metric tons of wheat get ruined each year due to improper storage. This leads to food scarcity and insecurity.

Warehouses are used by producers, dealers, traders, wholesalers, customers etc. Every year, farmers face a huge loss due to the problem of storage requirements in warehouses. This is due to improper monitoring of the food stored and the inability to provide proper refrigeration systems. Various traditional storage methods were initiated which forced a huge manual approach which is time-consuming and inefficient.

With the development of the Internet of things, there exist variety kinds of sensors. These sensors can not only monitor information about the various dimensions of the real world at anytime, anywhere, but also change the physical environment through some action. However, the information provided by a single sensor has limitations. The current status of the various sensors is often isolated from each other, lacking effective mechanisms to make various types of sensors to work together organically. The advantage of multi-sensor cooperative detection is that it can integrate the complementary information and redundant information of a scene, obtaining a more comprehensive and accurate scene representation than any single sensor can do. This establishes a

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good foundation for target recognition and tracking applications.

So, in this Warehouse Monitoring project, we are using IOT Microcontroller to send Warehouse data to IOT server and monitor all data using Thing Speak Server. All sensors (Infrared, DHT11 & MQ2) data we can monitor anywhere on earth using IOT cloud server, MQ3 is gas sensor which is used to sense the gases & smoke to detect the fire. DHT11 Sensoris used to monitor Warehouse Temperature & Humidity. For turning ON & OFF Warehouse appliances using counter function with the help of Ultrasonic sensor. The ESP8266 is a microcontroller and IOT module also. All Sensors are interfaced with ESP8266, and ESP sends all data to IOT cloud platform. Limit switch is used for read the status of ware house doors. In case of fire is happen in warehouse Alarm & Fire Extinguisher is ON and update the status on IOT platform. Temperature, humidity, Door Status, Alarm signals, Person counter all the data is monitored by user using IOT platform.

II. IMPORTANCE

As we can see that wastage of grains is increasing day by day and by this the quality of food is decreasing. The farmers and consumers are facing problems to find quality of food, accept the fair price and consumption. Due to lack of quality food the consumers are facing health issues. Which may increase the hospital bills. Due to this system, the farmers are having a little bit relaxation in storing the grains. With the help of this monitoring system, the real time detection from anywhere at any time, of the temperature and humidity of the storage rooms can be improved and the longevity of the products can be ensured.

2.1Target of community of project

As food is among the three basic needs, so this project aims to storage the food by using various sensors and controllers. The advantage of multi-sensor cooperative detection is that it can integrate the complementary information and redundant information of a scene, obtaining a more comprehensive and accurate scene representation than any single sensor can do. Hence this project will help the farmers to store the food for longer time. As food plays an important role in everyone's life, it is necessary to check whether the food we are consuming is good or not. So, the end result of this project is to give the quality food to the consumers in cheaper price. This establishes a good foundation for target recognition and tracking applications.

2.2 Scope of project

To reduce food losses and increase food safety using Internet of things.To monitors the variation in the limit set for the sensors and send real-time updates to farmers. To develop a system that assure extra safety for food and Grain. To design and develop an android, iOS and Web application for real-time monitoring Warehouse.

2.3 Objective of project

Problems faced by farmers and consumers can be prevented by storing and maintaining the quality of food. And also reduces the wastage and shortage of food.

Once the system is set up in the warehouse by placing all the sensors in the warehouse the following actions can be monitored and controlled-

1. Wastage of food reduces: due to proper monitoring of food the wastage of food reduces.

This will increase the amount of food to be available for consumers and the poor's will also be benefited.

2. Fare price: proper monitoring of the grains will lead to no wastage and the grains will be sold at fare prices which is accepted by all communities.
3. Suicidal rate of farmers decreases: now-a-days the suicidal rates are increasing due to improper storage of food, this cause more damage and the grains are thrown away or sold at lower prices. Due to this farmer becomes financially weaker and pawnbrokers grab the opportunity.

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Table -1: Gantt Chart

Task Name	Start	Finish	Duration(days)
Topic Finalization	06-09-2021	11-09-2021	5
Abstract Submission	12-09-2021	13-09-2021	2
Literature Review	14-09-2021	16-09-2021	2
Interaction-I with Guide	21-09-2021	21-09-2021	1
Component selection	23-09-2021	25-09-2021	2
Review Meeting-I	26-09-2021	27-09-2021	2
Interaction-II with Guide	19-10-2021	19-10-2021	1
Simulation	20-10-2021	06-11-2021	17
Review Meeting-II	08-11-2021	09-11-2021	2
Project phase-I report	15-11-2021	30-11-2021	15
PCB designing and fabrication	20-12-2021	30-12-2021	10
Hardware testing	01-01-2022	07-01-2022	6
Final project testing	15-01-2022	22-01-2022	6
Project phase-II report	01-02-2022	05-02-2022	4

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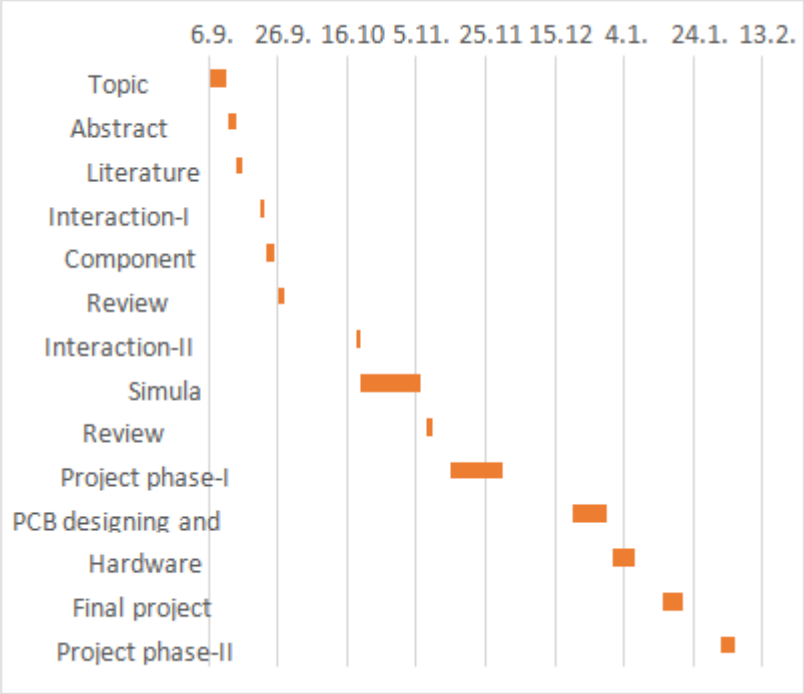

Fig -1: Figur

III. LITERATURE SURVEY

A design scheme of warehouse environment monitoring system, the solution uses the tiny4412 development board and as the main control platform, using DHT11 and DS18B20 sensors to monitor the temperature and humidity of the warehouse environment in real time, display the measured temperature through LCD1602 analyze and judge data, sound and light alarm and SMTP mail alarm are performed when the measured data exceeds the set threshold. Wu Zhuokui used WiFi wireless network to design the agricultural product storage monitoring system, which can realize the collection, display and alarm of temperature and humidity.designs a set of warehouse monitoring system for small and medium-sized enterprises. The system uses internet of thing technology, use tiny4412 development board based on CortexA9 and ST89C51 microcontroller, combine modern TCP/IP network communication protocol and HTTP network communication technology, combined with temperature and humidity sensor to collect data, able to monitor the warehouse environment with a smaller equipment volume.[1]

The method uses CAN bus and ethernet to design a distributed control structure with multilevel subsystem. It can be accessed into the INTERNET to control several centralized warehouses remotely in real time. The host computer and the monitoring computer can be synchronous controled through the CAN bus so that the parameters such as temperature and humidity can be get, modified and displayed not only from the host computer but also from the monitoring computer as well as the function of the fire alarm .The monitoring computer takes the single chip microcomputer as the core meanwhile it extendes several parts such as the data collection, serial storage, keyboard display, output control and alarm device.The temperature and humidity sensors collect the temperature and humidity at every region of the warehouse in real time, then the parameters are sent to the A/D of the P87C598 to be converted through the CD4051 analog switch and I /V converter. [2]

A novel system to monitor warehouse with wireless sensor networks is proposed. The system consists of wireless nodes and monitor. Wireless sensor nodes collect temperature and humidity information and send to monitor. Monitor provides GlJI for warehouse operators. The design of wireless nodes and monitor are introduced in detail. Wireless sensor networks have some characteristics which are suitable for warehouse monitoring systems. First, most wireless nodes has limited power because they are equipped with battery and difficult to change or charge battery. Second, Wireless sensor networks have dynamic topology because wireless nodes are often deployed at random. Third, wireless sensor nodes are often deployed at harsh environment such as battle field, nuclear plant, and outdoor environment. Wireless sensor nodes: They are

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designed to realize three functions. First, it gathers temperature and moisture information in the environment. Second, it compares gathered information with values which have been set by monitor before. If temperature and moisture information surplus required threshold, it will send alarm to monitor. So that warehouse operators can handle it. At last, all of them cooperate to transfer required information to sink. All of them equipped with a Zigbee module. [3]

Even today millions of people die every year due to starvation globally. On the other hand several tonnes of food crops are wasted, as there are no effective and cost efficient systems practically implemented for monitoring and control of the warehouse. Our work takes into consideration this problem which affects millions of people globally and has tried to bring out a simple solution by building a sensor-based module which monitors and also controls the warehousing system. This module acquires inputs from sensors. These inputs provide an understanding about the environment within the warehouse by considering parameters like humidity, temperature, gases present inside the warehouse and motion detection. These inputs are processed using an algorithm which will determine whether the conditions in the ware house are optimum, and are also transmitted to a remote terminal for monitoring. This system will work effectively to curb food crop wastage thereby saving precious lives. This system can directly lead to saving tonnes of food grains and impact the hunger ratio of a country like India, where people go hungry enough though enough crops are produced. [4]

We have implemented a monitoring and controlling system that monitors and controls the weather parameters like Temperature, Humidity, Gas and Light intensity. The users can control and monitor the above said parameters of the repository using IOT. These sensor values are sent to the cloud. When these values get exceeded by the threshold values then the user can take an action against the conditions. By using of Thingspeak to retrieve the cloud sensor data is monitored and controlled. the author represented the real time monitoring of grain storage by using ARM 7 and GPRS/GPS technique to reduce the grain loss and man power in grain repositories. Cloud computing is a technology which stores and runs the information on internet in spite from computer hard drive. Cloud computing services like information storage, database, software, networking, servers, analysis are rendered through cloud computing. the author implemented a home monitoring system by using ESP32 module, which can control the environmental conditions like room temperature, gas leakage, water levels in the tank, human detection and control several things like light, fan, motor, gas knob and take decision based on the requirement and controls remotely. Article the author explains the healthcare applications like patient health condition, symptoms by using wireless body bio sensors are networked together and sends this information to doctors via internet or cloud.[5]

Data that means unprocessed raw facts and figures are increasing at an alarming rate. This is due to the increased population. This is also due in the enhancement in the number of devices connecting to the internet. By 2020, 50 billion devices must be connected to the internet. The internet of things commonly abbreviated as IOT is a major concern in this. The Confidentiality, availability, integrity model is mentioned in this paper. Characteristics of Data warehouseOLAP is also mentioned in this paper. Security concern is also mentioned in this paper. Different types of attacks are also mentioned in this paper. All this will certainly contribute to the research sector. By every now and then, the unprocessed raw facts and figures are increasing at a tremendous pace. That means, if I take an example of today that is July 24, 2018 at 8:36 pm that suppose 3 lacs entries are there, and at 8:37 pm it becomes 4 lacs. That means at every millisecond or micro second some unprocessed facts are generating. It is full of noise and inconsistency. The main aim is that it should be kept secure, so that it may remain same throughout and may not be altered by an unauthorized party. This requires various parameters such as confidentiality, availability, integrity etc. In today's modern world, data is increasing at an enormous velocity. For this, security is really a matter of concern as if an unauthorized access takes place, security parameters can help in tracking that. As the information can be negative for some aspect and positive for some aspect. Every data should be monitored from time to time so that data should be kept authorized in every case. [6]

India, with more than 1.27 billion population, ensuring food security is very important. Grain production has been increasing steadily due to advanced production technology but improper infrastructure facilities and unfavourable environmental conditions result in storage losses of food grains. The environmental factors like temperature, moisture content, humidity, and light greatly influence the storage of food grains. Also, the factors like time and purpose of storage, type of storage, preventive insecticide treatments and storage practices account for the food storage losses. During storage, both qualitative and quantitative losses occur due to insect pests, mold growth, rodents, rats, fungi,

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micro-organisms and subsequent production of mycotoxins in storage. The occurrence and number of stored food insect pests are directly related to the climatic and geographical conditions. The safety of food storage is a significant issue concerning people's living quality and national economic development. In India, nearly 20% of food grains are going as waste due to storage losses. The food storage losses are accounted mainly due to the changing environmental conditions and improper infrastructure facilities. This paper proposes an integrated system to monitor and control the environmental factors like temperature, humidity and light illumination of food depots using wireless sensor networks. The food products chosen are Grains, Wheat, Rava and Maida flour. The ZigBee mesh networking technology is used to send the measured parameters from remote food depots and the LabVIEW software is used to monitor the environmental factors. The images of the food product are captured from remote end and checked for the right food product by image analysis. An automated aeration control strategy is employed to maintain the temperature and moisture content within the threshold limits for each of the food products, thus ensuring food security. [7]

In today's world, Internet of Things (IoT) is a different development. With the help of IoT, all the physical objects can connect to the internet. And with this we can consider the two layers of the system viz: the sensor device which gathers data and links to cloud and next is the cloud service which hosts the information from the environment. In the storage rooms of industries we need a good environment for the products to be healthy for use. Here we develop a monitoring system with the help of IoT. The Internet of Things entrance is used as a part of this system. In this strategy we use several access methods such as WiFi, GPRS, Ethernet etc. and also the data collected can be stored. In this IOT gateway we use ATmega 328 as the

Microcontroller unit and ȝC/OS-III as the implanted OS. The application authenticates that the entrance is reliable. In this paper we try to develop an arrangement encompassing Arduino wireless sensor networks and cloud and then extend our work to develop a method for the transmission of data between them which can be of great use in monitoring the temperature and humidity. With the help of this monitoring system, the real time detection of the temperature and humidity of the storage rooms can be improved and the longevity of the products can be ensured. The wireless sensor networks are connected with the internet with the help of the IoT gateway and also ensure the monitoring of the products inside cold store rooms. Also this type of application helps in checking the temperature and humidity on a continuous basis and then resulting instructions are sent to the server. Based on which the environment inside the store rooms can be monitored. This type of system can help in Industrial Automation using IoT, with the help of which we can take intelligent decisions.[8]

IV. DESIGN METHODOLOGY

4.1 Project Specification

1. Proposed system is using three sensors Infrared Sensor, DHT11, MQ2 Gas Sensor.
2. DHT11 temperature measuring range is -40 to +125 °C / ± 0.5 %accuracy &temperaturerange is from 0 to 50°C/ ±2%accuracy.
3. Humidity Range 20 to 80% with 5% accuracy.
4. Operating Voltage Range is 3-5V.
5. MQ-2 Gas Sensor module sense the smoke and combustible gases. Module operates on 5V and provide output in both Digital and Analog.
6. If System requires to fetch the values in PPM, then Analog pin is used to get PPM values. To fetch Accurate PPM values, it is required to use 10K ohm resistance while preheat duration of sensor is 20 seconds.
7. Portable circuit.
8. Cost effective.

4.2 Block diagram description

1. The temperature & humidity sensor (DHT11) is used to sense the rise in temperature & is used to see the percentage of humidity present in the warehouse.
2. detection of smoke, the gas sensor (MQ2) helps in detecting LPG & methane gas inside the warehouse. If smoke is detected in the ware house then this sensor will sense it and it will automatically turn on fire extinguisher and also turn on the alaram.
3. sensor is there to count the number of people entering in the room. If person in the room then IR sensor will sense it and the light in the warehouse will be turn on.
4. Also another IR sensor is placed there to perform same action but this will take action against the first IR sensor.
5. This sensor is placed to count people who are leaving in the warehouse. If count will be zero then this will automatically turn off the light. The limit switch is there to check the status whether door open or close.
6. sensing the data from the sensors, the data will be displayed on the LCD display and for the controlling action the relay is used which will take actions against the sensors.

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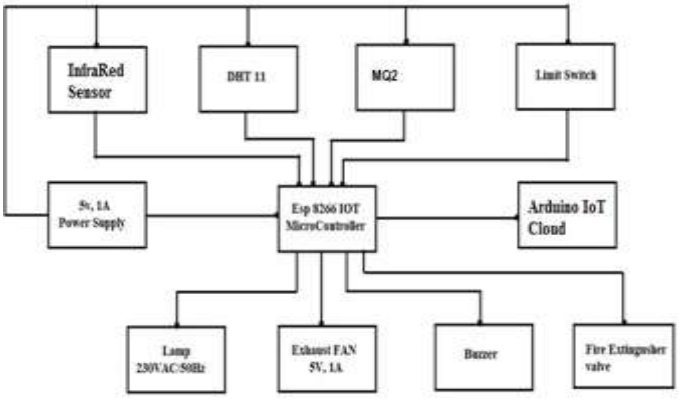
7. Administrator can access the data from anywhere by using IOT platform.

4.2 Block Diagram

Block diagram for proposed system is as shown fig.4.2



4.4 Hardware Description

ESP8266

The ESP8266 WiFi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all WiFinetworking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost-effective board with a huge, and ever growing, community.

This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfaces, it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts.

ESP8266EX is capable of functioning consistently in industrial environments, due to its wide operating temperature range. With highly-integrated on-chip features and minimal external discrete component count, the chip offers reliability, compactness and robustness. ESP8266EX is integrated with a 32-bit Tensilica processor, standard digital peripheral interfaces, antenna switches, RF balun, power amplifier, low noise receive amplifier, filters and power management modules. All of them are included in one small package, our ESP8266EX.

ESP8266EX achieves low power consumption with a combination of several proprietary technologies. The power-saving architecture features three modes of operation: active mode, sleep mode and deep sleep mode. This allows battery-powered designs to run longer.The ESP8266EX microcontroller integrates a Tensilica L106 32-bit RISC processor, which achieves extra-low power consumption and reaches a maximum clock speed of 160 MHz. The Real-Time Operating System (RTOS) and Wi-Fi stack allow about 80% of the processing power to be available for user application programming and development.

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Fig: 4.1 ESP8266 IC

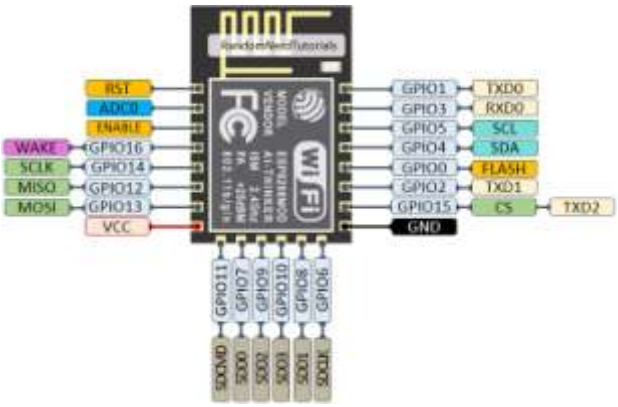

Fig: 4.2 ESP8266 pinoutreference

DHT11

The DHT11 is a commonly used Temperature and humidity sensor that comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The DHT11 sensor can either be purchased as a sensor or as a module. Either way, the performance of the sensor is same. The sensor will come as a 4-pin package out of which only three pins will be used whereas the module will come with three pins as shown above.

The DHT11 is a commonly used Temperature and humidity sensor**.** The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sensor is also factory calibrated and hence easy to interface with other microcontrollers.

The sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of ±1°C and ±1%.

Applications of DHT11-

1. Measure temperature and humidity
2. Local Weather station
3. Automatic climate control
4. Environment monitoring

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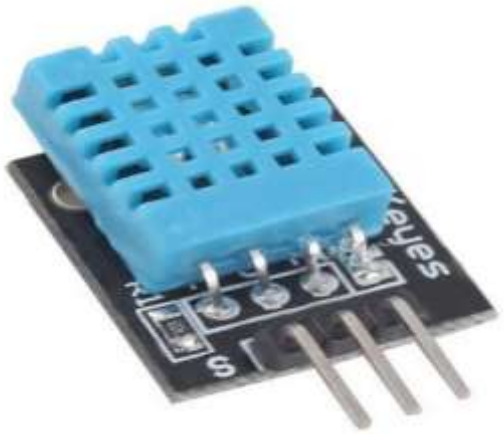

Fig 4.3Temperature &Humidity sensor (DHT11)

MQ2

MQ2 is one of the commonly used gas sensors in MQ sensor series. It is a Metal Oxide Semiconductor (MOS) type Gas Sensor also known as Chemiresistors as the detection is based upon change of resistance of the sensing material when the Gas comes in contact with the material. Using a simple voltage divider network, concentrations of gas can be detected. This sensor is also used for Air quality monitoring, Gas leak alarm and for maintaining environmental standards in hospitals. In industries, these are used to detect the leakage of harmful gases.

The sensor is actually enclosed in two layers of fine stainless-steel mesh called Antiexplosion network. It ensures that heater element inside the sensor will not cause an explosion, as we are sensing flammable gases.

It works on 5V DC and draws around 800mW. It can detect LPG, Smoke, Alcohol, Propane, Hydrogen, Methane and Carbon Monoxide concentrations anywhere from 200 to 10000ppm.

These sensors are used to detect the presence of gases in the air such as methane, butane, LPG and smoke but they are unable to distinguish between gases. Thus, they cannot tell which gas it is.

Module version of this sensor can be used without interfacing to anymicrocontrollerand is useful when detecting only one particular gas. This can only detect the gas. But if ppm has to be calculated then the sensor should be used without module

Features-

1. High sensitivity to alcohol and small sensitivity to Benzine
2. Stable and long life
3. Fast response and High sensitivity

MQ2 Gas sensor

Fig: 4.4 Gas sensor (MQ2)

Infrared sensor

An infrared sensor (IR sensor) is a radiation-sensitive optoelectronic component with a spectral sensitivity in the infrared wavelength range 780 nm-50 µm. IR sensors are now widely used in motion detectors, which are used in building services to switch on lamps or in alarm systems to detect unwelcome guests.

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In a defined angle range, the sensor elements detect the heat radiation (infrared radiation) that changes over time and space due to the movement of people. Such infrared sensors only have to meet relatively low requirements and are low-cost mass-produced items.

Depending on the basic physical principle, an IR sensor can work in a wide temperature range without cooling (so-called thermal infrared sensor) or must be cooled or at least thermally stabilized (semiconductor resistor or semiconductor diode) to achieve a good signal-to-noise ratio (detectivity).

Infrared sensorsin are used in gas warning devices, gas analysers, medical gas measurement technology, flame detectors and in contactless precision temperature measurement. These devices use the intensity measurement of infrared radiation in defined spectral ranges.

Fig4.5 Infrared sensor

Limit Switch

A limit switch is an electromechanical device operated by a physical force applied to it by an object.

Limit switches are used to detect the presence or absence of an object. These switches were originally used to define the limit of travel of an object, and as a result, they were named Limit Switch**.**

Standardized limit switches are industrial control components manufactured with a variety of operator types, including lever, roller plunger, and whisker type. Limit switches may be directly mechanically operated by the motion of the operating lever. Areed switchmay be used to indicate proximity of a magnet mounted on some moving part.Proximity switchesoperate by the disturbance of an electromagnetic field, by capacitance, or by sensing a magnetic field.

Advantages-

1. The designs are generally simple and straightforward
2. They work well in almost any industrial setting
3. They exhibit high accuracy and repeatability
4. They are low power consumption devices
5. They can switch high-inductance loads

Fig 4.6 Limiting switch

V. SOFTWARE DESIGN

5.1Modern tools used

1. Proteus
2. Arduino IDE
3. IOT cloud

5.2 Algorithm

1. Initiatize
2. Wifi searching
3. Display parameters to be measure

- Temperature
- Humidity

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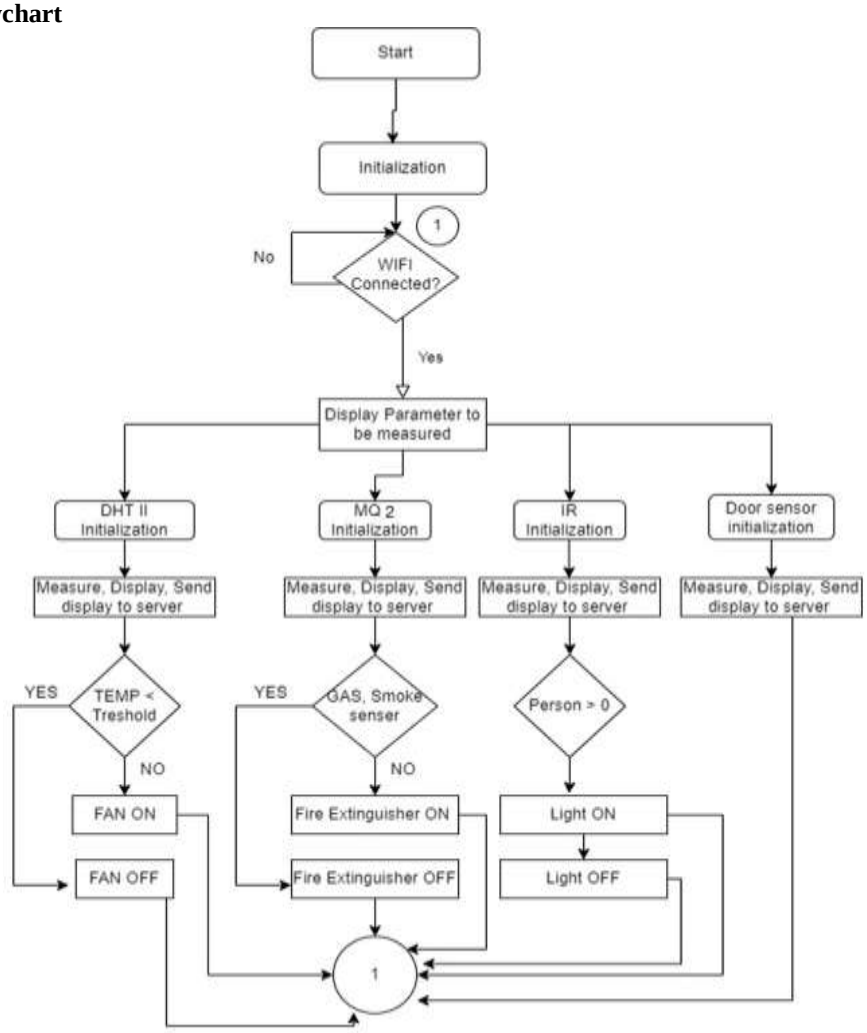
- Gas density
- Person count
- Door status

4. Sensor operation to perform
   I. DHT11- measure temperature & humidity
      - If temperature > threshold; fan ON
      - If temperature< = threshold; fan OFF
   II. MQ2- measures gas and smoke density
      - If density >threshold; fire extinguisher ON
      - If density<threshold; fire extinguisher OFF
   III. IR sensor- measures persons count
      - If count>0; light ON
      - If count=0; light OFF
   IV. Door sensor- door status display and send to server
   V. Sends the data to the server.

5.3 Flowchart



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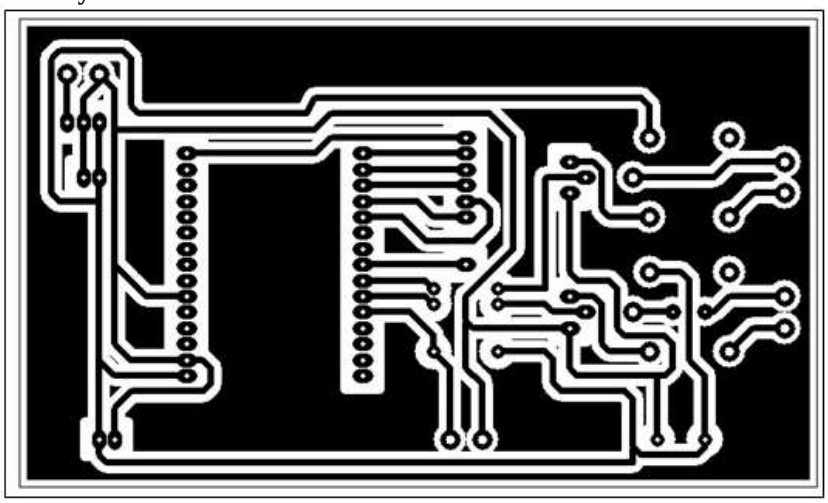
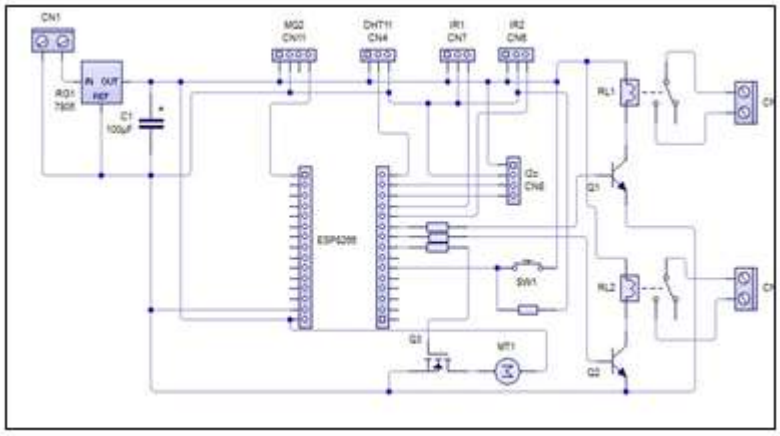
5.4 PCB design and Layout



5.6 Circuit layout



VI. NOISE IMMUNITY

- As per our requirement ESP32 is needed. Due to non-availability of esp32 in proteus for simulation part we are using Arduino.
- Ultrasonic sensor is not working as per our requirement.
- The system is designed to operate at normal working condition and within a warehouse. If it is operated in a high temperature environment then it will affect the reliability of the system.

VII. PROCEDURE AND RESULTS

Fig 4.1: Temperature sensed and detected more than 35

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Fig 4.2: Fan turns ON as temperature is more than 35

Fig 4.3: Number of persons is counted

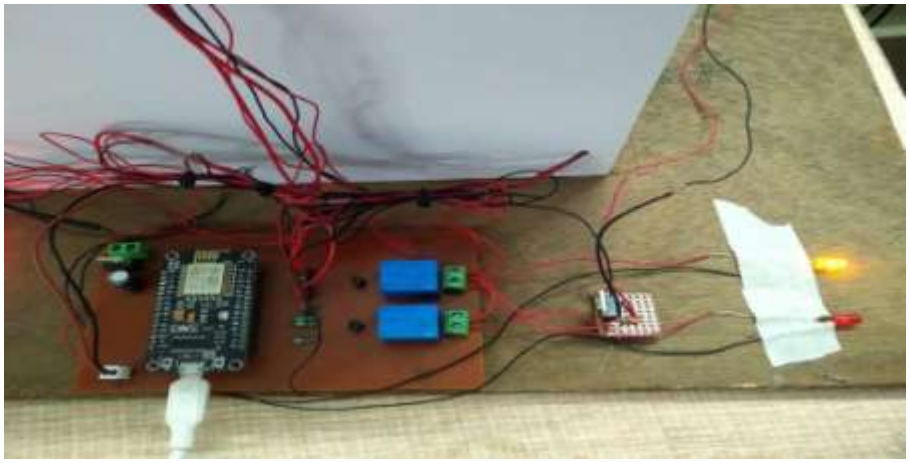

Fig 4.4: Glows yellow light if person enters

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Fig 4.5: Smoke is sensed and detected more than 350

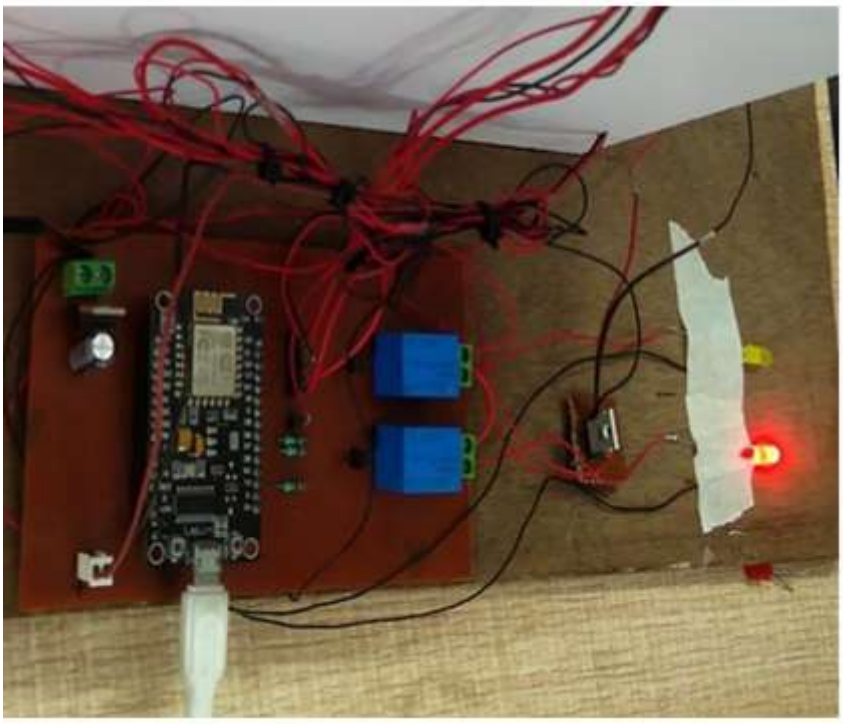

Fig 4.6: Glows red light if smoke is more than 350

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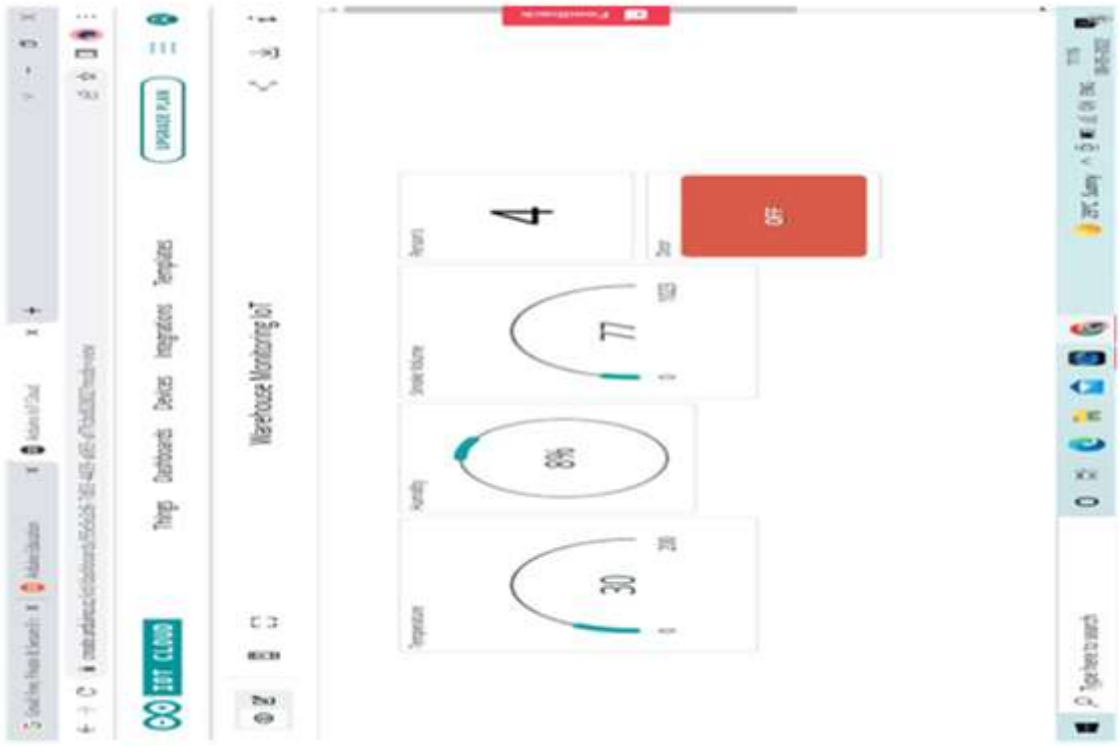

fig 4.7 IOT cloud showing status of door i.e., Open

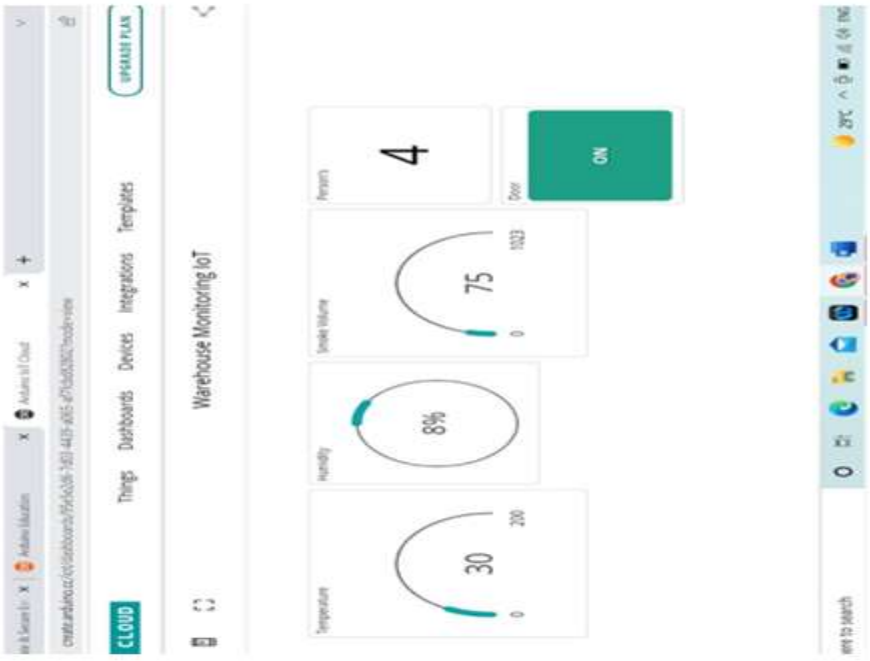

Fig 4.8: IOT cloud showing the status of door i.e., Open

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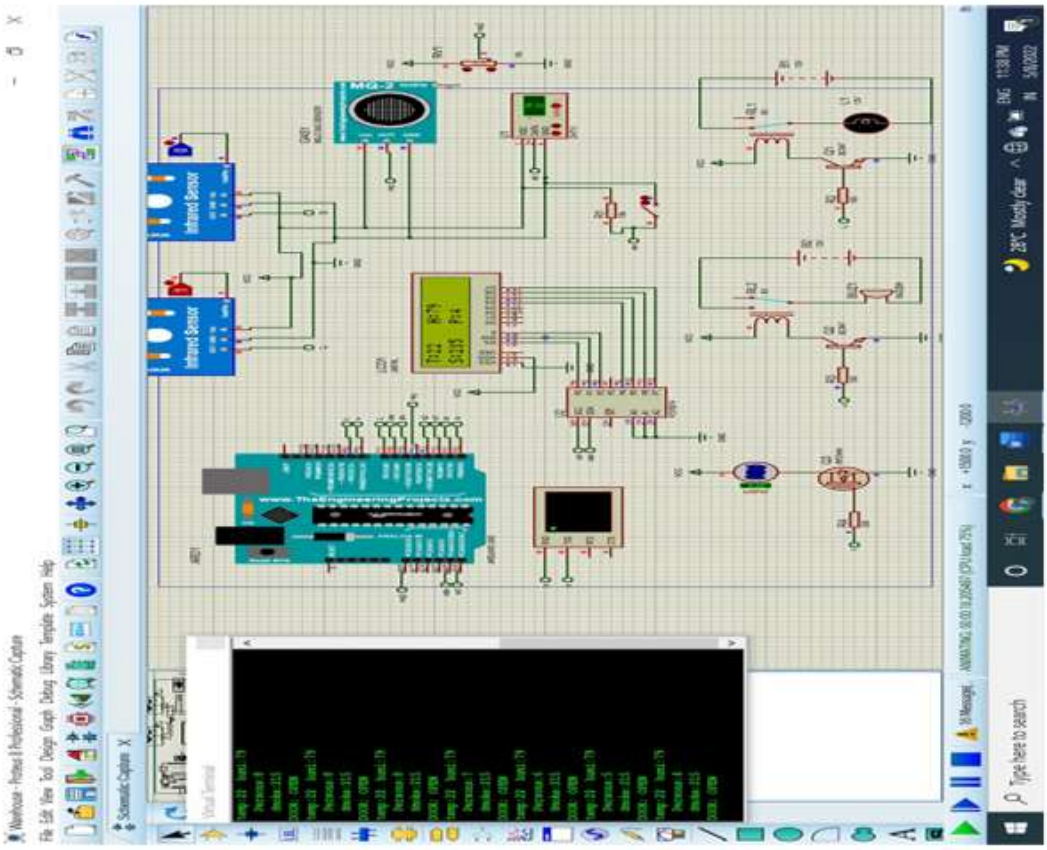

Fig 4.9: Simulation of Project in Proteus

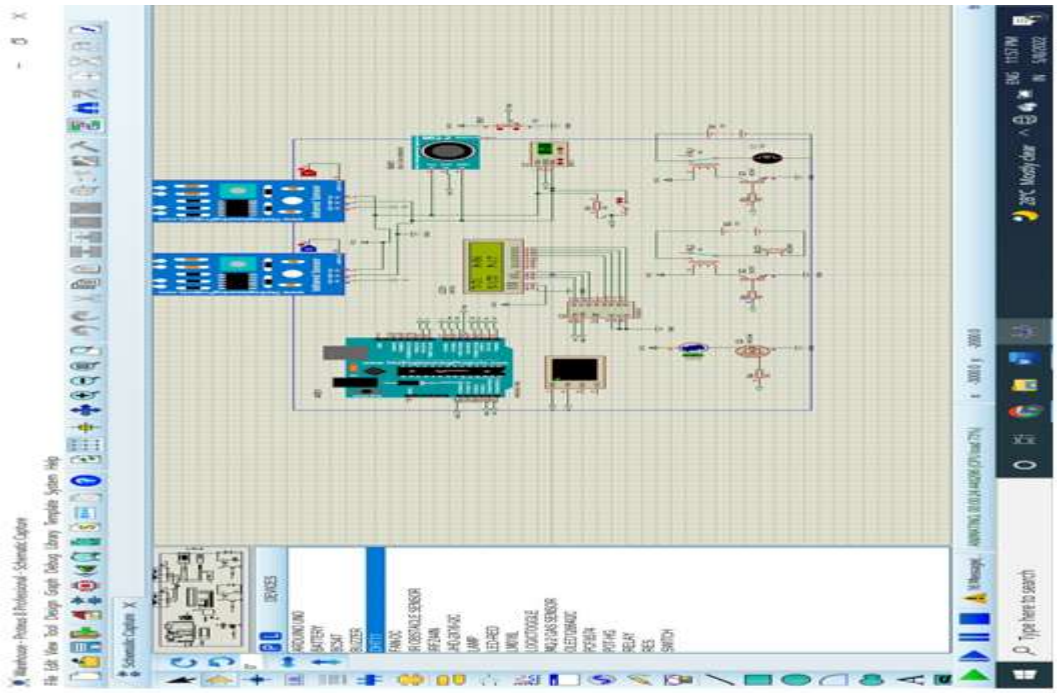

Fig 4.10: Simulation showing result when temperature exceeded

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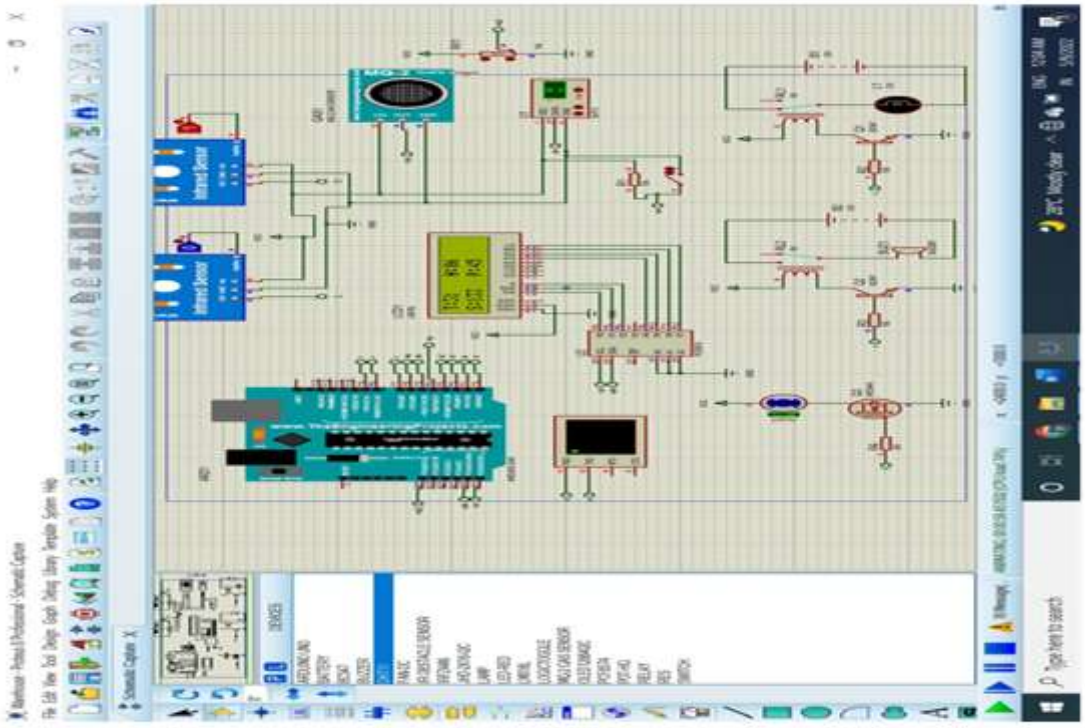

Fig 4.11: Simulation showing result when persons count increases

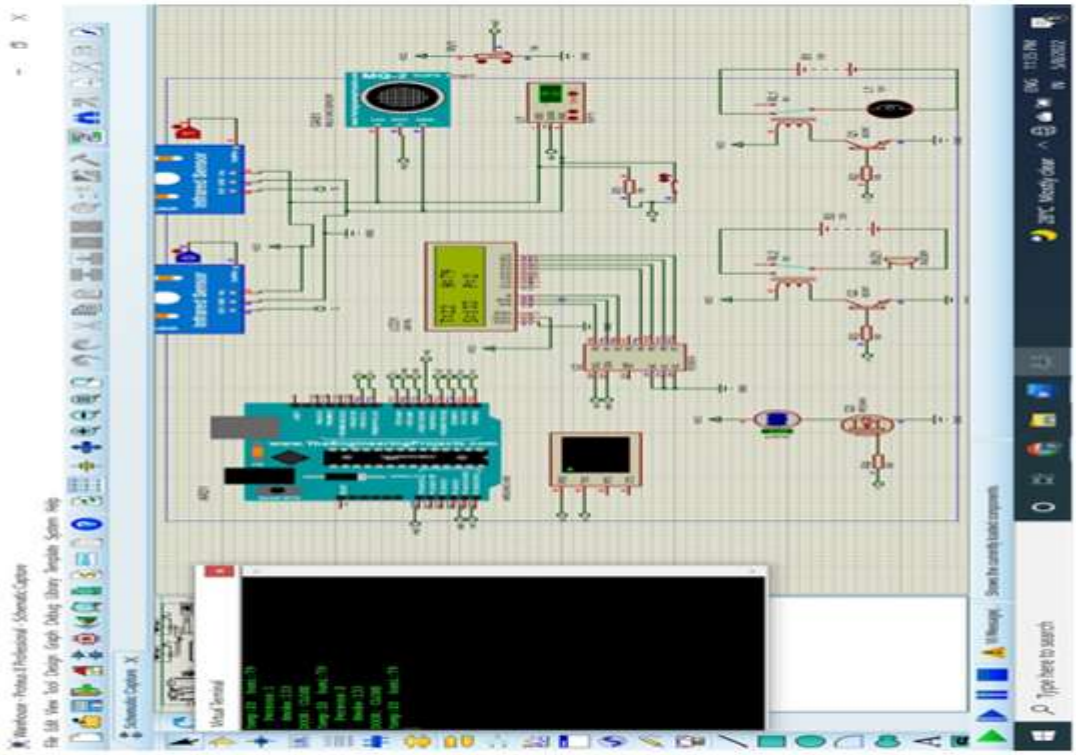

Fig 4.12: Simulation showing result door status

VIII. CONCLUSION & FUTURE SCOPE

8.1 Conclusion

This project aimed to provide cost effective solution to monitor the grains.

Also, this type of application helps in checking the temperature and humidity on a continuous basis and then resulting instructions are sent to the server. Based on which the environment inside the store rooms can be monitored. This type of system can help in Industrial Automation using IoT, with the help of which we can take intelligent decisions.

All sensors (Infrared, DHT11 & MQ3) data we can monitor anywhere on earth using IOT cloud server. Temperature, humidity, Door Status, Alarm signals, Person counter all the data is monitored by user using IOT platform. Once the system is set up in the warehouse by placing all the sensors in the warehouse the following actions can be monitored and controlled- Wastage of food reduces, Suicidal rate of farmers decreases, Fare price

I hope this system can be used not only in warehouse management but also in store management or medical care. OT technology has gradually changed our lives. In the future, there will be more combinations of Internet and physical goods systems, making our lives more convenient and safer.

8.2 Future scope

1. Advances in tracking and visibility.
2. Advance warehouse automation.
3. Big data and machine learning.
4. Labour shortage mean that warehouse will look to the ways to increase productivity, automation tools that are simply to use and easy to train workers on and change the nature of the work in order to attract new labour.
5. In future the warehouse technology will include robots, drones, and evolved supply chain management.

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