Monitoring and Controlling the Crops in Warehouse using IOT

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***Abstract* - Internet of Things (IoT) is a concept that allows physical objects with computational and sensory support to connect with each other and access services across the Internet. The IoT idea was introduced to connect devices through the Internet and facilitate access to information for users. The wide range of potential applications of IoT also includes agriculture, where extensive use of IoT is expected in the future. The aim of this work was to present the IoT concept as a basis for monitoring and controlling the crop in warehouses.**

Agriculture plays the major role in economics and survival of people in India. The purpose of this project is to provide an embedded based system for crop storage and reduce the manual monitoring of crops and get the information via web application and SMS. The system is proposed to help the farmers to increase food availability and reduce food spoilage. The present system is urbanized to collect real-time data from the warehouse such as temperature, humidity, CO_2 etc, and allows the user to control the changes if required.All these sensors can be easily controlled with the mobile through a web application developed using Node-Red.This project help us to monitor in real time.

Keywords- DHT22, PIR, RASPBERRY PI 3b+,BUZZER , MCP3008, MQ-135,FIRE ,Relay, IoT, smart warehouse.

I. INTRODUCTION

India is where the horticultural areas assume a significant part in the economy. Consistently ranchers face various issues because of the capacity prerequisites, absence of legitimate checking of the food put away. Distribution centre in the agribusiness area is considered as the more significant area for the most part for guaranteeing food safety. In prior days, there were antiquated techniques for stockpiling the yields which required a ton of the manual methodology incidentally which is tedious and wasteful. Food and grains begin to ruin when they are yielding. Furthermore, just a little amount of the food and grains are stored in storage centres. An enormous piece of the harvests is left without legitimate storerooms. because of the variances in the market gracefully both from one season to straightaway and from one year to next, the misfortunes that the nation faces each year because of ill-advised capacity is about Rs.50,000 crores in money related terms. A stockroom gives assurance of food from setback and mischief as a result of warmth, dampness, residue, and air. The basic point must be to keep up the yield in incredible condition for as far as might be feasible. Capacity of yields is one of the components of warehousing where insurance of yields and risk bearing is an essential factor. Besides, it hinders any mishaps like robbery or hardship. As observed by the Food and Agriculture Organization that the higher the temperature, the lower should be the clamminess of the grain to guarantee extraordinary security of the harvests. As a result of high temperature, food loses its weight continuously and in the end is withered, spoiled. The primary target of this work is to develop a monitoring and controlling of yields in warehouses using IOT which will give live information of temperature, dampness and different boundaries and furthermore to control these boundaries distantly over the web. Means on the off chance that an unforeseen circumstance is made, at that point administrator can control the circumstance using a webpage. Another intention is to automate this cycle where everything like stockpiling temperature, moistness is consequently kept up without human communication.

II. LITERATURE SURVEY

Use of smart sensor and IOT to monitor the preservation of food grains at warehouses.

In the proposed system,the problem of information transmission & data analysing can be solved using the integration of IOT.The information sensor is analysed to activate the electronic devices & raspberry pi is a server used to analyse the data and the information is transferred to the user.

Components Used:

- Raspberry pi 3 Model B+
- Sensors (PIR,Temperature & Fire).
- Ultrasonic Ranging Device
- Web Camera
- Buzzer

Software Requirements:

- Java
- Win forms using C#,Net
- Android studio

Raspberry pi 3 model B+ is third generation model
It has onboard wi-fi & Bluetooth.

After the completion of data processing, the website link involved via application interface & it is sent to the user with the time stamp & processed information.Along with the repellar activated is based on the distance that is calculated by ultrasonic ranging device that works at the frequency ranges 30KHZ to 65KHZ that result in causing aversiveness to rodents.

The sensors, red light camera and buzzer will be connected to the raspberry pi. If the motion of any object or the fire flame is detected, led light & buzzer will turn on.

When motion detected by PIRsensor message " motion detected" will display on the screen.

"Fire detected" with the presence of fire detected by the fire sensor inside the warehouse Red colour light turns into green.

The page displays the motion detected message along with the image of the object, fire detected notification with the flame image and also the temperature changes message when temperature crosses the limit value. By seeing all these messages,users can take the appropriate decision.

Intelligent food and grain storage management system for the warehouse and cold storage.

Agriculture is the main sector in India.All these depend on agriculture products. onWe uses a warehouse to store the products and then we export to the other country.20-30% of products we lose during this storage period because of not proper storage, loss is mainly due to environmental changes that change the quality, quantity & physical volumes of the product. So mainly we need to monitor and control environmental conditions.

In this paper they use GSM Module, LCD,renewals microcontroller and sensors to monitor the warehouse conditions and to control it.

Sensors monitor the temperature, humidity & smoke in the warehouse. The microcontroller collects these values from sensor mode & then it transmits it to the GSM module & the to the web server.

If temperature increases automatically the fan will on & controls the temperature and the data is sent to the GSM module.

If humidity increases fan stops automatically & sensed data will be sent to the web server to take necessary action to control the humidity level inside the warehouse.

LDR sensor is used to provide the proper lighting needed for some of the food products. Smoke detector is used to detect the fire & sends the information to the web server to take action to control fire.

Load cells are used to check the food products weight they might be decreased due to rat eating,spoiled reducing volume etc.

This system helps to reduce the browning effect in food products, decreases the micro-organisms activity.

Intelligent grain storage management system based on iot.

70% of people depends on agriculture in India.Humidity,temperature and carbon dioxide are affecting factors that spoil the food grains and leads to loss.the approach of monitoring grain storage system designed using sensors ,blink app to monitor and control the system through notifications in continuous time stamps.This system involves multi features like online detection ,regular updation and easy maintenance of system.

The intelligent grain storage management system is developed using the raspberry pi processor and to display the output thingspeak interface and blink application is used .the gas sensor(MQ135),smoke detector (MQ2),Temperature and humidity sensor(DHT11) are connected to raspberry pi.

In this paper they used Node MCU,ESP8266 which is an open source Iot firmware is used for the various number of iot applications.It has inbuilt wi-fi module for transmitting data over the server.DHT11 sensor is used to measure temperature and humidity,MQ135 gas sensor is used to measure the atmospheric gases specifically carbon dioxide in area,MQ2 smoke detector to measure the fire gases in the surroundings,PIR is a infrared sensor used to detect the motions of animal.

And they have used thingspeak which is an open source iot application and API to store the data and to retrieve data.It uses the HTTP protocol over the internet. Capture data from all above sensors is displayed in this window of thing speak.
Blink application is used to send notification over blink cloud with time stamp.For the sensors MQ2,MQ135,DHT11and PIR which are connected to Node MCU,buzze and fan are provided to control the actions.

Smart warehouse monitoring using iot

The smart warehouse monitoring system should monitor at regular time intervals to reduce storage cost of food grains.and it reduces manual labour work and it makes the work easier.smart warehouse uses the sensors and iot technologies to monitor and control environmental conditions inside the warehouse
In this project they used the sensors to capture temperature,moisture,earthquake and fire related data and send the alerts using iot technology.
In this proposed model they used raspberry pi3,a single board low cost ARM11 linux powered operating system which runs at 1GHZ with ARM11 microcontroller with 1GB RAM memory. Raspberry pi zero model controllers adopt iot technology to send the messages ,python language is used to program.
LM35 is an integrated circuit sensor that is used to measure the temperature.DHT11 temperature and humidity sensors are interfaced on the raspberry pi.

To see the vibration SWU20,PIE20 residue sensor is used to detect small trembling of the ground.
Infrared sensor is used to sense the distance and also for collision detection application.it has emitter and receiver pair,the receiver detects IR signal.The output is high if it receives the IR signal, low otherwise
Sensors and controllers are connected in a circuit .Any variation in threshold value sends the alert notification using wi-fi module through mobile to the user.user will take necessary action immediately to control the spoiling.

IOT based smart realtime agriculture warehouse monitoring and control system using raspberry pi

Warehouses are used by the farmer to stored their food products for long to increase the lifespan.to check the food products whether spoiled or not they smartend the warehouse to monitor in regular interval time and they can maintain the quantity and quality of the food grains by using several sensors and microcontroller like raspberry pi2.

Raspberry pi2 model B is packed with more features.it is a quad core processor with a memory of 1GB RAM.it works 6 times faster than its older version.

DHT22 is a temperature and humidity sensor with a single wire digital interface that uses a capacitive humidity sensor and thermistor to measure the surrounding air and passes the digital signal.

Humidity sensor senses both moisture and also air temperature then reports the data to the controller.
They are also using smoke sensors to detect the smoke based on the voltage levels.MQ2 is a smoke sensor connected to the raspberry pi it reads the output of the sensor and sends an alert to the user if smoke output is more than threshold value.
PIR sensor is used to detect motion of people,animal or any other object.Burglar alarm and the light system will active if any motion is detected
They are using cameras in this system to send the real time image of the warehouse to the owner.
Relay is used to control the light fan Peltier to control the humidity and temperature level.

IOT based food monitoring system in warehouse.

Warehouses are used by producers ,middle mam,traders,customers to store the food products.framers facing huge loss because of lack of storage requirements in warehouses.in this paper they are introducing the smart monitoring system iot using using microcontroller raspberry pi and various sensors to continuously monitor the warehouse conditions to improve the storage facilities,to avoid earlier food spoiling that are affected by various environmental factors like temperature,humidity etc.and they are using thingspeak cloud platform for visualization of data.the database is maintained using My SQL and login page for administration.

In this model sensor network consists of dht11 sensor to measure humidity and temperature,ldr sensor,it is light dependent resistor, it resistivity depends on the incident light radiation.when light falls on the sensors resistance decreases and it is maximum in the dark.MQ3 sensor is used to detect the nitrogenous gases that comes from the spoiled food

Raspberry pi 3 is a main processing unit.it has CPU,GPU,memory, video outputs along with the inbuilt wi-fi module. The software part consists of NOOBS operating system that is equipped with raspbian, contains python,scratch etc.

The entire system is designed using python.the environmental conditions of the warehouse are transferred to the web app in real time created using hypertext markup language.

The wireless sensors are used to monitor the critical conditions of the environment in the warehouse.Parameters like temperature,humidity,light,moisture etc.

Sensor senses warehouse parameters and sends it to raspberry pi. If any parameter is above or below the threshold then buzzer will turn on and notify the warehouse administration

Monitoring food storage humidity and temperature data using iot

This paper represents the internet based and monitoring real time based on humidity and temperature management using the available sensors or the components.

The main objective of this system is to maintain food safely.The methodologies used in the developed systems are Node MCU,DHT-11 sensor,Jumper Wires,Power Bank.

Methodology has been divided into mainly two parts.First hardware setup and then connection between Node MCU and DHT11 and Sensors.

Assets connected with obliged gadgets connected with the internet in adding implies different applications.

The system has an API built where the website is used. The site makes use of thingspeak.The sensor which receives the data converts that data into string.

Beside sending information to Iot Web Server the information will be sent to the database and webserver inside Local Area Network

The system can be used in cold storage evaluation & monitoring data can be done by using mobile phone or through PC.

IOT monitoring system for grain storage

Agriculture is the world's main longest profession and has a vital role all around. IOT also plays a vital role in agriculture,main and essential reasons for it, in implementation.

In the existing technology different techniques are used to store good items.It includes surface structures and Underground structures. Underground structures are like well. It is very easy to fill the gravity. Most popular storage systems followed by FCI, CWC and SWC, are covered storage.

The poor farm storage facilities are leading to damage. The warehouse doesn't have proper temperature and humidity.Poor Moisture maintenance to the grain leads to wastage gets damaged.

The experimental methodology used in this paper ESP8266 it is low cost WI-FI microchip and Node Red is a visual programming, amazon web service, it on demanding cloud based computing sowie platform, provides technical infrastructure. RAM memory and GPIOs for processing, networking a choice of operating system & many more other applications between. The working of the proposed method is a typical monitoring consisting of ES78266. It is Interfaced with a DHT11 sensor. Aws & Mongoose OS is flashed and sends data b/w the node MCU and Amazon Web Service.

Optimised sensor based smart system for efficient monitoring of grain storage

Many studies on food loss and waste, how the wastage of food related to various angles of food safety.

In this the proposed system. The monitoring system works by continuous sending of the sensor's connection on different parameters. To know the CPS- based smart grain storage system.The data processing system computes the Monitoring controlled by continuously sensed data and processed data will be sent to the data center in the cloud.

The system mainly has three layers and a sensor network is developed by deploying sensors. After deploying sensors in the grain storage bin and sending data to the central processing system. Challenges faced by the system include identifying hand ware constraint scalability cost topology sensor's sensitivity,coverage area.

In the proposed solution in the optional number of clusters the cluster should be set in such a way that can cover maximum area with less energy loss in data sending. In selection of the clusters head plays the vital role in minimising all the cost, hence the power consumption is directly proportional at the no of cluster heads.Conclusion of good storage system using info technology can ensure the grain quality by controlling & monitoring all the environmental conditions.

Automated Granary Monitoring and Controlling System Suitable for the Sub-Saharan Region

In sub-saharan regions lots of food is being wasted in storing time because of inability to continuously monitor & control the storage houses.Proper monitoring of warehouses can reduce grain loss.To do so in this paper they present automation systems for grain storage houses that are found in the sub-saharan region .

This automated system buildup of wireless sensor network that are communicate with linux based raspberry pi communication between them is lightweight-reliable machine-to-machine communication protocol and easily accessible & secure web interface is developed to graphical visualization the store by its owners.Owners gets alert messages in case of risk factors.

Each node consists of elements like sensor,processor,wireless communication unit & power supply unit.This system is also made accessible externally through a gateway,a web server & as sink node.Relay module used to control variation.

Raspberry pi 4 is used in this system operates at temperature between 0-500℃. The Node MCU(node micro-controller unit) has a luca based interactive firmware that runs on ESP8266 Wi-Fi.And it is open source firmware it has 32bit built-in processor of a speed of 80-160MHz.This board is to control electronic devices connected through Wi-Fi.

GSM module - SIM800 module is a quad band GSM/GPRS module used in this system to support GSM frequency bands of 850/900/1800/1900 MHz.This device supports 2G,3G,4G mobile networks.

MH-Z19 Co_2 gas sensor is used to detect the carbon dioxide in air using non-disruptive infrared principle.It has the ability to resist interference that has occurred by water vapour,low power consumption,high sensibility.

DHT22 humidity and temperature sensor is a high-performance 8-bit micro controller unit.Uses high precision capacitive technology to measure temperature & humidity operating temperature range is -400℃ to 800℃ & humidity range is 0 - 100%RH with temperature accuracy of ±50℃ & humidity

±2%RH.Passive infrared sensor device is used to detect the motion by infrared radiating from the warm- blooded animals.

Aeration is forced circulation of ambient air including storage houses to avoid the effects of bacterial instestation,molding & high humidity.The proposed aeration in this system is Aeration drying,Aeration cooling,aeration drying _reduction of grain moisture.

Prediction and Monitoring of Stored Food Grains Health using IOT Enable Nodes.

Developing countries like India are still facing issues in monitoring food grains health by traditional / conventional methods that may detect insects at later stages that will lead to spoiling of food grains. The parameters like temperature,humidity,carbon dioxide concentration have to be monitored and controlled in a timely manner to maintain the quality and quantity of food grains.

This paper gives a solution by using an IOT based real time system that monitors the environmental parameters to control loss of food grains.To maintain warehouse conditions they are using 2 sensors they are DHT22 and CDM71600,ESP8266 & battery for power supply.DHT22 detects temperature and humidity.CDM71600 detects Co_2. Outline protocol created to analyze the data and real time data collection from the sensor nodes.

Machine Learning algorithm deployed to predict relative humidity at a particular temperature.The type insect that attacks the grain is predicted by the relative humidity prediction.On these results the action taken to control the grain quality and loss.Proposed model has three parts for executing nodes,taking data from sensors & sending it to the cloud for analyzing to predict the health of grains.

The software system helps the nodes designing to take the proper caution after analysis of node data. Wi-Fi module ESP8266 used to connect our devices to the warehouse network.It can cut as both sender and receiver.Web application is created to analyze the retrieval data at cloud by the warehouse manager to get the information of the grains in real-time.In this model data is represented in the form of graphs.

Food Products Monitoring Machine using Combination of Multiple Autonomous Sensors

Food products are very essential for every human being.Linear growth in population needs more food.Households having the problem in monitoring and managing the food product stocks.So this paper gives a system that is used to solve this problem using IOT and multiple autonomous sensors like IR Sensor,Ultrasonic Sensor,Load cell to monitor the household food products.The data will be displayed on the user's mobile to monitor the food left in their storage.

The food products left in the storage can be maintained through user's mobile using sensors.This machine has 3 blocks,these 3 blocks consists of 3 sensors like IR Sensor which will measure the availability of food,Ultrasonic Sensor which is used to measure the change in volume of the goods and load cell is used to measure the weight of the goods.

The food products monitoring machine has an interactive way in food product supervision and managing.If any changes on weight,volume or presence then these changes can be detected and processed on the Node MCU.Node MCU ESP-8266 is open source module.It is built for the IOT applications.It has a 32-bit RAM microprocessor with wi-Fi network and built -in flash m/y.It supports Arduino IDE as development environment used for this work.

Hence the multi-sensors machine is very much capable in finding the problem in maintaining the stacks,packaged foods,drinks and displays the found problem on a user's mobile on real-time so users can maintain and take proper action immediately to save their food for a long time.

An IOT Based Real-Time Intelligent Monitoring and Notification System of Cold Storage

IOT is becoming a promising technology due to its cutting edge fusion of sensor techniques, predictive analytics.The rest of the paper is structured in five sections.Section illustrates literature review,architecture of proposed system,real time monitoring,implementation details.The real time value is stored in firebase database ANN classifier is applied to predict status of FVS into classes.An automatic alarming is implemented.Based on real time parameters it has decision support to predict the status of commodity.

Algorithms are done on the prediction model.Hardwares used are embedded with sensing devices.The temperature in cold storage results in loss of perishable FVS.Components used are ESP-WROOM-32,Power supply PCB board,Dht22,MQ-135,LDR.The relative humidity is substantial environmental parameter.High intensity is vital factor.The implementation totally monitors real time and has 3 algorithms implemented.Concluding who has suggested minimum 400g FVs per should be taken in human diet.

Deep Learning-Based Automatic Monitoring Method for Grain Quality Change in Warehouse using Semantic Segmentation

Through the cameras in granaries,grains warehouse staff can monitor the change of grain quantity.On part gears although the computer vision technology has been applied to many areas and achieved better results.When it comes to computer vision for it semantic segmentation to assign semantic category to each pixel of an image .When comes to methodology granary image acquisition used to capture image segmentation is used to obtain accurate grain loading lines and grain surfaces.The high level DCNN can capture rich semantic info that has less nose.The encoder as well as decoder is been implemented using algorithm in the methodology.Due to easy implementation and high efficiency they adopt attention model BAM to calculate attention maps.Grain quantity change.Monitoring and data sets are being used.When with result extensive experiments to validate the performance and feasibility of proposed method,precision and recall are referred as measures of the segmentation quality because they are sensitive.finally proposed system is to monitor abnormal changes in grain quantity.

III. EXISTING SYSTEM

Nowadays storehouses need a low operating cost technology hence, required minimum managers for efficient operation of the storehouse management administration. Let's discuss those new modern technologies:

A. WMS: In the last decades, more advanced technologies used in the storehouse management systems. Labour-intensiveness is reduced due to efficient and time consuming process.For example:

B. Data entry and Paperwork: Data entry and paperwork has reduced the time working with the spread sheets and ledger maintenance of the management system.

C. Selection efficiency: With the help of computer guided systems the operatives can work faster with WMS, because the new modern technology helps us to arrange systematically for efficient and real time management of the WMS.

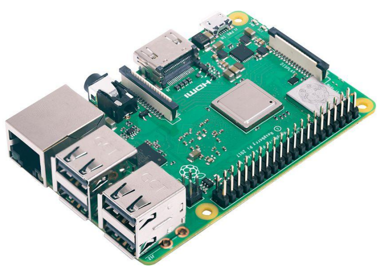
D. Task Interleaving: It becomes more powerful tools so that system guidance will be extended to all the activities. Especially it is used for the operator of forklift

IV. PROBLEM STATEMENT

Aim is to provide Farmers,Dealers,Traders and Distributors yield with good storage rooms to reduce food misfortunes and increment food safety.Reducing food misfortune which will consequently build high amounts of availability.In this problem we have considered fundamental five categories that will affect the condition of food which are Temperature,Humidity,Animals. According to above conditions we are providing suitable temperature,humidity,motion detection with smart IOT technology which includes temperature & humidity monitor,motion detector etc.,

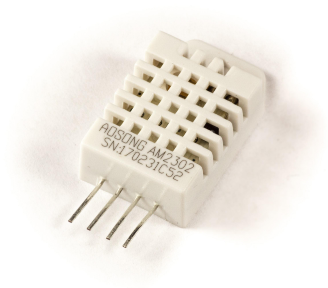
V. COMPONENTS

- *Raspberry Pi*



The Raspberry Pi3b+ is a single board as compared with the size of a credit card and a cheap computer that plugs into a TV or a computer screen and uses a mouse and standard keyboard. The raspberry pi is the lowest cost ARM11 Linux powered operating system with a single computer board. This board runs at @1GHz with ARM11 microcontroller and comes with a 1GB of RAM memory, as this model has given better specifications as compared to that of raspberry pi models such as raspberry pi and B model. It is a device that enables people of all ages to attract with the computer coding and also how to learn the coding from the scratch level. It has all facilities like a desktop computer and also to browse the internet and play with high definition videos and also high speed video games. It has a standard SD card slot and 32GB µ SD and also consists of four USB ports.

- *DHT22 Sensor*



The main purpose of the Digital Humidity and Temperature (DHT22) sensor is to measure the temperature and humidity of the surrounding air. In this system, this sensor uses a capacitive Units humidity sensor and thermistor to measure the temperature and humidity of the surrounding air in the warehouse. This data is used to maintain the yield without spoiling more than its original spoiling time. This sensor gives the accurate temperature and humidity of surroundings with perfection. It uses the web application to alert the farmers by detecting the temperature, humidity if it's above or below the required amount.

- *PIR Sensor*

A Passive Infrared (PIR) Sensor is a motion detector sensor used to detect the movement of humans,animals, birds, insects, and other objects by measuring the infrared light and when the crops are affected by a large number of insects, it gives an alert to the farmers and the buzzer will on.

- *Gas Sensor*

It is basically used to detect the CO_2 and display the values, like if the food it starting to spoil it will give alert to the farmer through the SMS

- *Fire Sensor*

A flame detector is a sensor designed to detect and respond to the presence of a flame or fire, allowing flame detection. Responses to a detected flame depend on the installation, but can include sounding an alarm, deactivating a fuel line, and activating a fire suppression system.

- *MCP-3008*

The MCP3008 is an 8-Channel 10-bit ADC IC, so it can measure 8 different analog voltages with a resolution of 10-bit. It measures the value of analog voltage from 0-1023 and sends the value to a microcontroller or microprocessor through SPI communication.

- *Relay*

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations.

- *Buzzer*

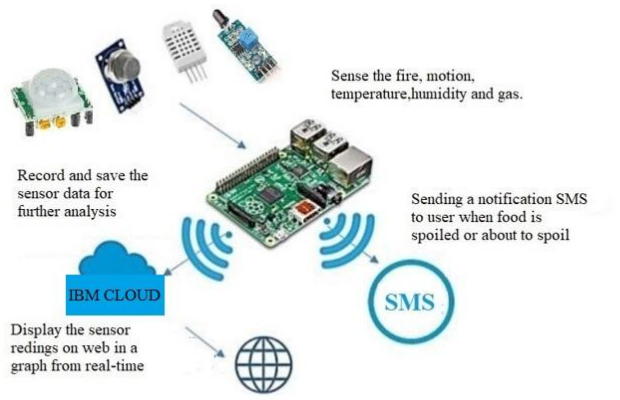
A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

VI. PROPOSED METHODOLOGY

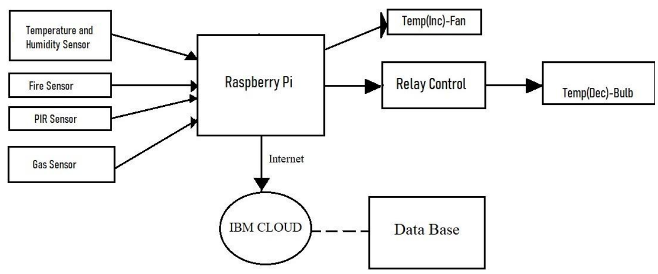
Monitoring and Controlling crops in the warehouse have been proposed with six major steps involved. Implementing these steps in precise order will produce classification and/or recognition as a final outcome.

Steps in the proposed methodology :

- Check temperature,humidity,co_2 values in the warehouse and record it.
- Input Temperature and humidity range for specific crops stored in the warehouse.
- If fire is detected then sms will be sent to the farmer or the manager.
- If motion is detected then the buzzer will switch on.
- If the temperature decreases than the required amount then the light will switch on.
- If the temperature increases than the required amount then the fan will switch on.



In the above proposed model, raspberry pi 3b+ model controller adopts IoT to convey the messages. The effective open source language python is used for programming. This is a very lucrative product for future use. The daring thing is to capture the ambient changes inside the warehouse. The DTH22 checks for the moisture and temperature contents.The PIR sensor checks for the motion in the warehouse.The MQ-135 checks for carbon dioxide contents.The Fire sensor checks for the fire in the warehouse.The Raspberry pi has an internal Wi-Fi module through which the IoT is connected. It also has a SD slot which stores a limited range of each sensor. The controller checks at regular intervals when the range exceeds it gives an alert. We monitor this by connecting with HDMI. Also, we use the HDMI port for scrutinizing the whole process. The Raspberry pi has an internal Wi-Fi module through which the IoT is connected. It also has a SD slot which stores a limited range of each sensor.Python language is a high level and highly interpreted programming language. It was founded and created by Guido van Rossum and was first released in 1991, It has a philosophy of design that has readability of the code, with significant whitespace. It enables and provides clear coding knowledge in both large and small scales. The main features of Python are automatic memory management and dynamic type system. It supports object-oriented, including imperative, multiple programming paradigms, procedural, and functional and also has a very large library with comprehensive functions. Many operating systems interpret the python programming language. It is an open source CPython and has a model with community-based development. as do nearly variant executions. It is a nonprofit foundation of the software industry.In this system basically we are checking how many days can a crop sustain in specific conditions which is compared with the crops left outside the box.With the help of python we are executing and running our system.When running the system first we will login to IBM cloud and the run the code.After running the code all values collected by the sensors are sent to raspberry pi and then raspberry pi will send this data to ibm cloud to display.Again in ibm cloud simultaneously this data will be stored in cloudant which a cloud database.And we are also storing the data in sheets

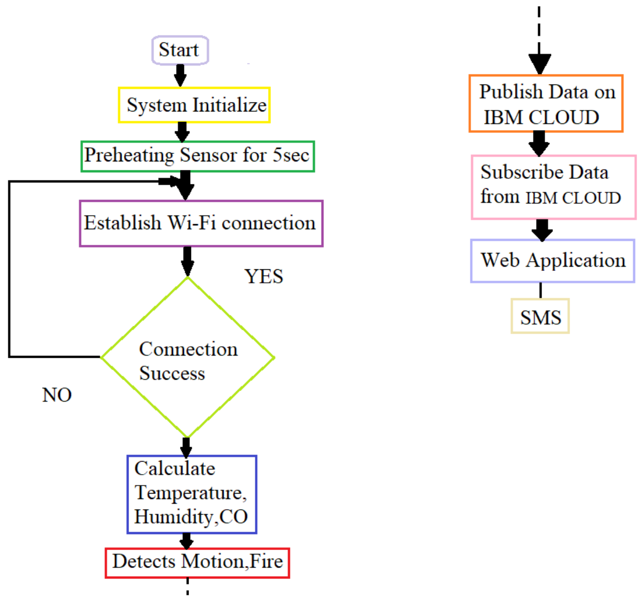


Constraints:

- Revenue and Affordability
- Power Supply
- Communication Range
- Harsh Device Environment
- Quality and Availability of Data
- Quality of Wireless Link

Assumptions

- Gracefully merchandise into the commercial center by having the option to store products when flexibly surpasses request and afterward delivering them when request surpasses.
- Keeping up reliable stock levels causes costs to remain stable, making it simpler for organizations to estimate creation, benefit and misfortune.

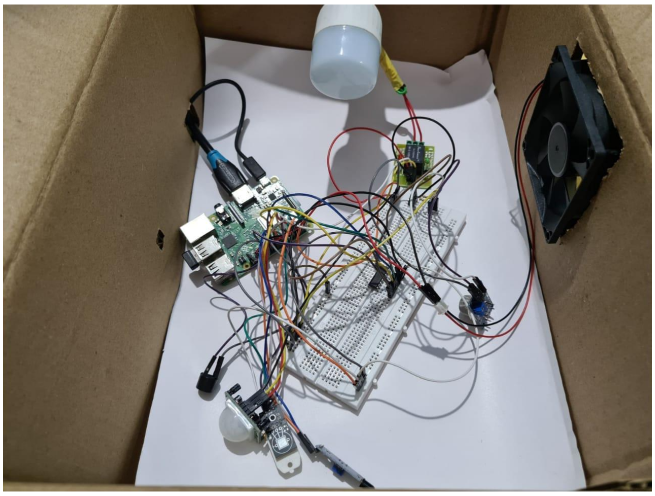


Advantages

- Reduced investment risk.
- Flexibility to design to specifications.
- Greater direct control on warehousing activities.
- If the volume is sufficient, this may workout cheaper.

Disadvantages

- Cost of manpower.
- Warehouses cause high prices of goods due to rent charges by owners of the warehouse.



Risks

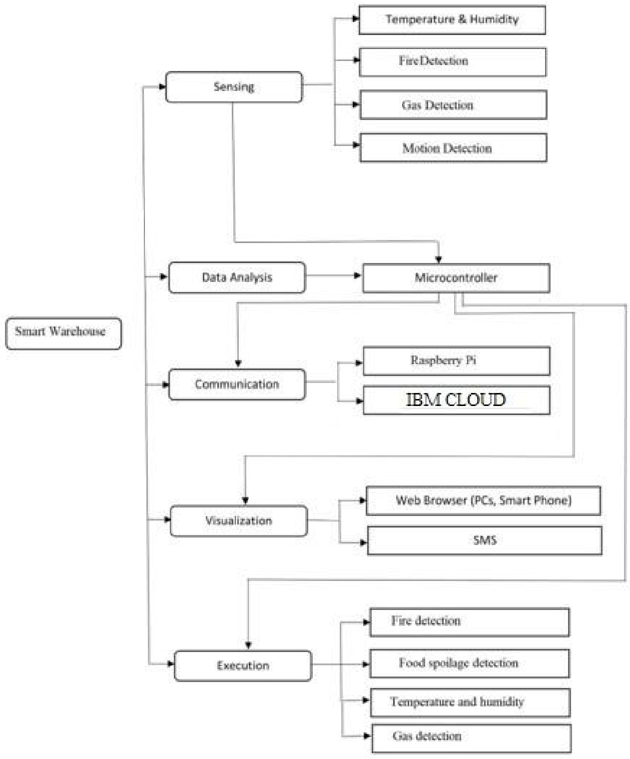
1. THE SECURITY FACTOR
2. TECHNICAL FAILURE AND FALSE ALARMS
3. CHANCES OF RASPBERRY PI GETTING DAMAGED
4. DATA SECURITY AND PRIVACY
5. NOT IN TIME ALERTS
6. CONTEXT-AWARENESS(META DATA)

Functional Requirements

The progressive necessities indicate the capacities and units of the proposed framework. They characterize the conduct of the framework identifying with need:

1. Measure Temperature
2. Gauge Humidity
3. Sense Carbon Dioxide
4. Sense Fire
5. Sense Motion
6. Estimate the Light intensity
7. Connecting Devices
8. Perit clients to alter the ideal qualities for the sensor
9. React to sensor readings and send alarms to the client.

VII. BLOCK SYSTEM



VIII. EXPECTED OUTPUT

With the sensors used and the dataset provided the system makes the best attempt to find the spoiled food and suitable conditions for the food to stay for long without spoiling. The accuracy of the system stands high with the ability of detecting the food spoilage and the conditions which are suitable for particular crops. As the trained dataset grows the efficiency of the system increases which in turn increases the accuracy in finding the spoilage. Thus the system stands for the betterment of farmers and dealers welfare thereby increasing the production and the economy of the country. This system can be further enhanced by changing sensors to find the spoilage of food in a more accurate way.

IX. CONCLUSION

There are no limitations on how many connections and sensors can be set up in an IOT smart warehouse system. The discussed model and IOT system design explored in this project can be implemented in a small setting like a storage house in the backyard and even on a large-scale warehouse.All the components and design can be scaled down to meet the user’s needs.However,it should be noted that the smart warehouse(as an application of IOT Technology) has not been given much attention and sufficient research. This basically happened because this kind of warehouse is costly and it's available only in highly developed areas.But given more attention especially from countries with much agricultural exports,smart warehouses have the potential to revolutionize the way warehouses operate and hence to boost the food availability and food market around the world.

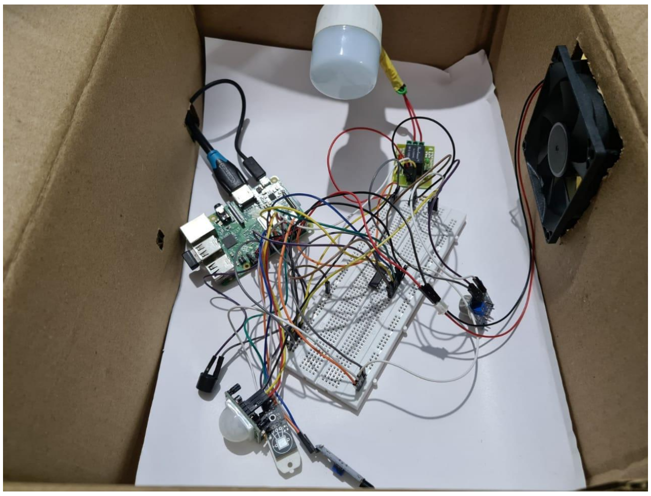
X. RESULTS

In this project the analysis of the results are Crop monitoring and Visualizing the data in Cloudant and storing the data in the sheets and alerts regarding the warehouse is sent to the user.

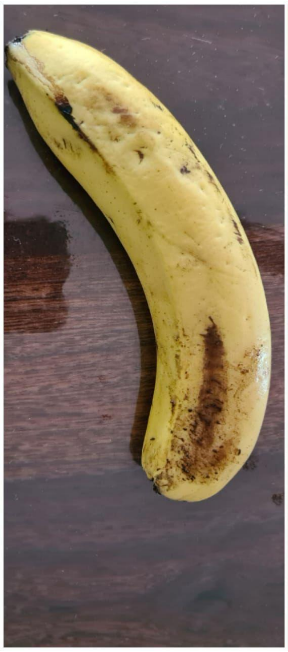
Crop Monitoring:

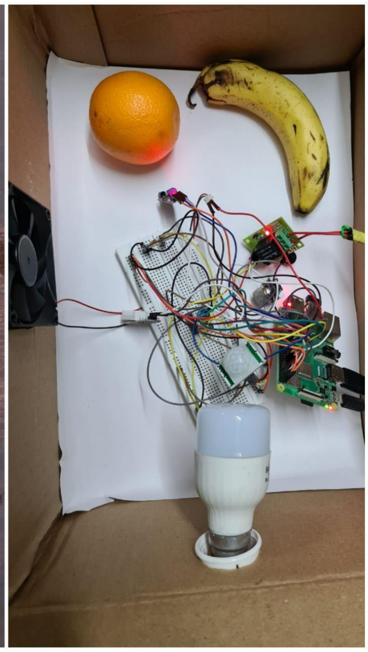
In this module it monitors the complete crop with the help of sensors and the data is visualized in cloudant and stored in sheets.

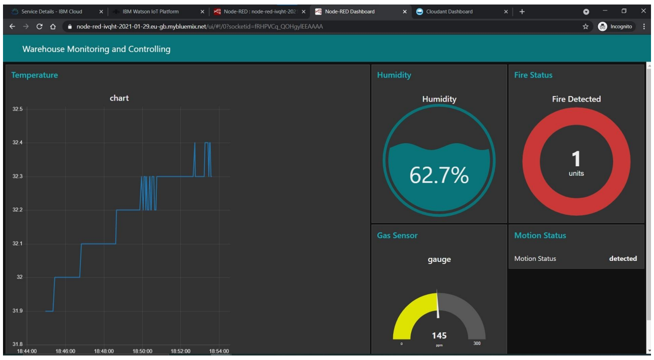
Monitoring and Controlling System:

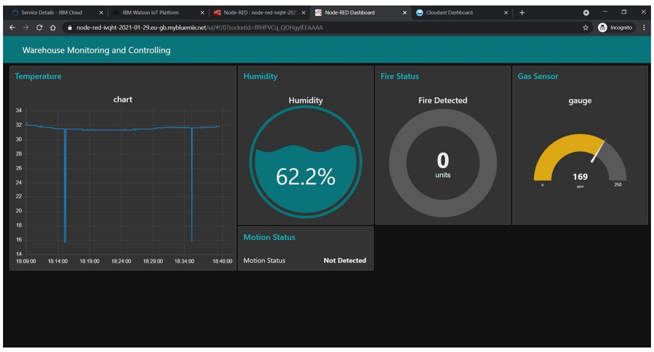


Day 1:

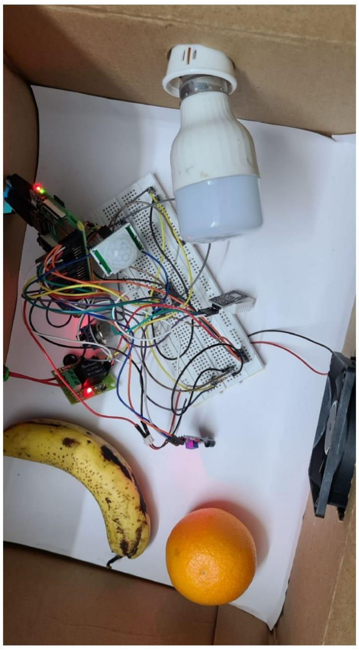


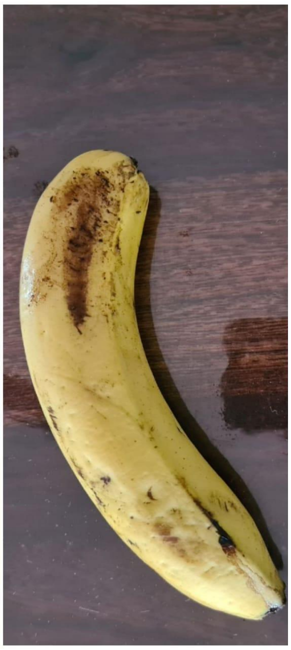


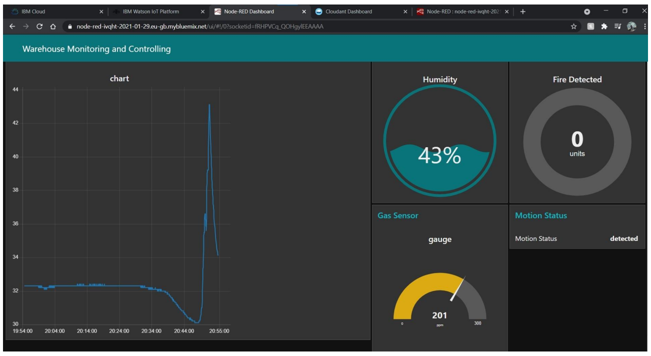


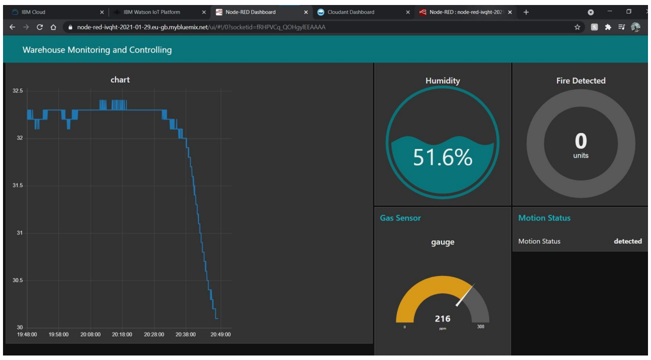


Day 2:

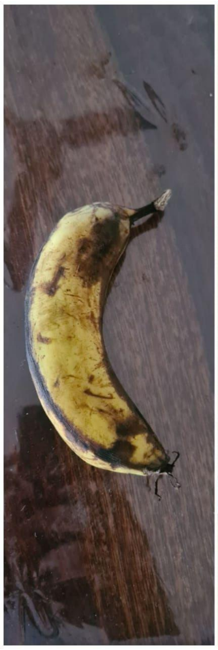


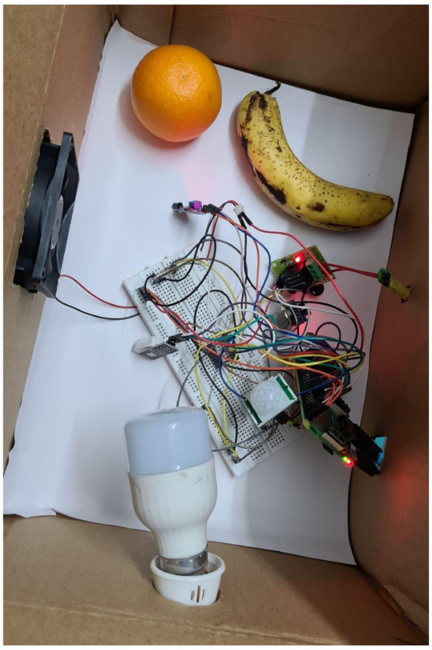


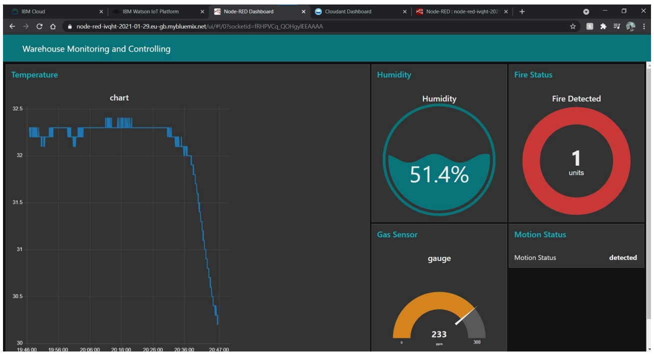

Warehouse Monitoring and Controlling
chart
Humidity
43%
Fire Detected
0
units
Gas Sensor
gauge
201
Motion Status
Motion Status
detected

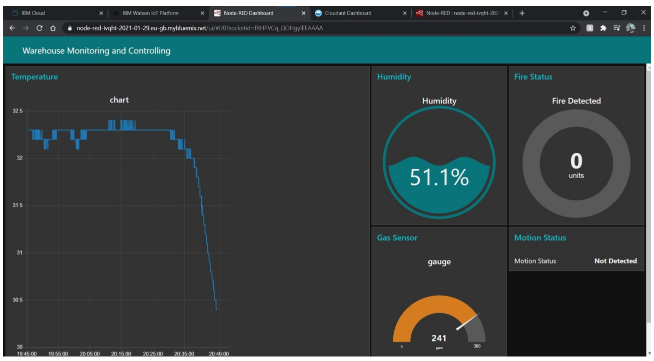

Warehouse Monitoring and Controlling
chart
Humidity
51.6%
Fire Detected
0
units
Gas Sensor
gauge
216
Motion Status
Motion Status
detected

Day 3:

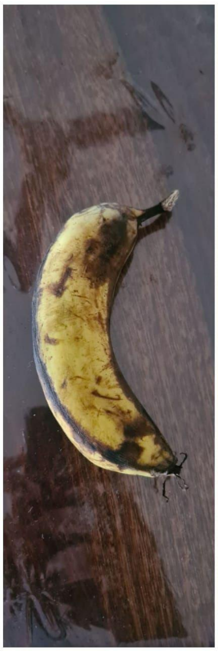


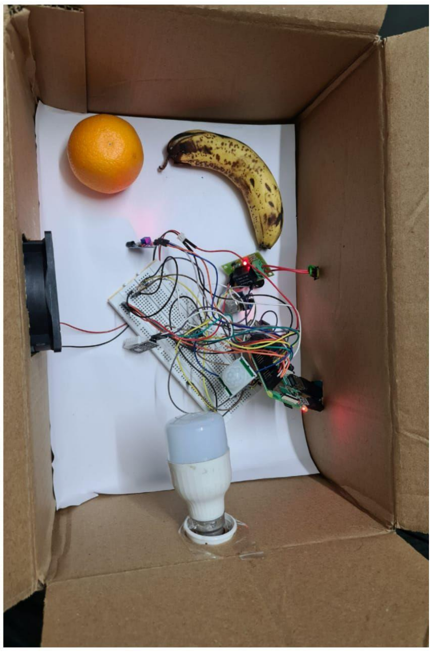


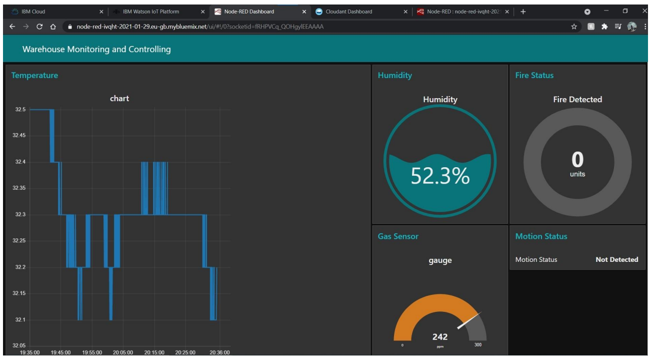

Warehouse Monitoring and Controlling
Temperature
chart
Humidity
Humidity
51.4%
Fire Status
Fire Detected
1
units
Gas Sensor
gauge
233
Motion Status
Motion Status
detected

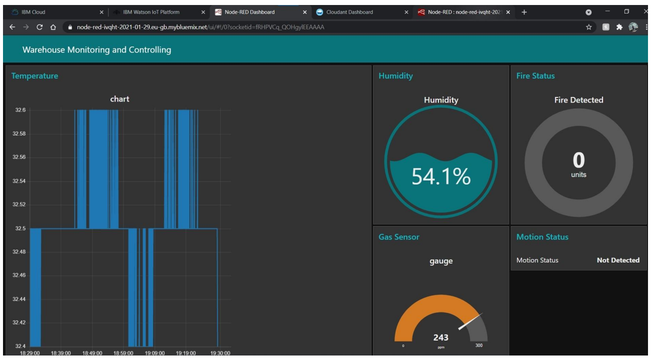

Warehouse Monitoring and Controlling
Temperature
chart
Humidity
Humidity
51.1%
Fire Status
Fire Detected
0
units
Gas Sensor
gauge
241
Motion Status
Motion Status
Not Detected

Day 4:

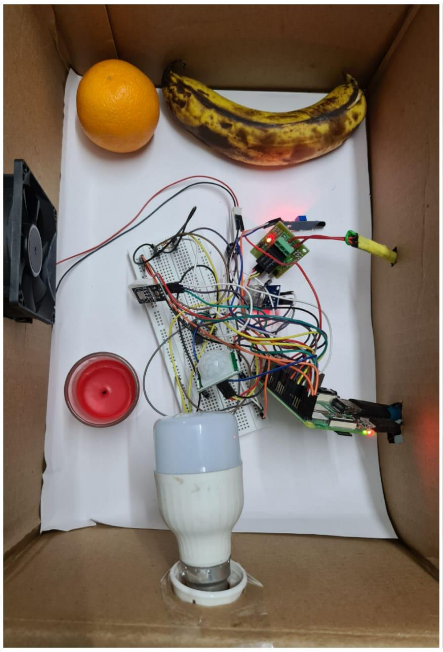


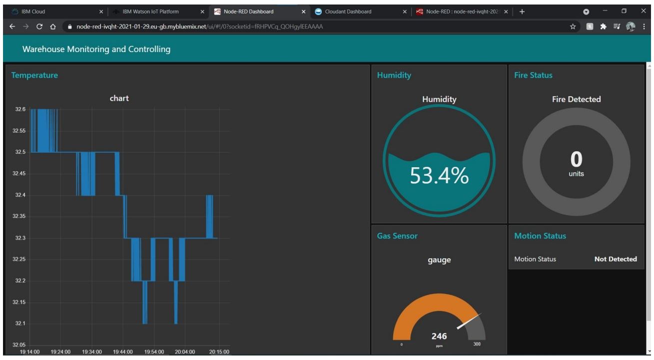


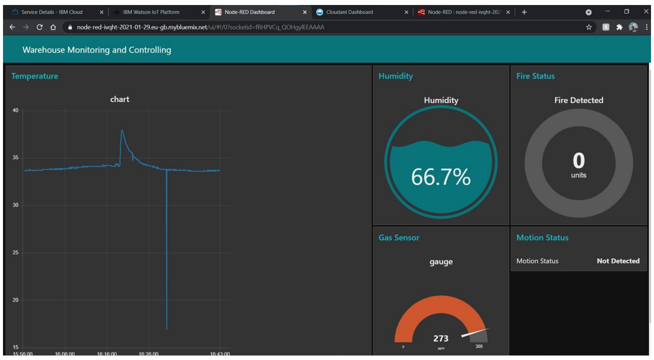

Warehouse Monitoring and Controlling
Temperature
chart
Humidity
Humidity
52.3%
Fire Status
Fire Detected
0
units
Gas Sensor
gauge
242
Motion Status
Motion Status
Not Detected


Warehouse Monitoring and Controlling
Temperature
chart
Humidity
Humidity
54.1%
Fire Status
Fire Detected
0
units
Gas Sensor
gauge
243
Motion Status
Motion Status
Not Detected

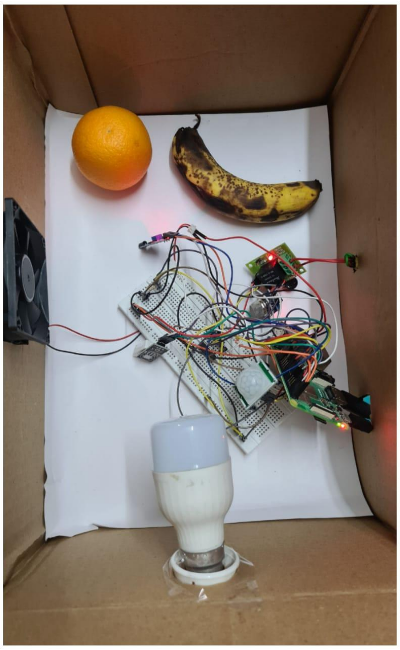
Day 5:

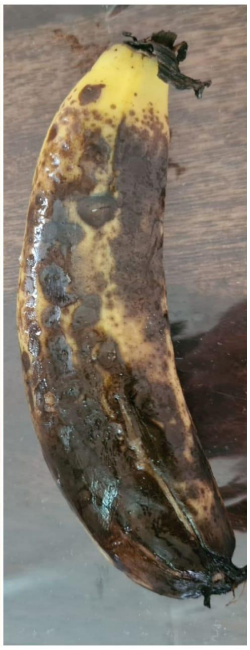


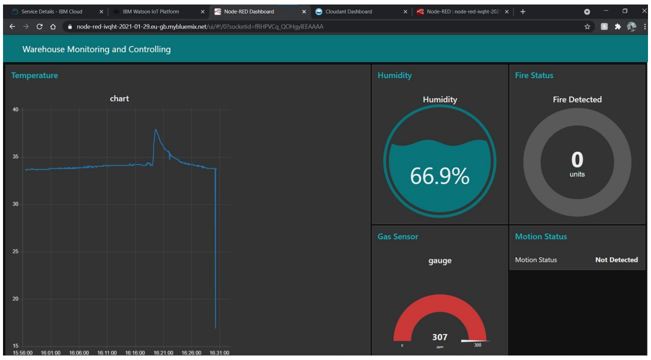

Warehouse Monitoring and Controlling
Temperature
chart
Humidity
Humidity
53.4%
Fire Status
Fire Detected
0
units
Gas Sensor
gauge
246
Motion Status
Motion Status
Not Detected

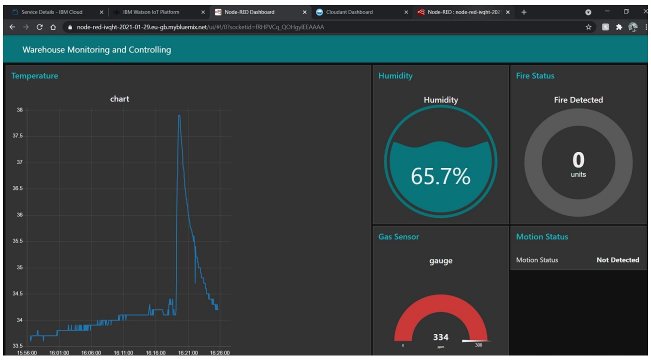

Warehouse Monitoring and Controlling
Temperature
chart
Humidity
Humidity
66.7%
Fire Status
Fire Detected
0
units
Gas Sensor
gauge
273
Motion Status
Motion Status
Not Detected

Day 6:

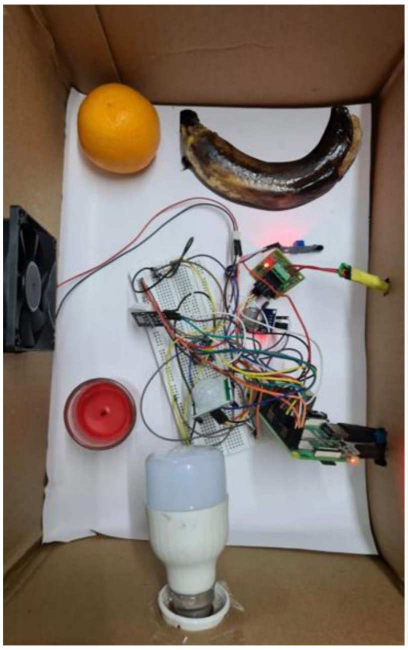


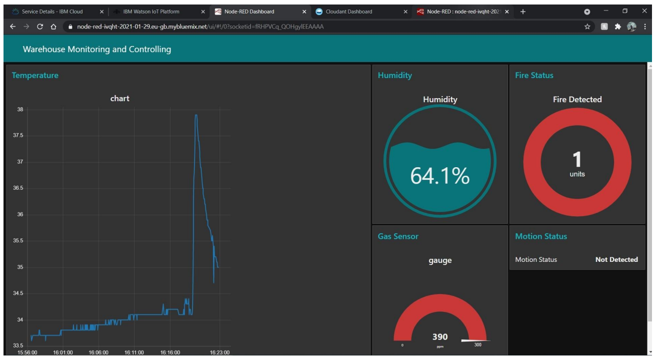


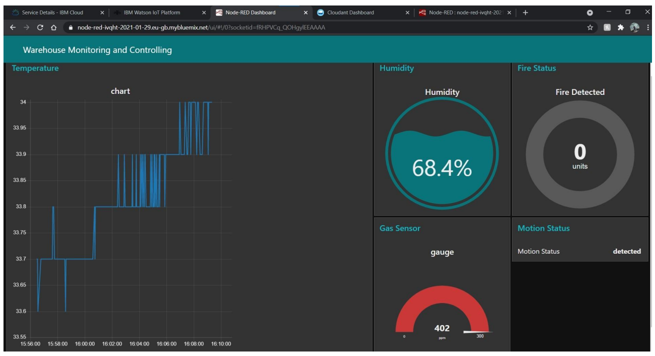

Warehouse Monitoring and Controlling
Temperature
chart
Humidity
Humidity
66.9%
Fire Status
Fire Detected
0
units
Gas Sensor
gauge
307
Motion Status
Motion Status
Not Detected


Warehouse Monitoring and Controlling
Temperature
chart
Humidity
Humidity
65.7%
Fire Status
Fire Detected
0
units
Gas Sensor
gauge
334
Motion Status
Motion Status
Not Detected

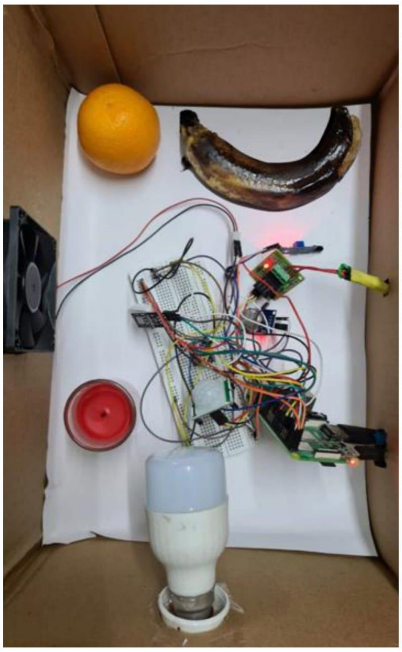
Day 7:

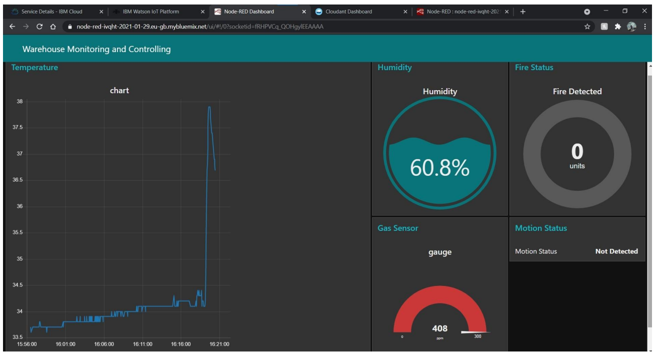


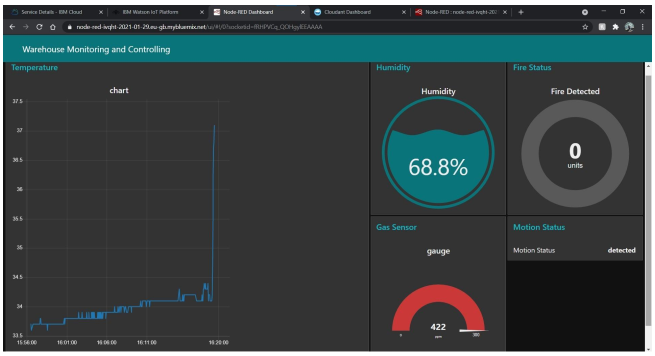

Warehouse Monitoring and Controlling
Temperature
chart
Humidity
Humidity
64.1%
Fire Status
Fire Detected
1
units
Gas Sensor
gauge
390
Motion Status
Motion Status
Not Detected


Warehouse Monitoring and Controlling
Temperature
chart
Humidity
Humidity
68.4%
Fire Status
Fire Detected
0
units
Gas Sensor
gauge
402
Motion Status
Motion Status
detected

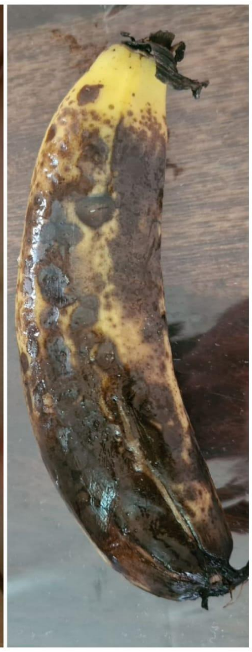
Day 8:

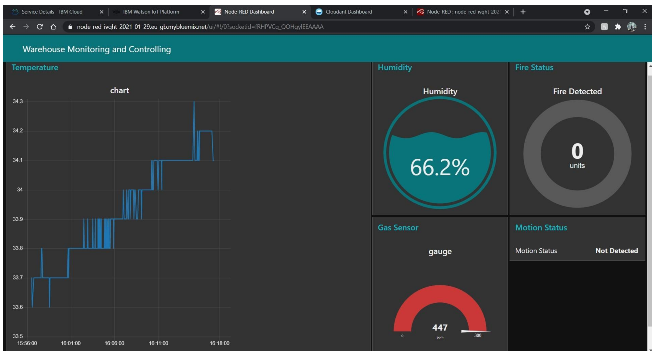


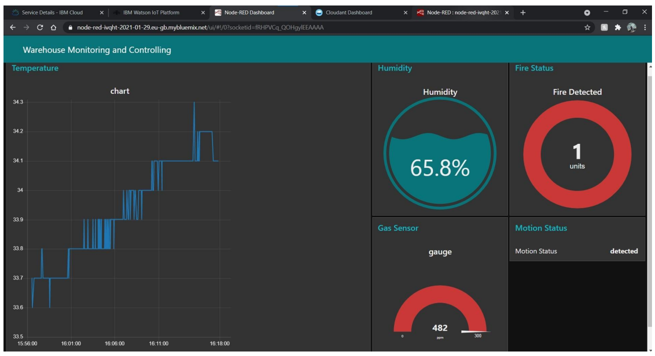

Warehouse Monitoring and Controlling
Temperature
chart
Humidity
Humidity
60.8%
Fire Status
Fire Detected
0
units
Gas Sensor
gauge
408
Motion Status
Motion Status
Not Detected


Warehouse Monitoring and Controlling
Temperature
chart
Humidity
Humidity
68.8%
Fire Status
Fire Detected
0
units
Gas Sensor
gauge
422
Motion Status
Motion Status
detected

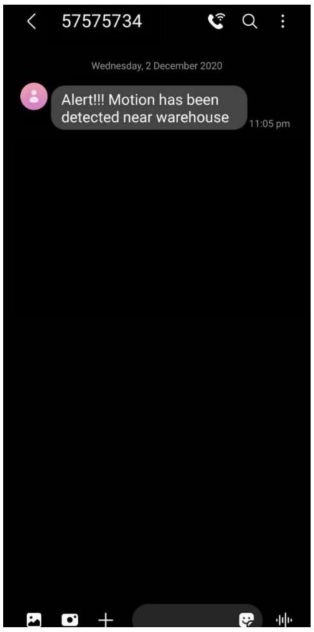
Day 9:

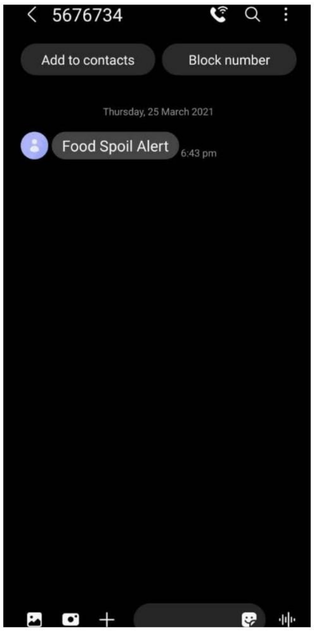


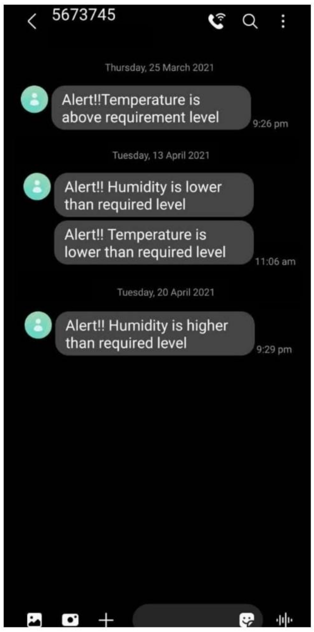

Warehouse Monitoring and Controlling
Temperature
chart
Humidity
Humidity
66.2%
Fire Status
Fire Detected
0
units
Gas Sensor
gauge
447
Motion Status
Motion Status
Not Detected

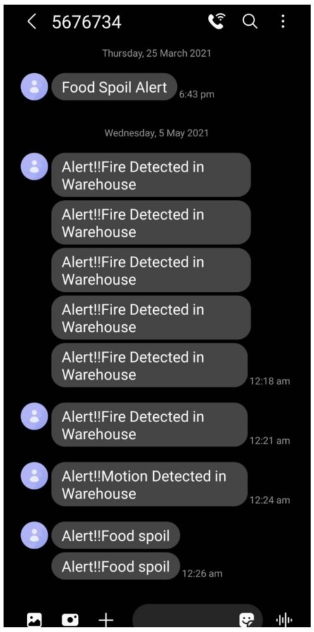

Warehouse Monitoring and Controlling
Temperature
chart
Humidity
Humidity
65.8%
Fire Status
Fire Detected
1
units
Gas Sensor
gauge
482
Motion Status
Motion Status
detected

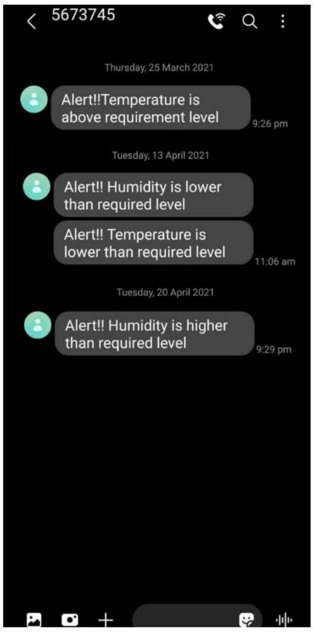
Messages:

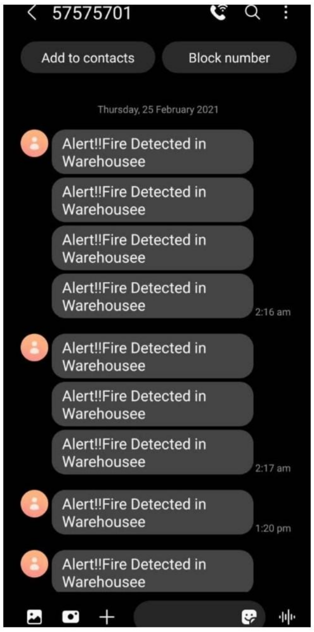




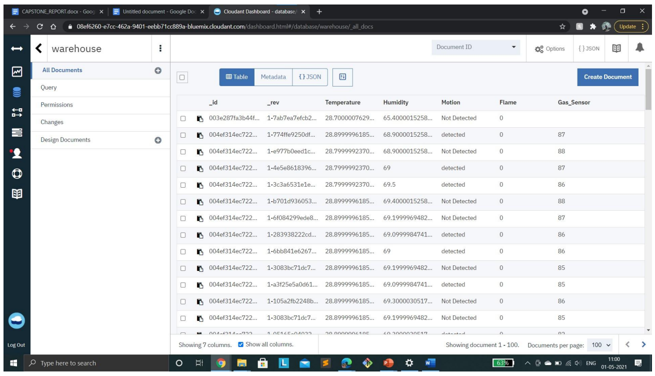


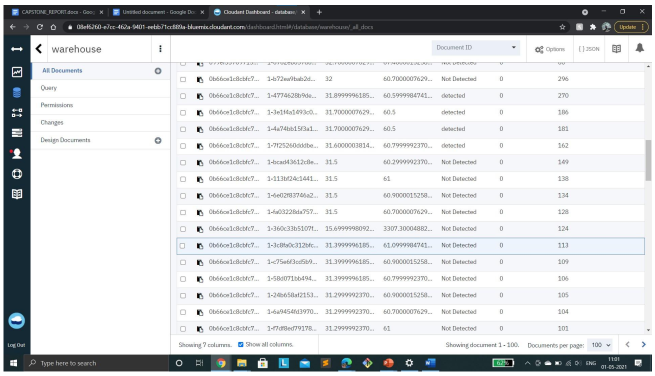




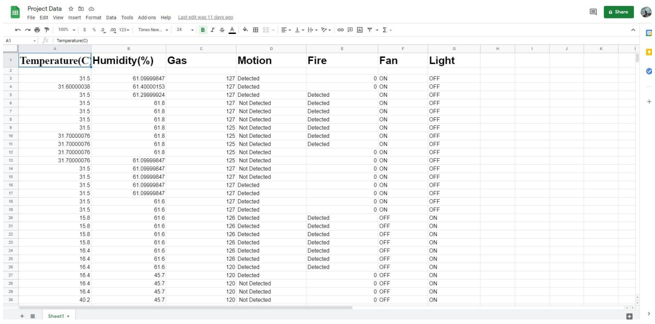


Database:



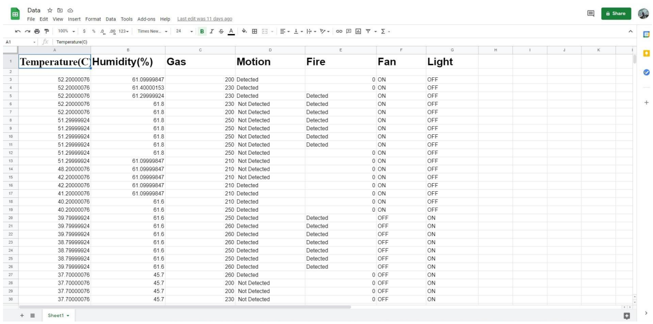


Sheets:



Project Data

Temperature(C)	Humidity(%)	Gas	Motion	Fire	Fan	Light
31.5	61.09999847	127	Detected	0	ON	OFF
31.60000038	61.40000153	127	Detected	0	ON	OFF
31.5	61.29999924	127	Detected	Detected	ON	OFF
31.5	61.8	127	Not Detected	Detected	ON	OFF
31.5	61.8	127	Not Detected	Detected	ON	OFF
31.5	61.8	127	Not Detected	Detected	ON	OFF
31.5	61.8	125	Not Detected	Detected	ON	OFF
31.70000076	61.8	125	Not Detected	Detected	ON	OFF
31.70000076	61.8	125	Not Detected	Detected	ON	OFF
31.70000076	61.8	125	Not Detected	0	ON	OFF
31.70000076	61.09999847	125	Not Detected	0	ON	OFF
31.5	61.09999847	127	Not Detected	0	ON	OFF
31.5	61.09999847	127	Not Detected	0	ON	OFF
31.5	61.09999847	127	Detected	0	ON	OFF
31.5	61.09999847	127	Detected	0	ON	OFF
31.5	61.6	127	Detected	0	ON	OFF
31.5	61.6	127	Detected	0	ON	OFF
15.8	61.6	126	Detected	Detected	OFF	ON
15.8	61.6	126	Detected	Detected	OFF	ON
15.8	61.6	126	Detected	Detected	OFF	ON
15.8	61.6	126	Detected	Detected	OFF	ON
16.4	61.6	126	Detected	Detected	OFF	ON
16.4	61.6	126	Detected	Detected	OFF	ON
16.4	61.6	120	Detected	Detected	OFF	ON
16.4	45.7	120	Detected	0	OFF	ON
16.4	45.7	120	Not Detected	0	OFF	ON
16.4	45.7	120	Not Detected	0	OFF	ON
40.2	45.7	120	Not Detected	0	OFF	ON



Data

Temperature(C)	Humidity(%)	Gas	Motion	Fire	Fan	Light
52.20000076	61.09999847	200	Detected	0	ON	OFF
52.20000076	61.40000153	230	Detected	0	ON	OFF
52.20000076	61.29999924	230	Detected	Detected	ON	OFF
52.20000076	61.8	230	Not Detected	Detected	ON	OFF
52.20000076	61.8	200	Not Detected	Detected	ON	OFF
51.29999924	61.8	250	Not Detected	Detected	ON	OFF
51.29999924	61.8	250	Not Detected	Detected	ON	OFF
51.29999924	61.8	250	Not Detected	Detected	ON	OFF
51.29999924	61.8	250	Not Detected	Detected	ON	OFF
51.29999924	61.8	250	Not Detected	0	ON	OFF
51.29999924	61.09999847	210	Not Detected	0	ON	OFF
48.20000076	61.09999847	210	Not Detected	0	ON	OFF
42.20000076	61.09999847	210	Not Detected	0	ON	OFF
42.20000076	61.09999847	210	Detected	0	ON	OFF
41.20000076	61.09999847	210	Detected	0	ON	OFF
40.20000076	61.6	210	Detected	0	ON	OFF
40.20000076	61.6	250	Detected	0	ON	OFF
39.79999924	61.6	250	Detected	Detected	OFF	ON
39.79999924	61.6	260	Detected	Detected	OFF	ON
39.79999924	61.6	260	Detected	Detected	OFF	ON
38.79999924	61.6	260	Detected	Detected	OFF	ON
38.79999924	61.6	250	Detected	Detected	OFF	ON
38.79999924	61.6	250	Detected	Detected	OFF	ON
39.79999924	61.6	260	Detected	Detected	OFF	ON
37.70000076	45.7	260	Detected	0	OFF	ON
37.70000076	45.7	200	Not Detected	0	OFF	ON
37.70000076	45.7	200	Not Detected	0	OFF	ON
37.70000076	45.7	230	Not Detected	0	OFF	ON

XI. FUTURE WORK

In the current system we have shown only four sensors.For further research and study, we can use ML Algorithm.Furthermore,in this system we can add a GSM module and incorporate USSD functionality to implement an offline action control mechanism for warehouse management.This is relevant to users in remote areas where the internet connection is weak. We can add more sensors likeMQ-2,IR Sensor,LDR Sensor etc..We can add a heater instead of light.We can add LCD Display.Create an app instead of Web Page.

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