Visvesvaraya Technological University

Belagavi

A Mini Project Report

On

"IoT Based Cold Storage Monitoring"

Submitted by

Nandankumar K-(1NH18EC073)

Rahul M R -(1NH18EC090)

Rohit Egayya Harikantra(1NH18EC098)

Vinay Kumar K(1NH18EC121)

In partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

IN

ELECTRONICS & COMMUNICATION

NEW HORIZON
COLLEGE OF ENGINEERING
New Horizon Knowledge Park, Ring Road, Marathalli
Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by NAAC with 'A' Grade, Accredited by NBA

NEW HORIZON
COLLEGE OF ENGINEERING
New Horizon Knowledge Park, Ring Road, Marathalli
Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by NAAC with 'A' Grade, Accredited by NBA

BENGALURU-560103

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CERTIFICATE

Certified that the Mini project entitled "**IoT Based Cold Storage Monitoring**" is carried out by Mr. Nandankumar K bearing USN: 1NH18EC073, Mr. Rahul M R bearing USN: 1NH18EC090, Mr.Rohit E H bearing USN: 1NH18EC098 and Mr.Vinay Kumar K bearing USN: 1NH18EC121, bonafide students of NHCE, Bengaluru in partial fulfillment for the award of Bachelor of Engineering in Electronics and Communication of the Visvesvaraya Technological University, Belagavi during the year 2020-21. It is certified that all corrections and suggestions indicated for Internal Assessment have been incorporated in the report deposited in the department library. The mini project report has been approved as it satisfies the academic requirements in respect of the mini project work prescribed for the said degree.

Signature of the Guide	Signature of the HoD
Mr Rajesh G	Dr. Sanjeev Sharma
Senior Assistant Professor Department of ECE	Professor & HoD Department of ECE
NHCE, Bengaluru	NHCE, Bengaluru

External Viva

Name of the Examiners	Signature with Date
1. _____	1. _____
2. _____	2. _____

< Keep similarity index page. Only first page of the plagiarism report is required >

ABSTRACT :

Eating rotten fruits and vegetables (FVs) in one's diet can have an effect reducing the risk of chronic diseases. But unfortunately, the rate of loss of FVs is high among all diets it is produced annually and occurs in the final phase of the life cycle after harvest. One of the most important things to offer at this high rate of loss of inability to measure important environmental parameters in cold storage. The available monitoring solutions for cold storage are limited to gauge temperature only, relative humidity and other important environmental barriers, such as light and gas.This is a sensitive issue that needs to be addressed in order to overcome the loss of FVs. An approved method of monitoring real-time temperature, relative humidity, light and concentration electricity in a cold storage area and alerted employees by exceeding the dangerous limits of these structures.

In addition, decision support was made to RT-IMNS using the Artificial Neural Network viatransfer distribution to classify the condition of the asset into one of three categories which means positive, unsatisfactory or frightening. The proposed forecasting model surpasses Compress Sending , Adaptive Naiveve Bayes , Extreme Gradient Boosting and Data Mining for forecasting accuracy. We have obtained 99% accuracy using the forward distribution network model while it is available models such as CS, ANB, XGBoost, DM obtained 95.60%, 87.50%, 93.59%, 90% accuracy respectively.

In addition, the proposed method achieved 100% accuracy, 100% memory, 100% F1 points in good class achieved, because unsatisfactory section accuracy is 98%, memory is 99%, F1-score is 98% and alarming category accuracy is 100%, memory is 98% and F1-score is 99%.

CONTENTS:

LIST OF FIGURES :

LIST OF TABLES :

CHAPTER 1

INTRODUCTION :

The Internet of Things (IoT) is one of the rising advancements and is currently totally changing the manners by which the enterprises work. Forbes considers the Internet of Things a goliath organization of associated things, with connections among individuals and things and things. The Internet of Things is characterized as the foundation of the data society. The IoT permits objects to be detected or controlled distantly across existing organization frameworks, setting open doors for more straightforward coordination of the actual world into PC based frameworks. Nature of foods grown from the ground gigantically affects the environmental factors during capacity. We can just keep up with the nature of leafy foods in the wake of reaping; in this manner store it in a legitimate climate. Quality is an unpredictable impression of numerous characteristics that are at the same time assessed by the purchaser either impartially or emotionally. Foods grown from the ground are profoundly short-lived because of variety in temperature while they are put away. Successful perception of temperature, dampness and other biological conditions inside a conveyance place has ended up being one of the significant fields in inventive work in many making nations over the world.

The primary thought of this venture is to conquer the time intricacy and absence of itemized perception which is looked at in protecting the foods grown from the ground utilizing cold stockpiling the executives' frameworks to load up the food items or yields for a more drawn out period. In this proposition we execute a structure for cold stockpiling the executives' frameworks dependent on IoT (Internet of Things) innovation by sensors. This is utilized to protect the different boundaries of yield, for example, (degeneration time, temperature boundary, and so forth) for a more extended period. This data framework likewise breaks down the information to report unusual natural status and risks during the putting away cycle. Thus, the chilly stockpiling of the executives' frameworks can be inventive and worked with minimal expense and in a brief time frame span, henceforth upgrading the food items attainable quality all as the year progressed.

According to FAO (Food and Agriculture Organization) 1.3 billions of tons per year food loss is reported which represents 33% of the total production. The food demand is continuously increasing and could reach about 150-170% of the current demand by 2050.

In addition, according to the World Health Organization (WHO), an estimated 1.7 million deaths a year worldwide are associated with low FV diets. The WHO recommends eating at least 400g FVs a day to help reduce the risk of diseases such as diabetes, certain cancers, respiratory conditions and heart disease (CVD). While the rate of loss of FVs (45%) is high among all other foods including meat (20%), seed oil (20%), milk (20%), grains (30%), fish and seafood (35%) . The loss of FVs that occur in the last phase is 10% and higher than all other stages including harvesting, storage, processing and distribution of the post-harvest life cycle. This convincing evidence suggests that urgent action should be taken to minimize the loss of decay products such as FVs. To overcome the loss of degraded FVs, it is important to monitor environmental parameters that affect the quality of FVs. Traditionally, low temperatures are considered a key factor in cold storage to slow down the ripening process of FVs that do not stop even after picking and continue until they are overripe or rotten FVs. It causes freshly harvested germs such as germs, fungi etc. which ultimately reduce the quality of FVs and result in the loss of FVs.

CHAPTER 2

LITERATURE REVIEW :

Title of the paper Author & Year of Publication	**Author and year of publication**	**Outcome**	**Limitation**
Outcome Limitation Research Anthology on Food Waste Reduction and Alternative Diets for Food and Nutrition Security	IGI Global ISBN:9781799853558 , 1799853551 Published:July 2020	We could able to learn more about the theoretical aspect of "Cold Storage System made by IoT".	Even though it has practical part, But that ain't helpful for our project.

FIG 1.1

This function combines a variety of nerves and a cloud of nerves that can be used to monitor the condition of cold cells. Raspberry pi designs and internet connection hardware. We have used messages for informational purposes. . This function interacts with food security monitoring and controls using the Android app. We concluded that using the Android app works better compared to the Desktop app. This functionality is related to the implementation of IoT-OSMS, and ensures occupational health and safety and improves the efficiency of cold storage facilities. Fuzzy Logic and Real-Time positioning are combined to achieve their goal. They have used Bluetooth Low Energy, a type of RFID solution to obtain and collect accurate data for cold-blooded employees. D. SulmanFarrukh, Muhammad Shahzad, Usman Khan, TalhaChughtai, and Ali Nawaz Khan. They suggest an economic solution for cold management. The sensors are also connected to different degrees as the temperature varies at different levels. This leads to the loss of accurate and reliable data from the sensors that make the whole system reliable and robust. E. Mira Trebar This project is responsible for the management of inventory in cold storage areas where radio frequency detection technology is used. Temperature is monitored using the UHF type

RFID data logger, RFID default tag. This tag helps to add sensor values using a timed stamp. The function includes features such as data protection, automatic signal detection, smart power supply. Data is stored using the latest analogue nanotechnology technology. F. Zhao Xiaorong, Fan Honghui, Zhu Hongjin, Fu Zhongjun, Fu Hanyu In this paper, the IoT architectural novel is developed based on what is called a service that captures and stores information on the web. High volume products can be tracked using RFID tracks and low volume products can be tracked using bar codes. Data from sensors, code bars and RFID tags are updated for shelf life and product quality. G. Yanan Li, YuyanPeng, Lei Zhang, Jiefeng Wei, Dan Li. This function uses a wireless network sensor and studies the performance and integration of the technical mode. Designed to achieve a large and long distance transmission network. Easy access to product information is made which helps to improve product quality and safety.

CHAPTER 3

EXISTING SYSTEM :

FIG 1.1

FIG 1.2

The present system of cold storage facilities is not very efficient. control is manually done so there is a requirement of human intervention needed for any temperature and humidity control and there is an efficient method such as an android app where we monitor the precise requirements continuously from a remote location and there is no much human labour required .the products present in the cold storage facility usually gets degraded if there is continuous human involvement ,there are chances of degradation of the food products of medicines which we might have preserved for the later use and some products require such a

sterile environment that even some sort of bacteria or viruses which might result in adverse effect and loss to the company having cold storage facility

PROPOSED SYSTEM :

Introduction related to your research work, This project develops a new approach towards IoT based systems, which can track various sensor data and give report analysis data. It is designed and analyzes data from various devices and gives time to time delivery. It is developing a wireless monitoring system using wireless protocol. It is develop data monitoring system using integration between base station/gateway and the internet

-Our proposed system used cost-effective hardware components which ultimately provide an affordable solution for small and medium-size enterprises. -Our proposed system gauged four vital ambient environmental parameters and analyzed results on the basis of gauged parameters. - Our proposed system provides support for Android Apps for remote monitoring and personnel can check the status of commodities at any time from anywhere. -Our proposed system also sends an automatic notification to personnel on dangerous limits of these parameters which contribute to taking timely necessary action to mitigate the loss of FVs. -Our proposed system used a forward propagation neural network model with softmax activation function to efficiently perform multi-classification about commodity status. -Our proposed solution gauged ambient environmental parameters at multiple places inside cold storage using multiple sensing modules to efficiently predict the status of a commodity. IoT is becoming a promising technology due to its cutting edge fusion of sensor techniques, predictive analytics and efficient wireless-connectivity. There are many IoT applications including environmental monitoring, augmented mapping and assisted driving are included in current applications of transportation, logistics domain and manufacturing. Therefore, it indicates that real time monitoring of the food supply chain is feasible in an IoT platform.

CHAPTER 4

HARDWARE AND SOFTWARE SPECIFICATIONS :

1. PROTEUS SIMULATION SOFTWARE

FIG 1.3

The Proteus Design Suite - combines easy to use with a powerful feature set to enable the quick design,test and layout of professional printed circuit boards.

The Proteus pcb Design-Proteus PCB tools seamlessly combines schematic capture and PCB layout to provide a powerful, integrated and easy to use suite of tools for professional PCB Design**.**

Proteus circuit simulation-Design test and debug complete embedded systems inside schematic capture before ordering a pro physical prototype BSM brings a child development to the embedded workflow

Proteus iot builder-The complete cure for designing and order no appliances and then controlling it remotely from the power browser build multi of client systems with the mqtt protocol design simulate and apply directly from proteus

2. ARDUINO UNO

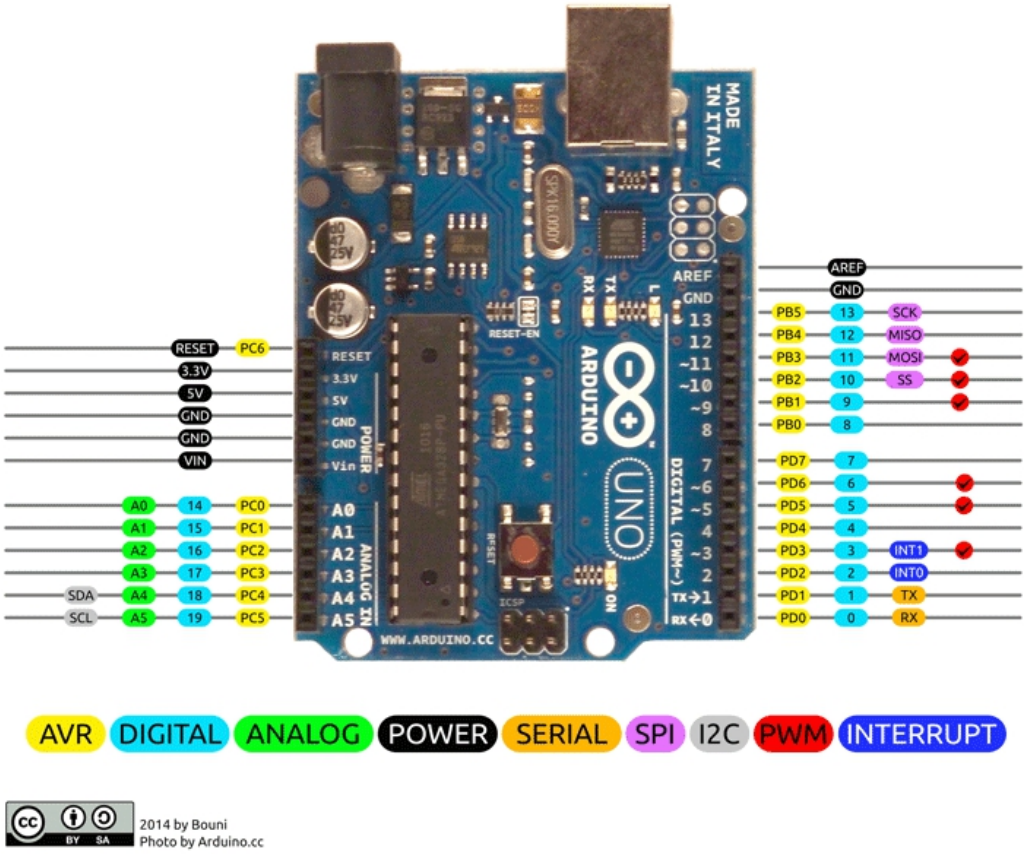

FIG 1.4

Arduino is an open source electronic platform based on easy-to-use hardware and software. Arduino boards can read input - turn on the sensor, finger button, or any other type of message - and then convert it into an output - activate the car, turn on the LED, and publish something online. You can tell your board what to do by sending a set of instructions to the microcontroller on board. To do so use Arduino programming language, as well as Arduino Software (IDE), based on Processing.

Arduino has a microcontroller board based on ATmega328P (datasheet). It has 14 digital input / output pins (of which 6 can be used as PWM output), 6 analog input, 16 MHz ceramic resonator, USB connection, jack jack, head ICSP and reset button. It contains everything needed to support a microcontroller; Simply connect it to a USB cable or power it with an AC-to-DC adapter or battery to get started. . "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno Board and version 1.0 of Arduino Software (IDE) were the most reliable versions of Arduino, now converted and released. The Uno board is the first in a series of USB Arduino boards, as well as a reference model for the Arduino platform.

PIN CONFIGURATION OF ATMEGA328P:

Microcontroller	**ATmega328P**
Operating Voltage	**5V**
Input Voltage	**7-12V**
Input Voltage (recommended)	**6-20V**
Digital I/O Pins	**14(6 pins are PWM output)**
PWM Digital I/O Pins	**6**

PWM Digital I/O Pins	**6**
DC Current per I/O Pin	**20mA**
DC Current for 3.3V Pin	**50mA**
Flash Memory	**32 KB of which 0.5 KB used by bootloader**
SRAM	**2KB**
EEPROM	**1KB**
Clock Speed	**16 MHz**
LED_BUILTIN	**13**

Table 1.2

PIN CONFIGURATION OF ARDUINO UNO :

pin category	pin name	details
power	Vin, 3.3V, 5V, GND	Vin: Input voltage to Arduino when using an external power source. 5V: Regulated power supply used to power microcontroller and other components on the board. 3.3V: 3.3V supply generated by on-board voltage regulator. Maximum current draw is 50mA. GND: ground pins.
Reset	Reset	Resets the microcontroller.

Analog pins	A0 - A5	Used to provide analog input in the range of 0-5V
Input/ Output pins	Digital pins 0 - 13	Can be used as input or output pins.
Serial	0(Rx),1(Tx)	Used to receive and transmit TTL serial data.
External Interrupts	2,3	To trigger an interrupt.
PWM	3,5,6,9,11	Provides 8-bit PWM output.
SPI	10 (SS), 11 (MOSI), 12 (MISO) and 13 (SCK)	Used for SPI communication.
Inbuilt LED	13	To turn on the inbuilt LED.
TWI	To turn on the inbuilt LED.	Used for TWI communication.
AREF	AREF	To provide reference voltage for input voltage.

Table 1.3

3. DHT11 SENSOR

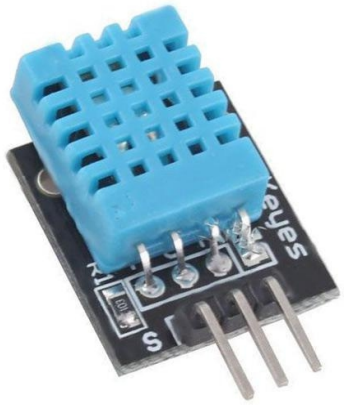

FIG 1.5

The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin.

DHT11 is the most widely used temperature and humidity sensor. The sensor comes with an NTC dedicated to measuring temperature and an 8-bit microcontroller to extract temperature and humidity values such as serial data. The sensor is also factory-based so it is easy to work with other microcontrollers.

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

Specifications:

- Operating Voltage: 3.5V to 5.5V
- Operating current: 0.3mA (measuring) 60uA (standby)
- Output: Serial data
- Temperature Range: 0°C to 50°C
- Humidity Range: 20% to 90%
- Resolution: Temperature and Humidity both are 16-bit
- Accuracy: ±1°C and ±1%

Pin configuration :

Pin name	**Description**
Vcc	Power supply 3.5V to 5.5V
Data	Outputs both Temperature and Humidity through serial Data
NC	No Connection and hence not used

Ground	Connected to the ground of the circuit

Table 1.4

4. COMPIM IN PROTEUS

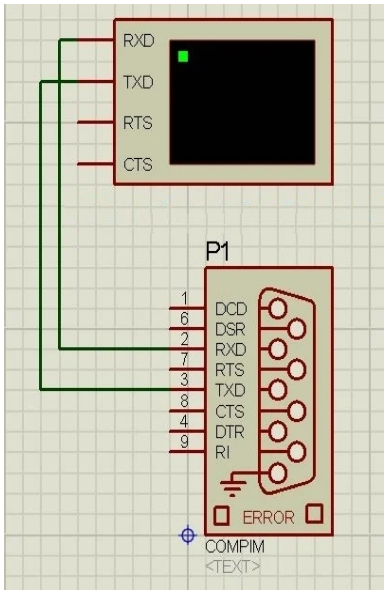

FIG 1.6

COMPIM is used to model physical COM interfaces in Proteus. It works by capturing and buffering serial signals which it then presents to the electrical circuit. The computer's serial ports will be used to conduct all serial data originating from the CPU or the UART model.

Virtual serial ports can also be built using USB or Bluetooth communication using several technical workarounds. Baud rate conversion is possible when using the COMPIM model. Verification of the physical and physical features of the device can be designed with the installation of optional hardware in the software.

BLYNK

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it. There are three major components in the platform:

Blynk App - allows you to create amazing interfaces for your projects using various widgets we provide.

Blynk Server - responsible for all the communications between the smartphone and hardware. Blynk Libraries - for all the popular hardware platforms - enable communication with the server and process all the incoming and outcoming commands.

FLOW CHART :

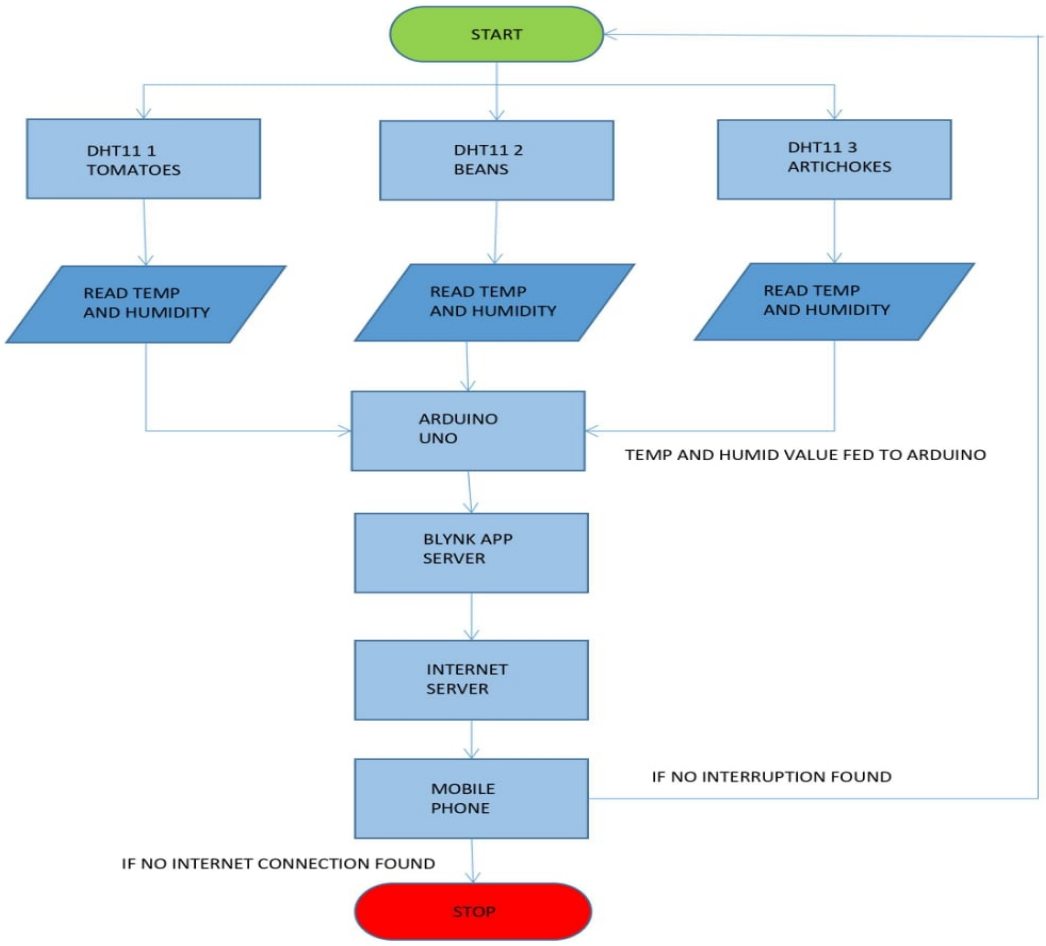

FIG 1.7

The above figure the flowchart of our project,where we collect the values of temperature and humidity from the sensors and feed it to the arduino uno,the varying temperatures and humidity values are sent over the internet,and the values are stored on the internet server using a blynk mobile application software and the values are updated from time to time unless there is any interruption in the connection.

CODE :

```
#define BLYNK_PRINT SwSerial

#include <SoftwareSerial.h>
SoftwareSerial SwSerial(10, 11); // RX, TX

#include <BlynkSimpleStream.h>
#include <DHT.h>
#define DHTPIN1 2
#define DHTPIN2 3
#define DHTPIN3 4
#define DHTTYPE DHT11

DHT dht1(DHTPIN1, DHTTYPE);
DHT dht2(DHTPIN2, DHTTYPE);
DHT dht3(DHTPIN3, DHTTYPE);
int t1;
int t2;
int t3;
```

```
int h1;
int h2;
int h3;



int H;
unsigned long startMillisReadData;
int secondsDataDisplay = 500;
char auth[]="mR0IhhUiV6STNLoxexNmEgQigI31klfV";

BlynkTimer timer;
WidgetBridge bridge(V10);
WidgetLCD lcd(V0);

BLYNK_CONNECTED()
{
  bridge.setAuthToken("mR0IhhUiV6STNLoxexNmEgQigI31klfV");

}

void setup()
{
  // Debug console



  dht1.begin();
  dht2.begin();
  dht3.begin();
```

```
  Serial.begin(9600);
  Blynk.begin(Serial, auth);
  timer.setInterval(500L, readValue);
  startMillisReadData = millis();
}

void loop()
{

Blynk.run();
  timer.run();
if (millis() - startMillisReadData >= secondsDataDisplay)
  {
   h1 = dht1.readHumidity();
   t1 = dht1.readTemperature();

   h2 = dht2.readHumidity();
   t2 = dht2.readTemperature();

    h3 = dht3.readHumidity();
   t3 = dht3.readTemperature();

    startMillisReadData = millis();
  }
}

void readValue()
{
  Blynk.virtualWrite(V1,t1);
```

```
 Blynk.virtualWrite(V2,h1);

 Blynk.virtualWrite(V3,t2);
 Blynk.virtualWrite(V4,h2);

 Blynk.virtualWrite(V5,t3);
 Blynk.virtualWrite(V6,h3);

//artichokes 31-34  32.2-35
//humid
if (h1<31){

 lcd.clear(); //Use it to clear the LCD Widget
 lcd.print(0, 0, "Artichokes");
 lcd.print(0, 1, "H:Low");
}
else if(h1>34){

 lcd.clear(); //Use it to clear the LCD Widget
 lcd.print(0, 0, "Artichokes");
 lcd.print(0, 1, "H:High");
}
else{

 lcd.clear(); //Use it to clear the LCD Widget
 lcd.print(0, 0, "Artichokes");
 lcd.print(0, 1, "H:Good");
}
//temp
```

```
if (t1<32){

  //Use it to clear the LCD Widget
 lcd.print(0, 0, "Artichokes");
 lcd.print(9, 1, "T:Low");
}
else if(t1>35){

 lcd.print(0, 0, "Artichokes");
 lcd.print(9, 1, "T:High");
}
else{
 lcd.print(0, 0, "Artichokes");
 lcd.print(9, 1, "T:Good");
}
delay(500);

                        //Beans  40-50  4.4-10
//humid
if (h2<40){

 lcd.clear(); //Use it to clear the LCD Widget
 lcd.print(0, 0, "Beans");
 lcd.print(0, 1, "H:Low");
}
else if(h2>50){

 lcd.clear(); //Use it to clear the LCD Widget
 lcd.print(0, 0, "Beans");
```

```
 lcd.print(0, 1, "H:High");
 }
 else{

 lcd.clear(); //Use it to clear the LCD Widget
 lcd.print(0, 0, "Beans");
 lcd.print(0, 1, "H:Good");
 }
 //temp
 if (t2<4){

  //Use it to clear the LCD Widget
 lcd.print(0, 0, "Beans");
 lcd.print(9, 1, "T:Low");
 }
 else if(t2>10){

 lcd.print(0, 0, "Beans");
 lcd.print(9, 1, "T:High");
 }
 else{
 lcd.print(0, 0, "Beans");
 lcd.print(9, 1, "T:Good");
 }
 delay(500);


                        //Tomato 55-70  32.2-35
//humid
```

```
if (h3<55){

 lcd.clear(); //Use it to clear the LCD Widget
 lcd.print(0, 0, "Tomato");
 lcd.print(0, 1, "H:Low");
}
else if(h3>70){

 lcd.clear(); //Use it to clear the LCD Widget
 lcd.print(0, 0, "Tomato");
 lcd.print(0, 1, "H:High");
}
else{

 lcd.clear(); //Use it to clear the LCD Widget
 lcd.print(0, 0, "Tomato");
 lcd.print(0, 1, "H:Good");
}
//temp
if (t3<32){

  //Use it to clear the LCD Widget
 lcd.print(0, 0, "Tomato");
 lcd.print(9, 1, "T:Low");
}
else if(t3>35){

 lcd.print(0, 0, "Tomato");
 lcd.print(9, 1, "T:High");
```

```
 }
 else{
  lcd.print(0, 0, "Tomato");
  lcd.print(9, 1, "T:Good");
 }
  delay(500);

}
```

WORKING :

This project mainly comprises an arduino board and three dht11 sensors.Since we are doing it Virtually on a simulation software we are using a compim to connect arduino virtually to the internet . So at first dht11 sensors read the temperature and humidity values of the of the vegetables are the fruits which are kept in the cold storage facility and values will be sent back to the Arduino know where it recognise a high value through the pin connected I didn't earn if there are any changes and the recorded temperature and humidity of the any dht11 sensor the arduino read the values and sends back to the cloud server which we have created using a blynk app.Blynk Server is an Open-Source Netty based Java server, responsible for sending messages between Blynk mobile application and various microcontroller boards and SBCs (i.e. Arduino, Raspberry Pi).When there are any changes recorded by dht11 sensor these values are forwarded to the blink application and it can be monitored remotely from any place.So in this simulation software we have used compim to connect to the arduino to the internet,if there are any changes in the values recorded in temperature and humidity,the values are updated and sent to the blynk server through compim and limit can be set to these values and controlled accordingly with real time data from time to time.There is usually an a char type authorization key provided at both the arduino and the receiving server side,if these two keys match then only values are sent and received at the respective ends.

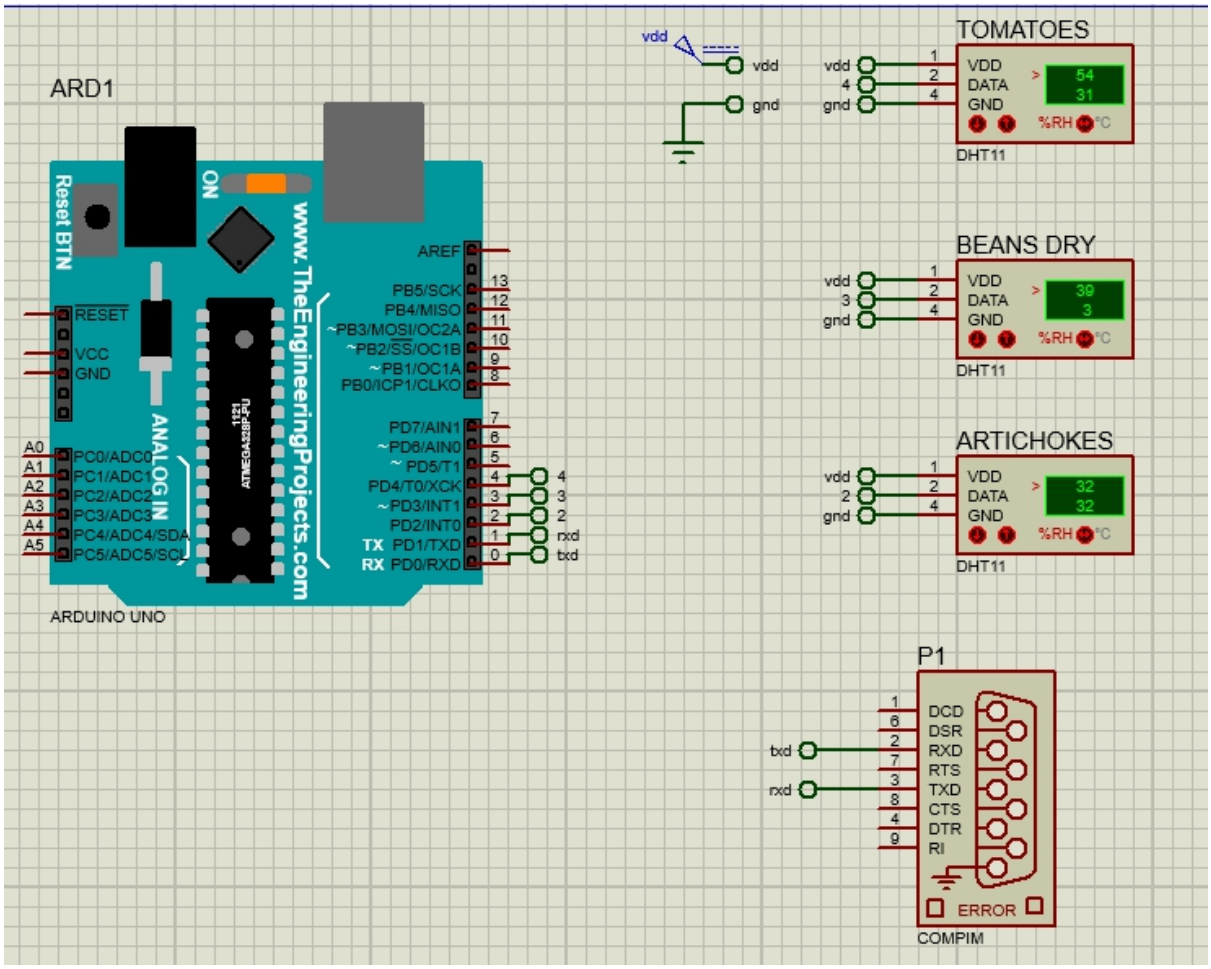
ARD1
Reset BTN
ON
www.TheEngineeringProjects.com
RESET
VCC
GND
ANALOG IN
A0
A1
A2
A3
A4
A5
PC0/ADC0
PC1/ADC1
PC2/ADC2
PC3/ADC3
PC4/ADC4/SDA
PC5/ADC5/SCL
AREF
PB5/SCK
PB4/MISO
~PB3/MOSI/OC2A
~PB2/SS/OC1B
~PB1/OC1A
PB0/ICP1/CLKO
PD7/AIN1
~PD6/AIN0
~PD5/T1
PD4/T0/XCK
~PD3/INT1
PD2/INT0
TX PD1/TXD
RX PD0/RXD
ARDUINO UNO
vdd
gnd
TOMATOES
VDD
DATA
GND
54
31
%RH
°C
DHT11
BEANS DRY
39
3
ARTICHOKES
32
32
P1
DCD
DSR
RXD
RTS
TXD
CTS
DTR
RI
txd
rxd
ERROR
COMPIM

FIG 1.8

ADVANTAGES AND APPLICATIONS :

ADVANTAGES:

- It provides endless real-time monitoring:-

IoT-enabled devices will provide real-time unrestricted monitoring. All updates will be recorded and forwarded to ensure that appropriate action is taken in a timely manner.

- Helps in maximizing profits:-

The primary effect of real-time monitoring is an analytical analysis, which further leads to a reduction in maintenance operating costs and an increase in profits. In addition, timely renewal by power failure or heat leak will lead to an increase in profits over time.

- It makes cold storage management easy:-

Effectively managing a cold storage is not just expensive but also cumbersome. Temperature fluctuation is a major factor for management but with IoT constant monitoring on power usage, broken switches and temperature fluctuation, management becomes very easy.

- It provides remote accessibility:-

The best part of modern technology is that it enables remote access. With IoT any and all updates on the storage process can be accessed on-the-go. Therefore, the management is connected to the processes anywhere they go.

- It assures smarter maintenance:-

This is the time for smart phones and smart technology. Technologies such as health watchers have now reached places we never thought possible. When IoT is used in cold storage, it eliminates the need to visit the cold room to monitor the process, because remote access can provide the necessary information anywhere and anytime.

- Worker and Asset Safety:

Smart IoT sensors update the cold storage owners in case of a system failure. It will enable them to detect risky scenarios in real-time so that immediate action is taken before a mishap. IoT maintains a detailed log of every user activity to enhance the security of the entire system.

- Real-Time Monitoring:

IoT sensors enable stakeholders to record and monitor every minor detail of their cold store. The sensors update the staff about temperature and humidity to prevent food spoilage. It even sends alerts via SMS text, email or voice call if a cooler's temperature is out of its nominal range.

- Efficient Tracking:

Smart IoT solutions share every information with the owners about their perishable or non-perishable items in transit. It updates them with critical details including speed, location, vehicle status, driver's behavior, and more. It makes real-time tracking of the vehicle easier so that owners can evaluate when a specific consignment will be delivered.

- Efficient Stock Management:

It keeps the owners informed about the vacant space available in the cold store for optimum utilization. The IoT sensors record the moment of goods and raw material so that owners stay pre-informed in case of theft. The system even sends alerts about the expiry of a product so that it is moved out of the store for selling in real-time.

- Reduces Third Party Intervention:

IoT solution automation of various processes at cold stores to limit third party intervention in stocking and dispatching of goods. It also maintains transparency in the entire process starting from the spawning to the consumption stage.

APPLICATIONS :

- Agriculture industry
- Blood banks
- Food & beverage industry
- Healthcare industry
- Pharmaceutical facilities
- Restaurant chains
- Food manufacturing facilities
- Educational institutions that provide meals to students, etc.

RESULT AND DISCUSSION :

RESULT : We are able to see the temperature and humidity values on our blynk server mobile application.The values are updated from time to time and we can store these values on the server,if there are any fluctuations in the values,they are communicated over the internet and stored in the server.

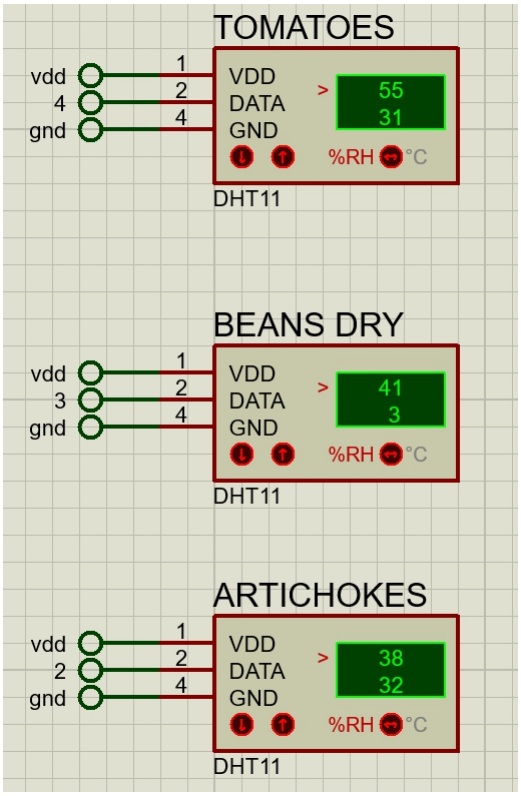

FIG 1.9

FIG 2.0

Discussion:

- The food monitoring system prevents food from contamination.
- We are making use of sensors to collect data.
- The system will help in deciding a good or bad condition of environment where food is stored.
- The food monitoring system is needed, which will monitor the condition of the food where it is stored to prevent it from getting spoiled.
- We were able to successfully print the output data in the blynk app.

FUTURE SCOPE AND CONCLUSION :

FUTURE SCOPE :

● Going forward, most of the units can be embedded within the controller like the Android system, with technological changes thus improving the acquisition system can be implemented in real time in natural conditions in the cold, which is why the life of extended food products can be made easier with cold storage using IoT.

● Historic data at customizable intervals allows better long-term decisions.

● Timely alerts can be sent on abnormal environment situations based on custom logic.

● Impending problems can be anticipated to avoid loss by taking appropriate remedial action.

CONCLUSION:

● Overall, the implementation of an IoT-based cold storage monitoring system leads to the optimum utilization of space and resources. It helps to track the usage pattern and power consumption of devices, minimize wastage, detect anomalies within the facility and monitor and control the intensity of light as per the changes in daylight. An IoT-enabled monitoring solution brings terrific value to businesses and enhances profitability. IoT-enabled cold storage monitoring helps to increase your ROI.

● Cold chain management system will increase fruits availability throughout the seasons.

● To enhance the revenue of farmers, industries and government.

● Farmer can use the low cost technology to preserve their yields.

● The farmer and organization can review the status of crop yield, fruits,vegetables and time span of the food products is extended for a longer period.

REFERENCE

[1] Author - IGI Global, “Research Anthology on Food Waste Reduction and Alternative Diets for Food and Nutrition Security”, ISBN:9781799853558, 1799853551,Published:July 2020

[2]Gupta, P.K., Ören, Tuncer, Singh, Mayank, “Predictive Intelligence Using Big Data and the Internet of Things”,

[3] W. H. Organization, "Promoting fruit and vegetable consumption around the world," Global Strategy on Diet, Physical Activity and Health; World Health Organization: Geneva, Switzerland, 2003

[4] S. Food, "Global Initiative on Food Loss and Waste Reduction. Food and Agriculture Organization of the United Nations," SAVE FOOD.[Online]. Available: http://www.fao.org/3/ai4068e. pdf, vol. 25, p. 2018,