

Smart Buffer Stock Solution

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Abstract-

India is the world's alternate- largest patron of onions. Among other fruits and vegetables, the onion is one of the highly important vegetable and also plays a major part in foreign exchange. Still, because of the constant changes in the weather, onions can decay. As a result, onions must be stored at the temperature [5] recommended by the Onion Association of India (NOA). The onions are stored in ambient conditions at temperatures ranging from 0 - 4 °C [7] and humidity situations ranging from 60 to 70. So, the idea of conserving onion has arisen. In this design, we created an onion storage system that stores an onion in a specific way [7]. Temperature and humidity sensors [1], [5], [7] have been used in this system to cover temperature and humidity, singly. By exercising the Peltier [4] [5] module, to maintain the standard temperature range, the air inside the storage tank is warmed as well as cooled based on the requirements. The proposed system will be smart and effective thanks to the use of the Internet of goods (IoT) [1], and the user will admit system advert from anywhere.

Keywords:Vegetable preservation, Onion preservation, Peltier Module, Cooling system.

1. INTRODUCTION

The losses in stored onions in India are advanced because onion bulbs have advanced water content. A total of 41 lakh tons of onions are produced each time in India, of which 40 to 50 percent of onions are lost due to the decay [1], dehydration and sprouting of onions while storing it [2], going further than Rs.600 crores [3]. As a result, their price increases by four to five times. The product request value of this implicit vegetable is adding everyday. This defines that the onion dehydration, rotting, lodging, decay, and sprouting in onion storage [2], [9] should be ignored. Onion farmers are finding a best possible way to increase product time after time. Still, the price of onion has been varying very much and in recent times the price has been very less.Among other fruits and vegetables, the onion is one of the highly important vegetable and also plays a major part in foreign exchange [7]. This issue has reacted in the Indian State Agriculture Marketing Board for the enhancement of price and support [7], [8].

EXISTING SYSTEM

In order to reduce onion declination after crop, a post-harvest onion storehouse methodology is designed and enforced.

1. The discovery of onion rotting is fulfilled using ESP32 Module, LM35 temperature[1], [5] detector, moisture detector, gas detector[6] and GSM module.

2. The purpose of detecting onion quality by using the ARDUINO IDE is to measure the temperature and ammonia gas [7], moisture using LM35 temperature detector, DHT11 moisture detector, MQ137 gas detector [6], and to shoot SMS cautions to named mobile phones.

PROPOSED SYSTEM

In terms of early discovery of rotting, the proposed onion storehouse system performs admirably. This design offered an innovative system that will help the stoner in controlling temperature between 25 and 30 degrees Celsius [5] , performing in positive feedback against onion losses, as well as a force system

for dealing onions as soon as possible before they decay. We also created an application that allows druggies to interact fluently with it. Originally [2], [10], the stoner must produce an account and answer general questions about their background, similar as their part as a client (or) planter and the position of their storehouse. Using this information, the system is suitable to give the planter and client with information about near smart buffer stocks. The app can display the vacuity of onions for trade grounded on the analysis. And also, a new option is given for users to register their conditions in this operation.

BLOCK DIAGRAM OF PROPOSED SYSTEM

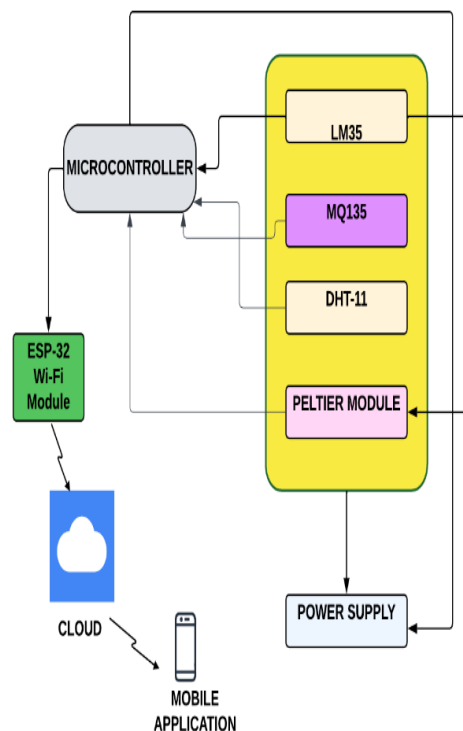


Fig. 1. Block Diagram

2. METHODOLOGY

The volume and quality of the onions are controlled by a Thermoelectric Colling System with the help of IOT technology. The ESP32 WI-FI module is used to transfer the data about the onion conditions to users who are situated in any corner of the world [1]. The temperature controlling system is the most important part of the system as the external factors can easily affect the inner tank temperature[5]. The system can be divided into two main parts.

Maintaining temperature inside the tank

One of the major task is maintaining the temperature. The Thermoelectric Cooling System is used to maintain the temperature inside the storage tank[5]. As the power force generates it is forwarded to the thermoelectric cooling module which results in the cooling of one side of thrPeltiertiles[4]. The exhauster which is attached to the cooling module blows the cooling air from the thermoelectric module inside the tank, As the process continues the temperature decreases exponentially. When the temperature comes to the ideal state of 0 to 4 degree Celsius, the cooling module is turned off automatically. When the temperature increases the process again starts until the temperature comes to

ideal temperature. For any reason, if the temperature goes down beyond the ideal range, the heating module is turned on in order to increase the temperature inside the tank.

In this system, monitoring and logging of the tested data on Google Cloud is done automatically, and the temperature and moisture controls are covered by using the LM35 and DHT11 sensors independently [1],[4]-[5]. The entire covered data is stored on the Google cloud. This data can also be accessed by the user, so the users can be able to know the conditions of the onion stored in the tank.

DESIGN AND TECHNOLOGY

Thermo-Electric Cooling Module(TEM)

The thermal temperature can be achieved using electricity. The thermoelectric modules corresponds to the two further semiconductor blocks p- and n- type semiconductors are placed in between the ceramic substrates, generally called as “The Peltier Tiles” [5]. These two p- and n- type semiconductors are connected in series electrically,[5][6] while connected thermally. When Direct Current (DC) voltages are applied, the heat from one side of the module is transferred to the another side of the module. Hence, one side of the is cooled and the other side becomes hot.

LM35 Temperature Detector

For maintaining the temperature, LM35 temperature detector is used. The main usage of the LM35 sensor is in charge with the voltage and then the traditional thermo-couple[5]. Because of this, there is no further external current supply is needed to maintain the temperature of 0.5 degree Celsius which operates from 4 to 30 volts of current.

DHT-11 Sensor



Fig. 2.DHT-11 sensor

If one is attempting to find a tool that detects temperature and humidity, the usually applied DHT11 version can be suitable. It functions a delegated NTC to degree temperature in addition to an 8-bit microcontroller which transmits readings thru serial data. Additionally, this calibrated system can without problems hook up with diverse varieties of opportunity microcontrollers. Its precision varies between $\pm 1^{\circ}\text{C}$ to $\pm 1\%$ while measuring temperatures from 0°C up till 50°C at the same time as figuring out humidity starting from twenty percentage all of the manner up until 90 percentage. Thusly, if stated parameters fall inside your unique project’s scope – it might permit you to take into account deciding on the dependable DHT11 sensor with the intention to satisfy any vital standards at hand.

ATMEGA328P Microcontroller

The temperature inside the onion storage tank is maintained by using the ATmega328P microcontroller. Principally, it is an 8-bit low energy microcontroller. The primary factor is built in 10-bit analog to digital converter (ADC) considerably used for temperature dimension. This factor makes the microcontroller appropriate for this operation. It further helps in the process of Intergrated circuits (I2C).

ESP32 Wi-fi Module

It is an intertwined system-on-chip (SoC) used to attach the tool to the world [10]. It's a wi-fi transceiver.



Fig. 3. ESP32 Module

It additionally helps WPA/ WPA2 protection mode. Indeed, we are able to join detectors without delay to it. It helps Bluetooth4.2. It offers wi-fi connectivity to the bias, so it is able to join and talk with different systems. Furthermore, it operates at a voltage variety of 2.2 to 3.6V.

Power Supply

The TEM calls for steady DC voltage, so the thermal impact may be achieved. Then, the energy pressure is 12V and 2A. Switch mode energy pressure (SMPS) [8] is a great alternative as a energy pressure due to the fact decrease warmth is generated via it. But, SMPS is complex to layout and apply. As as compared to the direct energy pressure, SMPS is lots higher due to the fact transfer mode shops much less warmth withinside the factors, hence, the existence of things is greater than as compared to direct [8].

Peltier Module

Thermoelectric coolers (TECs) additionally referred to as peltier plates or peltier coolers. Which works primarily based totally on precept of thermoelectric cooling. The peltier plate is aggregate of distinct varieties of semiconductor bias (plates), one tool is N-kind semiconductor any other bone is P-kind semiconductor. The semiconductors need to be distinct, we want distinct electron consistence to supply warmness or cool. Peltier plate converts voltage into warmness (temperature) and warmth into voltage. When voltage carried out to the peltier plate additionally the modern-day passing thru peltier plate. When the modern-day passing thru distinct semi-conductors additionally there might be produced warmness. The electric powered modern-day influx modified from the electrons much less in certain to electrons extra in certain while the 2 distinct semiconductors are in contact. The purpose for that is the Fermi role strength of N-kind semi \rightarrow captain and P-kind semiconductor are different. so the electrons usually flow from excessive Fermi role facet to low Fermi role facet. This system repeated as much as the each semiconductor Fermi role powers come equal. Typically, the temperature is 40 °C to 70- 80 °C while we use ultramodern peltier plate.

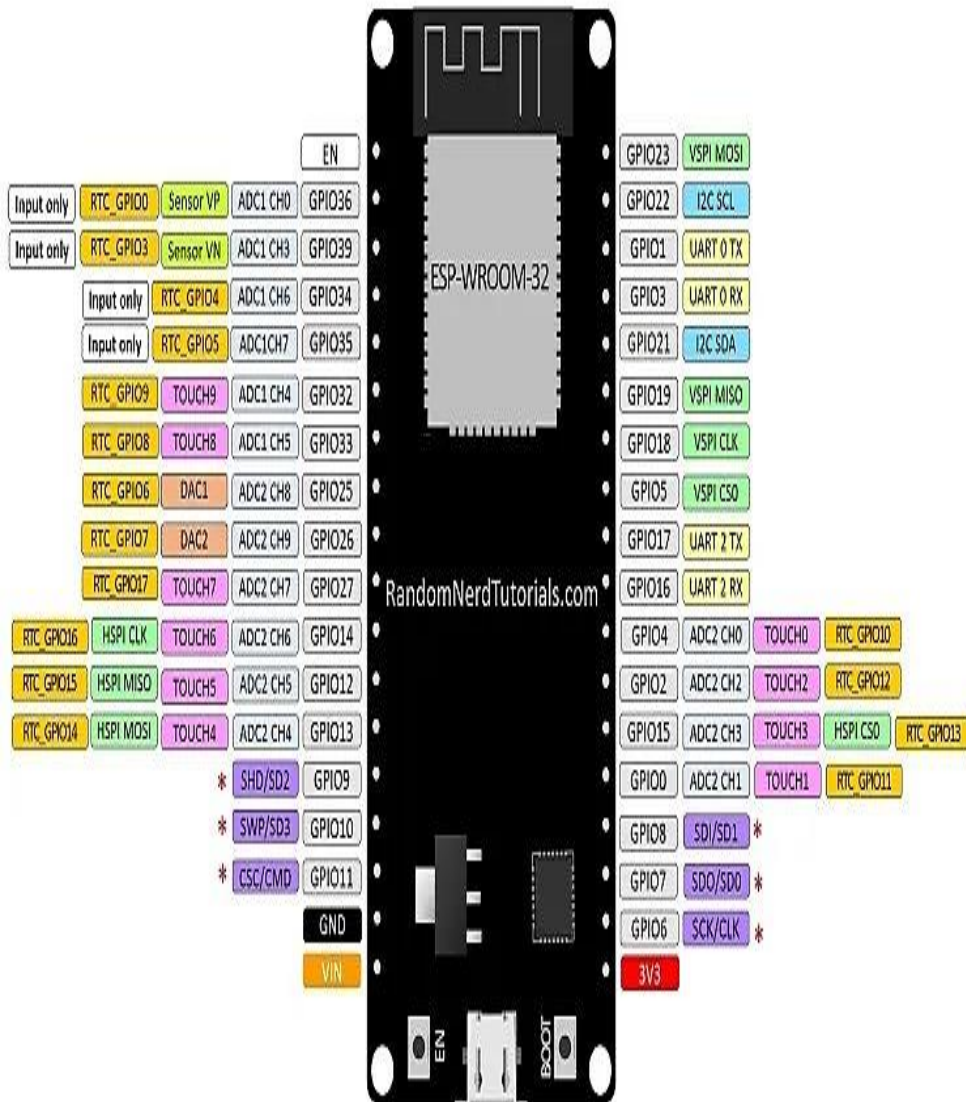
APPLICATION

An intelligently designed mobile app that facilitates effortless user interaction is available. At first, the individual must establish a personal profile and respond to basic inquiries regarding their identity as either a buyer or cultivator and the position of their storage facility. Leveraging these responses, this platform can furnish relevant data about nearby astute inventory reserves for producers and purchasers alike. The program has an interface capable of depicting onion stock availability after meticulous cloud analysis with added functionality allowing users to register specific needs through its system.

FLOWCHART DEVELOPMENT

ESP32 DEVKIT V1 - DOIT

version with 36 GPIOs



* Pins SCK/CLK, SDO/SDD, SDI/SD1, SHD/SD2, SWP/SD3 and CSC/CMD, namely, GPIO6 to GPIO11 are connected to the integrated SPI flash integrated on ESP-WROOM-32 and are not recommended for other uses.

Fig. 4. ESP32 Dev Kit

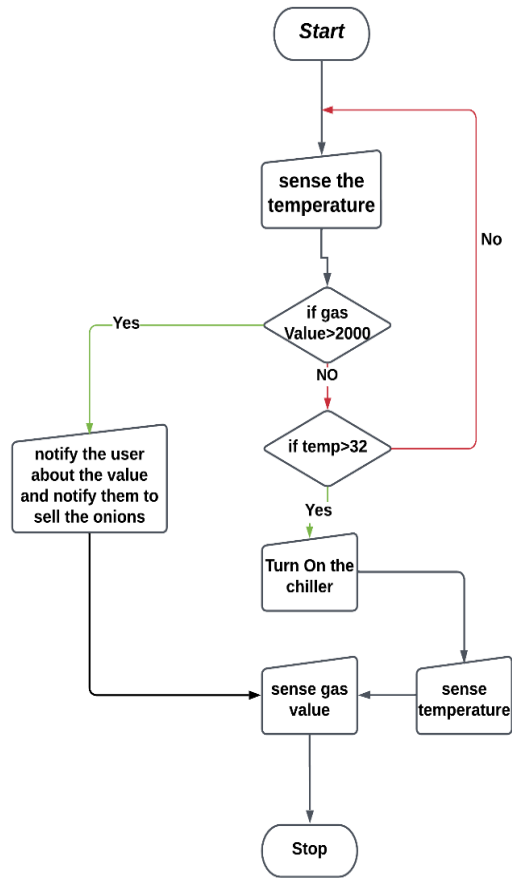


Fig. 5. Flow chart

3. EXPERIMENTAL RESULTS

The experimental results are divided into three significant parts, which are listed below. We used Tinker cad to simulate the temperature cooling system as well as the ammonia gas detection [6] and alerting system.

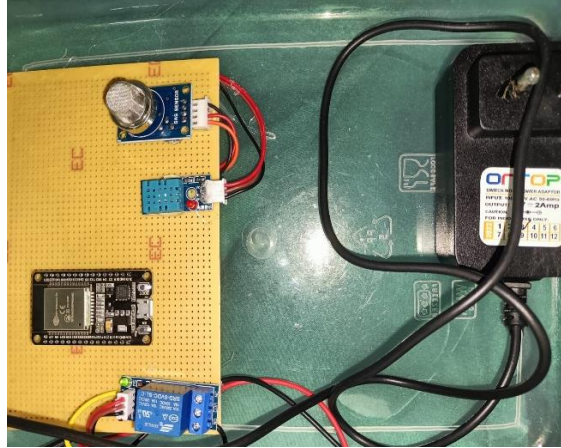


Fig. 6. Hardware kit

1. SIMULATION (PART-1)

In this simulation circuit, ESP32 Wi-fi module, DHT11 Humidity sensor, Power Supply and a few connecting wires are used.

2. SIMULATION (PART-2)

In this simulation circuit, ESP32 Wi-fi Module, MQ35 sensor, DHT11 Humidity sensor, LM35 Temperature sensor, Power Supply, Breadboard & Peltier module [5] and a few connecting wires are used.

APPLICATION PROTOTYPING

Stock Buffer user and Stock Buffer admin are platform-independent mobile applications that can run on both iOS and Android, is being developed with Angular JavaScript. The figure below depicts the user interface of our mobile application.

4. CONCLUSION AND FUTURE WORK

The use of Internet of Things in cultivation or production of plants are generally known as smart cultivation or smart production of crops. In this type of IOT based cultivation the process are atomized to a maximum extent like the collection of data using sensors and the data are processed and taken into action by controllers, etc. Due to the lack of modern technology in cultivation and plantation of crops, Pakistan cannot participate in the large production. Also in recent times there are several demands and price hikes are increased for potatoes, onions, chillies and tomatoes have gained profit in considerable amount.

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5. REFERENCES

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