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Food Quality Monitoring System

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Abstract **– Sanitation and cleanliness is a pressing issue to forestall the food wastage. The Quality of the food should be observed and should be kept from spoiling and rotting by the barometrical elements like temperature, dampness and dim. In this manner, it is valuable to convey quality observing devices at food stores. These quality checking devices keep a watch on the natural component that might be the reason to speed up the rotting of food. Afterward, the natural variables can be controlled like by refrigeration, vacuum capacity and so forth.**

INTRODUCTION

It is essential to keep up with the security and cleanliness of the food to keep it new and consumable which helps in **diminishing food wastage**. One answer for this is to keep up with appropriate ecological circumstances for the put-away food to control the pace of disintegration. There are various boundaries on which food deterioration depends, the boundaries like humidity, microscopic organisms, alcohol content, and temperature are central point on which the pace of decay of food relies upon. Assuming the temperature of the stockpiling is between 40F° to 140F°, it is a risk zone on the grounds that during that temperature microbes develop quickly, multiplying its number in 20 min[1]. Additionally, the dampness in the food extra space ought to associate with 50-55% to keep the nature of the food at high, to the extent that this would be possible[1].

In this Internet of things(IoT) project, we have fabricated a Food Monitoring device utilizing NodeMCU and Arduino IDE, to screen the temperature and humidity and control it. To control the temperature, we will utilize a DC engine as a cooling instrument. To track down the temperature, and stickiness the DHT11 sensor module is utilized, and to decide the condition of the food, the MQ3 gas sensor module is utilized.

The project inspiration includes fostering the exceptionally proficient, financially savvy food monitoring framework utilizing straightforward and quick calculations which will accomplish the ideal objective to decide the quality of vegetables and food varieties.

The venture includes the information procuring and controlling framework applications, which are challenging to create and incite. The nature of the food should be observed and it should be kept from spoiling and rotting by the climatic elements. Along these lines, this installed framework is proposed to send quality monitoring devices to food stores.

The principal expectation of the task is to present a model for the detection of quality in food. The model contains ESP32 and different sensors like DHT11 to screen temperature and stickiness, and MQ3 to identify alcohol content. This entire model is an IoT-based installed framework that senses the deliberate sensor data to an IoT stage. The IoT stage utilized for logging and monitoring sensor information is Blynk.

LITERATURE REVIEW

In this section, a review of food quality checking frameworks that presently exist or have been proposed giving both their assets and shortcomings. A study on our proposed system is done comparing it with these food quality monitoring systems focusing more on how our system addresses their weaknesses.

- **Installed Measurement Devices monitoring systems**
  These frameworks are the better forms of the manual Framework. Estimation gadgets for environmental circumstances are introduced inside the food store. But there is no programmed hand-off of data. One needs to go to the store to find data about the ongoing environmental circumstances and food conditions. Postponements in estimation perusing, the disappointment of gadgets, and the upkeep of gadgets are a portion of the weaknesses of the framework which would have an adverse effect on food quality.[2]

- **Smart Food Quality Monitoring System**
  This study recommends the deliberate utilization of different sensors to perform quality checking and control of food materials. All the more, this framework comprises gas, temperature, and humidity sensors, which give the fundamental data expected to assess the nature of the pressed or put away item. This data is communicated remotely to a PC framework giving a point of interaction where the client can notice the development of the item quality after some time utilizing the Internet of Things innovation. This framework accompanies the accompanying key benefits[2] ;
  a) Robotization of everyday undertakings promoting better observing of gadgets.
  b) The greatest benefit of utilizing the IoT innovation in this framework is setting aside cash.
  c) Proficient and saves time.

- **Manual monitoring of atmospheric and environmental factors**
  Larger part of food stores distribution centers actually depend on this arrangement of manual observing of the air factors connected with food quality. This requires a staff to visit and really look at the states of

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the store by observing these circumstances at some chose time stretches regularly. Expansion in labor by routine tests, chance of injury or damage to the faculty by outrageous circumstances, postponements or even human mistakes in estimations are among the deficiencies of this strategy.

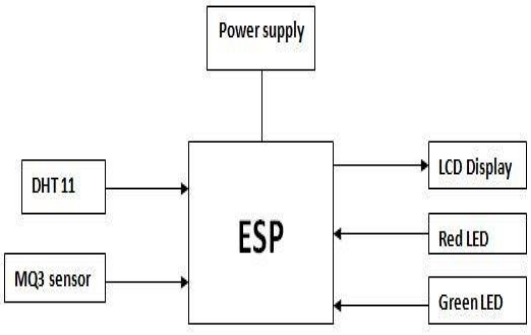
- **Artificial Intelligence technology in Food quality monitoring system**
  To foster a clever framework, man-made consciousness(Simulated intelligence) covers various strategies. Among a few AI procedures, the fluffy rationale is a method that is utilized to handle the fluffy data and rule-based surmising to develop choice help, all things considered, applications.The Fluffy set hypothesis is applied to assess the expiry of food wares [3].
- **Machine Learning technology in Food quality monitoring system**
  AI (ML) is a cycle that utilizations test information to prepare the model to simply decide. The proposed framework in [11] utilizes ML frameworks like GPR also, SVR to ascertain the period of foods grown from the ground and the edibility of the natural product. In [12] the food decay is resolved to utilized PCA and KNN calculations of AI. The data from MQ gas sensors is taken care of by PCA to diminish the information. It likewise utilizes KNN for the arrangement of food.
- **Deep Learning Technology in Food quality monitoring system**
  Profound learning assists the machine with acting like the human mind by extricating highlights naturally by brain organization and afterward preparing them to decide. In [13] the framework has been suggested that takes food variety as a central point of deterioration. It is appropriate
  just for the cooked item. It utilizes a prepared back spread brain network as a distinguisher. This framework is being applied to various food items and has given precise results.
  In [14] the proposed framework involves CNN as a strategy to distinguish the natural product type and quality.

PROPOSED SYSTEM

This venture proposes a framework to investigate the encompassing circumstances under which the food is being put away and shipped. The proposed arrangement detects the temperature, humidity and alcohol content under general climate as these boundaries influence the healthy benefits of food things. This framework utilizes capacity units embedded with different electronic sensors which can peruse those boundaries influencing food materials.

1) Block Diagram-

The block diagram for this **project** is given in the image below:



The proposed system should be able to:

a) Read temperature and relative humidity of the food.
b) Detect the emission of ethanol type of gases.
c) Collect data from all the sensors and pass to LCD for display.
d) Monitor the sensor data visually online.

2) System Requirements

- NodeMCU ESP32
- MQ3 Sensor Module
- DHT11 Sensor module
- Connecting wires
- LCD Scree

Hardware Requirements

- **NODE MCU ESP32**

It is a framework on chip (SoC) module that is pre-customized with TCP/IP convention stack which gives an entrance for the microcontroller to a Wifi organization. It is generally utilized for different IoT applications.

- **MQ3 Gas Sensor Module**

MQ3 is one of the most commonly used sensors in the MQ sensor series. It is a Metal Oxide Semiconductor (MOS) type of sensor. Metal oxide sensors are also known as Chemiresistors, because sensing is based on the change of resistance of the sensing material when exposed to alcohol. So by placing it in a simple voltage divider network, alcohol concentrations can be detected.

- **DHT11 Sensor Module**

The DHT11 sensor module consists of a resistive type humidity measurement and NTC temperature measurement components along with an 8 bit-microcontroller. It ensures quality, fast response, anti-interference ability, and cost-effectiveness. The sensor module is precalibrated in the laboratory which makes the end-user directly use this sensor in their project. The calibrated data is stored in the OTP memory, which is used by the sensor's internal signal detecting process. It consists of a single-wire serial interface to send the data from the sensor to the microcontroller.

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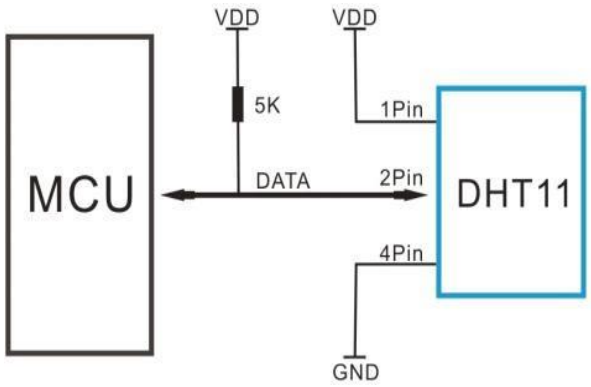


- **Blynk application interfacing**

Blynk mobile application is used to display the data that is procured by the sensors and then transmitted to the phone using NodeMCU ESP32. The software requirements for the interfacing and communication are:

- Arduino IDE
- Embedded

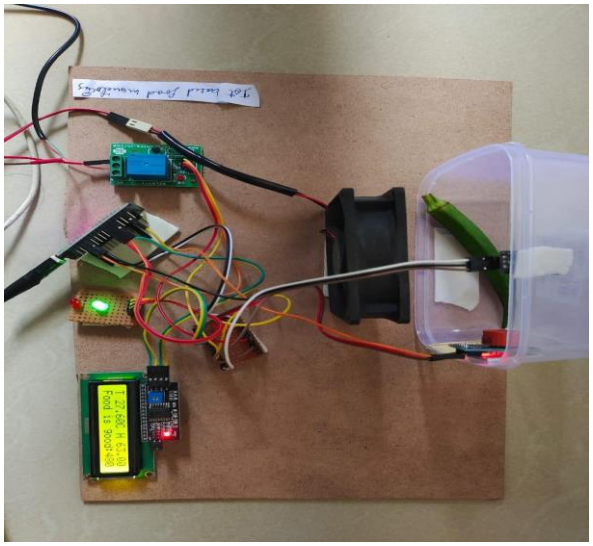
Software Requirements

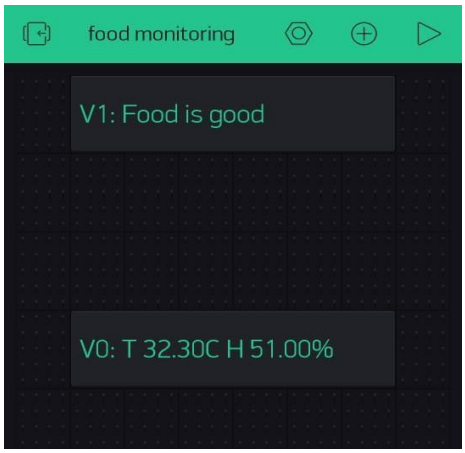
- **ARDUINO IDE**
  It is free source Arduino software that helps to write codes and program Arduino board. This software is compatible with any type of Arduino board.
  Then Arduino programming language and Arduino programming (IDE) for handling. The Arduino IDE upholds the dialects C and C++ utilizing extraordinary guidelines to sort out code. The Arduino IDE supplies a product library called Wiring from the Wiring project, which gives numerous common information and result strategies.
- **EMBEDDED C**
  Embedded C is an extension of the C language and it is utilized to foster miniature regulator-based applications. The expansions in the Embedded C language from typical C Programming Language are the I/O Hardware Addressing, fixed-point math activities, getting to address spaces, and so on.

IMPLEMENTATION

All the data from the MQ3 sensor, and the DHT11 sensor is collected and converted to string values. The data from the sensors, in the form of proper strings are passed to the LCD screen for display. The ESP8266 Wi-Fi module associated with the Arduino transfers the information to Blynk Server. For showing and observing information transferred to the Blynk server, either a computerized dashboard or information representative is required. In this venture, the Blynk Application is utilized to screen the sensor information outwardly on the web.

RESULTS





CONCLUSION

The goal of the venture is to plan a food quality checking framework prepared to understand temperature and relative humidity and distinguish the discharge of ethanol kind of gases. The framework ought to likewise have the option to gather information from every one of the sensors and pass it to LCD for show and further screen the sensor information outwardly on the web. The framework has been planned around the ESP32 microcontroller, MQ5 gas sensor, and DHT 11 Sensor.

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