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Food Monitoring System Using Iot

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Abstract:- Nitrogen, Oxygen, Trace gases and other various mixtures of gases comprises the Earth's atmosphere. Trace gas is usually in small portion and is a mixture of gases include carbon monoxide, methane, carbon dioxide, hydrogen, argon, neon etc. The concentration of these trace has have increased in recent past and have a adverse effect on human health. So, it is very important to determine these gases. Over the last few decades, sensors have developed its applications in several fields of technology.

In this paper, IoT framework is provided for food monitoring system for protection of food due to surrounding conditions with array of low cost sensors. The proposed work analyzes temperature, humidity and gas emitted by food as these parameters affect nutritional value of the food items and analyzed results will be displayed on LCD and message will be sent to phone by using Telegram application.

Keywords:- *IoT, Sensors, Food MonitoringSystem.*

I. INTRODUCTION

Food is the main source of energy for human being. Toady everybody's main concern is consuming healthy and fresh food. Not only junk food, but also most of the packed food like vegetables, fruits are also causing the problem because of the freshness/quality of the food. Most of the times, we buys food because it looks good and it has great aroma, but food may not be suitable for consumption. This leads to food poising in people when it is consumed. Thus, quality of the food is the major factor which has to be considered. Due to different atmospheric conditions the food gets rotten easily. The detection rotten food is difficult by bare eyes and nose. One rotten food has the capacity to spoil all foods with which it is stored. The amount of rotten food or spoilt food is the deciding factor of the quality of the food. The detection of the rotten food in the early stages prevents the food wastage.Thus, the quality of the food needs to be monitored and it must be prevented from rotting and decaying because of atmospheric conditions.

The rotten food produces many gases Hydrogen Sulphide, methane, ammonia, Ethylene, nitrogen dioxide etc. One of the common gases released from rotten food is Methane.

Below table shows the gas liberated by different rotten food items.

Food	Gases Liberated
Channa	**Methane**
Banana	Ethylene, Formaldehyde, **Methane**
Apple	Ethylene, Formaldehyde, **Methane**
Coriander	**Methane**
Onion	Sulfoxides, **Methane**(Small amount)

Table 1.1 Gases liberated by rotten food

➢ *Problem Statement*

In food industry, the quality of the food is detected by the amount of gases liberated by the food. Human nose cannot determine the gases liberated by these food items precisely. To overcome this, the proposed paper uses different sensors to determine the gases liberated bydifferent food items. This helps in studying and analyzing different food samples.

➢ *Description about the work*

The proposed paper uses different array of sensorsfor monitoring the quality of the food. The temperature and humidity of the food storage is monitored using DHT11 sensors.

The gases emitted by different food items are measured using MQ3 and MQ5 sensors. Thesesensors will detect the gas and if the gas emitted by the food item is above the threshold value will be indicated in LCD and the same will be uploaded in Node MCU and is messaged through Telegram.

II. ARCHITECTURAL DESIGN FOR PROPOSEDSYSTEM

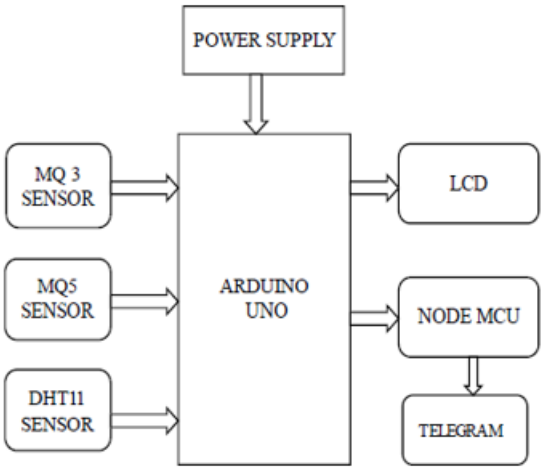

Fig 2.1. Proposed system block diagram

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➢ *Working Principle*

Food monitoring system using IoT consists of a wireless sensor unit to monitor critical environmental parameters like temperature, humidity and gas emitted by the food. DHT11 sensor senses the temperature and humidity of the food storage environment. It senses the value from the surroundings and sends the information to the Arduino and Arduino will convert this analog value into digital value which will be compared with the threshold value which will be mentioned by each food samples. We have gas sensors like MQ3 and MQ5 connected to Arduino which will sense the gas liberated by food items. We have Node MCU connected to the Arduino which will send the message to the phone through telegram app. The values sensed from different sensors are sent to the Arduino. If the value is greater than the threshold value then Arduino will send indication to the Node MCU and the same will be displayed on LCD.

➢ *Hardware and Software Requirements*

Hardware Components required for the projectare:

1. Arduino Uno
2. MQ3 Sensor
3. Node MCU (ESP8266)
4. Temperature and Humidity sensor(DHT11)
5. LCD Display

➢ *Software Components required for the project are:*

1. Embedded C
2. Telegram BOTFATHER

➢ *Advantages*

1. Foods like vegetables and fruits are prevented from rotting.
2. Hygiene and clean environment ismaintained.
3. Commercial loss is reduced.
4. Commercial profit is increased.
5. Data can be saved for future analysis.

➢ *Applications*

1. Can be used in places where food is storedin bulk like shops.
2. Gas sensors can be used in many fields like Industrial protection (eg. Methane detection in methane), Automotive Industry(eg. Detection of polluting gases from vehicle) etc.

III. IMPLEMENTATION

The IoT based food monitoring system has to be installed in a food store. Once it s installed properly and then it is powered ON. The device connects through the internet via modem, and it starts collecting the data from the surrounding where it is stored. The DHT-11 sensor senses the temperature and humidity of the food storage and displays the information through the LCD display and the same sent in telegram app also. The different gas sensors which are connected to the Arduino board also reads the gas liberated by the food samples and compares it with the threshold value.

The DHT11 sensor is the temperature and humidity measuring digital sensor which consists of inbuilt capacitive humidity sensor and thermistor, it reads the real time temperature and humidity every 2 seconds. These sensors operate on 3.3 V to 5V supply voltage and measures temperature between 0 degree C to 50 degree C and relative humidity between 20% and 95%.

The gas sensors like MQ3 and MQ5 sensors are connected to the Arduino through ADC channel. The sensor data are passed to the LCD display in the form of character. The data uploads to the server by using ESP8266 Wi-Fi module connectedto the Arduino. The analog pin of Arduino gets information from analog output of Arduino which has inbuilt ADC that converts analog to digital value.

➢ *Circuit Diagram*

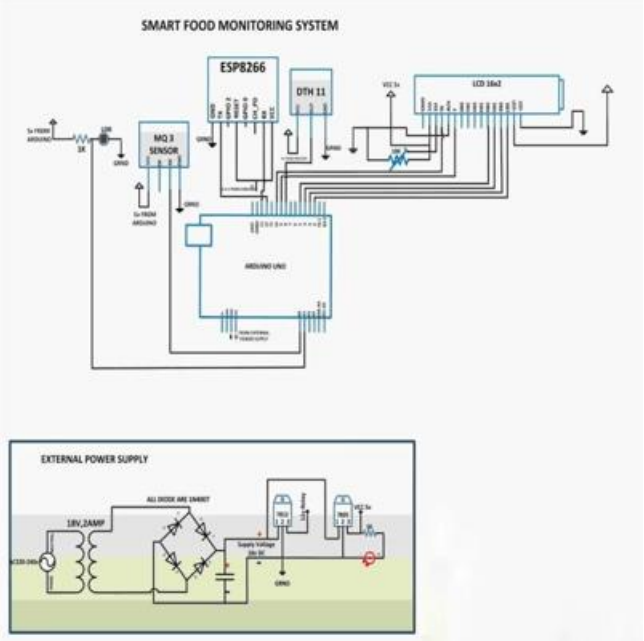

Fig3.1 Circuit diagram of food monitoring system using IoT

The above figure shows the circuit diagram of food monitoring system using IoT. It gives the complete information about how different sensors are connected to the Arduino board and its pin information also.

It also shows the external power supply which is given to the Arduino board to power up.

The threshold value for each food sample is different. We have tested different food samples for its threshold value. The unit of gas measured for different food samples is PPM.

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The below table shows the values for different food items.

Food Samples	Amount of CH4
Banana	416
Onion	742
Channa	643
Custard Apple	448
Coriander Leaves	409
Jamun Fruits	439

Table3.1 Threshold value of different food samples

IV. RESULT

During phase one testing, only gas sensor was connected to the Arduino board and the food quality was tested.

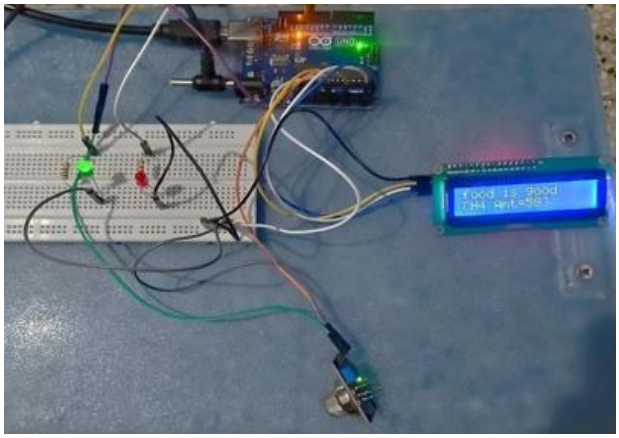

Fig 4.1: Gas sensor connected to Arduino board

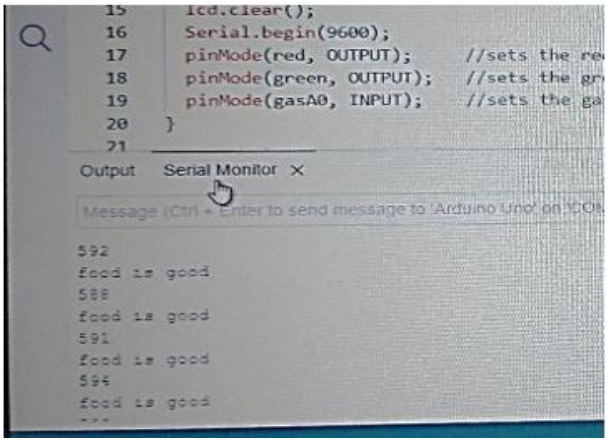

Fig 4.2: Result can be seen on computer

Fig 4.1 shows that a gas sensor is connected to Arduino and it is subjected to take values for the food which is in good condition. Along with this LED's are also connected to indicate in initialconditions.

Fig 4.2 shows that when a food is in good condition and its gas emitted value is less than the threshold value then green LED is on (which can be observed in fig 4.1) and also the same can be observed on the computer (which says "Food is good").

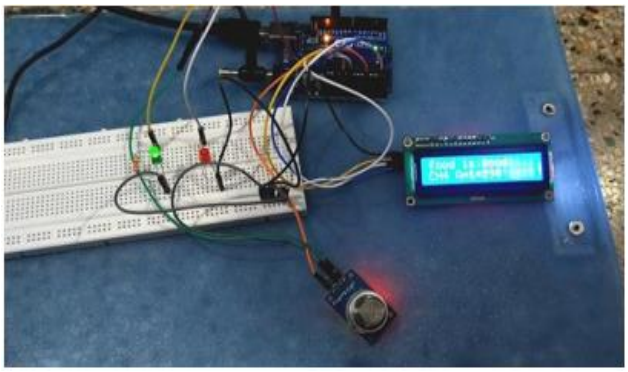

Fig 4.3 LCD is connected to Gas sensor and Arduino

In the next phase of testing, LCD is connected to gas sensor and Arduino, which can be seen inFig4.3. This is the result of testing a fresh food by the gas sensor. The result of which can be seen in LCD which says "Food id good" and also givesthe gas value emitted in PPM.

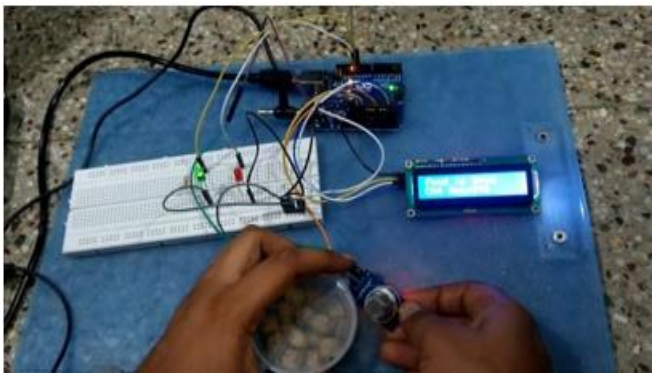

Fig4.4 Rotten Food samples

The fig 4.4 shows the result of testing rotten food by the gas sensor. The result of which can be seen in LCD which says "Food id bad" and also gives the gas value emitted in PPM. Here rotten Channawas tested.

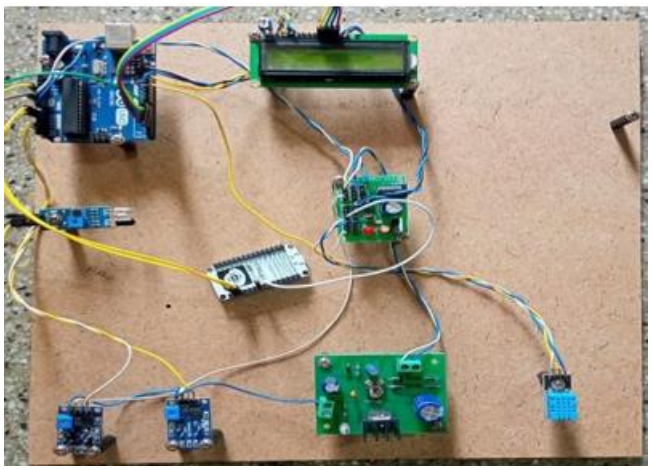

Fig 4.5 Interfacing all Sensors to Arduino

Fig 4.4 shows interfacing all sensors to Arduino board. It includes temperature and humidity sensor (DHT11) and 2 gas sensors(MQ3 and MQ5) a node MCU to send messages throughTelegram application.

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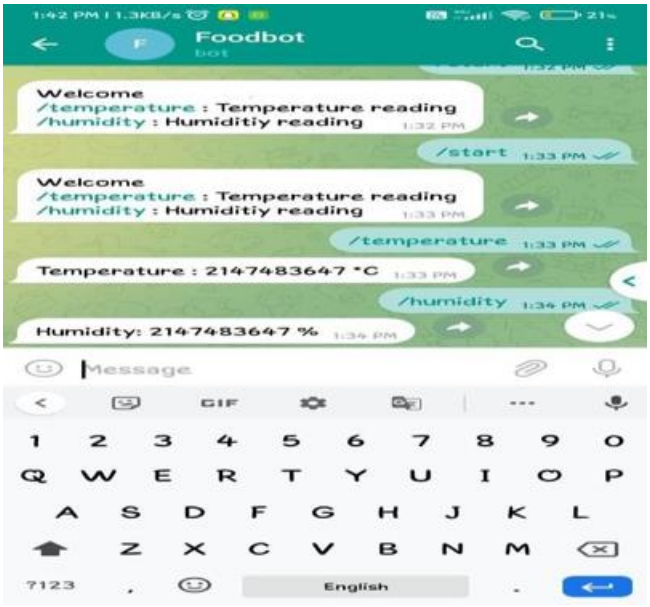

Fig 4.6 Messages through Telegram app

The figure 4.6 shows the sample of messages coming through Telegram app to the phone. Thisis done by the Node MCU that is connected to the Arduino. In the figure the temperature and humidity of the food surroundings where it is stored is shown. We will also get the same type ofmessages for the gas liberated.

V. CONCLUSION

The proposed food monitoring system using IoT has a wide range of applications in food processing industry. This addresses the critical issues like food waste, food contamination etc. The threshold value of the device is maintained according to the food sample as each food has its own different threshold value. The array of gas sensors helps in reducing the chances of inaccurate readings. The device can be customized and can be used for different other applications. This project uses many low cost sensors which will reduce the cost and improves the efficiency.

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