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RESEARCH ARTICLE OPEN ACCESS

EDIBILITY DETECTION USING IOT

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Abstract:

In today's world, food deterioration is a serious issue in the modern world since eating rotten food can have negative effects on consumers. to keep the food stored in a proper environment and to limit the rate of breakdown. There are different factors that affect the rate of food decomposition include temperature, bacteria, humidity, and bacteria are important determinants of the rate of food decomposition.. The device aims at using the right sensors to identify rotten food and keeping an eye on gases emitted by the specific food item. The internet of things uses sensors for scent, humidity, and temperature to deliver alerts in synchrony with one another so that the proper action can be performed. This is widely used in the food industry, where food detection is currently done by hand and automatically. So, in this IoT paper,.In order to track and control the temperature and humidity of the storage environment, we will construct a food monitoring device utilising a DHT11 sensor and an Arduino controller. The DHT11 sensor module is used to measure temperature and humidity, while the MQ4 gas sensor is utilised to detect the state of the food. Module is used. In the future, if needed we can also use a IoT based weight sensor to also monitor the food quantity in the storage area.

Keywords *— Temperature, Humidity, Smell, Internet of Things, Food Spoilage, Edibility Detection, Arduino UNO, DHT11 sensor, GSM modem, MQ4 Gas sensor*.

I INTRODUCTION

Food waste has been a serious issue in recent years, and research are being done to find creative ways to reduce it. not only wastage of food but also food contamination and spoilage is also a major issue which is the main cause to many health problems. Given that food is the primary source of nutrition for all living things, food quality has historically received more attention than other considerations. Using Internet Of Things (IOT) we can access anything from anywhere using this technology we will be able to manage the device from anywhere if we have access to that the device, by measuring and monitoring the condition of the food and sharing data with the customers so they are aware of the food, it is feasible to extend the shelf life of the food.

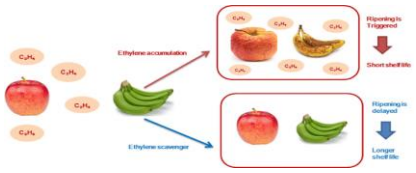

Figure 1: Food Spoilage

There are many aspects where we can measure or monitor the contamination or the spoilage of the food. As we install the control systems in the refrigerators of the storage marts we will be able to control and monitor the temperature and

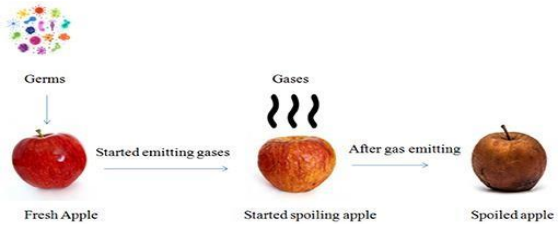

Figure 2`: Food Spoilage Process

here are different factors that spoil the food like Bacteria, virus, protozoa. These factors may have a negative impact on customers, but we may use some preventative measures to keep them from spoiling and ensure high-quality food.Typically, we believe that bacteria cannot result in food poisoning, however odourless and tasteless microorganisms are the main culprits in food borne illnesses. Therefore, it is never advised to ingest damaged food.

Food spoilage or contamination can be brought on by a number of things, including humidity and temperature swings.As a result, it's crucial to supply a measurement tool that can track changes in temperature and humidity while moving and storing food. . The details congregated by tracking and monitoring can be used for review, research, pattern forecasting and planning.

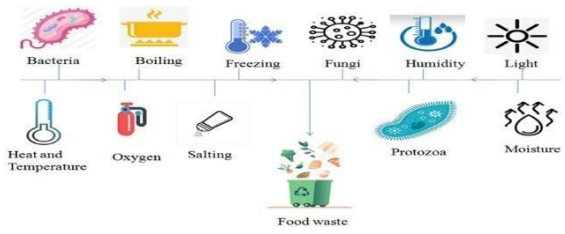

Figure 3: Affecting Factors of Food

II. LITERATURE REVIEW

the constant observation in a smart home using special sensor technology that can tell good food from bad food. Numerous studies that examine key elements in food deterioration have produced a range of findings that are consistent with the method employed to detect or keep track of the ruined food.The electronic nose created by Green et al. is a straightforward monitoring device for microbiological spoilage and pollutants in canned food. It consists of four gas sensors made of functionalized single-walled carbon nanotubes and polymer nanocomposites.

In Gunasekaran, Brosnan and Sun, and Du and Sun, a review of the techniques for evaluating food quality is offered. The writers discuss several acquisition methods as well as features that can be used to various jobs. The overview in (Gunasekaran) in particular updates vision techniques based on morphology and pattern recognition approaches that were widely used in industry up until the 1990s. While machine learning algorithms are highlighted in Du and Sun, the authors of Brosnan and Sun argue that further advancements in X-ray and 3D vision technologies would significantly benefit the industry in the future.

The examination of food quality is often conducted in a small space with few food classes and little variation. For this reason, extremely basic features like colour or shape information are sufficient to address the issue and produce excellent outcomes. This kind of situation is distinct from one in which pictures of food are either downloaded from a social network or obtained during actual meals consumed by a patient. A general system for tracking food intake must be able to operate in low-resource situations without any prior training. A generic food understanding challenge has many variables, in contrast to an industrial plant where the components, the quantity, and the look of food are known in advance.This task is extremely difficult due to the numerous food categories and ingredients, food combining, as well as lighting,

orientation, various acquisition equipment, and other factors.

III. METHODOLOGY

The desired result of edibility detection is to monitor and detect food goods to prevent damage from temperature and humidity fluctuations. Food could be wasted for many reasons one among them would be improper storage of foods. Even though there are many devices which keep track of food but the device concerns about concerns about, for how many days food can be preserved and intake of food does not cause may harm.

Everyone of us know that food plays a major role in our life, rather than saying major role we could not sustain without consuming the food.
So, in year 2020 we have a gone through a very difficult situation where people could not know what to consume, how much quantityshould we consume, we could not recognize the food is damaged until it gives us very rotten smell. And it is pre-eminent to take food rather than taking pills.

Edibility preservation main moto is not allow food get spoiled before it has to be intake. This device consists of 3 sensors which are used to monitor the food. Its contains Gas sensor, Humidity sensor, temperature sensor, and it also contains Arduino UNO and GSM modem. Gas Sensor senses the smell of the food, Arduino is directly connected to the LThe environment's humidity is detected via a humidity sensor.If it is lower than the threshold value, the humidifier raises the humidity to the threshold value, and an Arduino-controlled temperature sensor guides the temperature for the already-set threshold value. ED screen. GSM modem is used to send a message to registered mobile number.

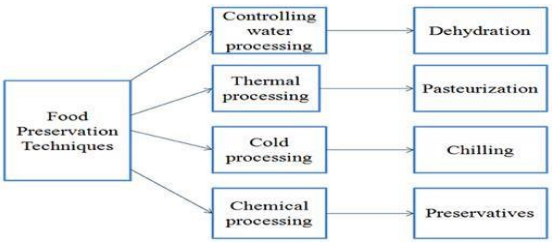

Figure 4 : Flowchart of Food Preservation Techniques

So, the device is constructed base on the IoT technology. Internet of things is used to deliver a huge amount of data to required source. Here, we are progress the status of the food item to the mobile phones and LED screen.

ALOGORITHM:

1 Turn on the device
2 Store the ideal parameter values based on the object that was captured.
3 Read the sensor values to track the progress of fruits or vegetables.
4 if Gas content is identified then
5 go to step 18
6 else
7 go to step 19
8 end if
9 if Moisture content is discovered AND moisture is greater than the maximum-optimal humidity of object (93 gm/m^3).
10 go to step 19
11 else
12 If not, 12. If Heat content is discovered AND the temperature is higher than the object's maximum recommended storage temperature of 45°C
13 go to step 19
14 else if, life of object is greater than average shelf life of object then
15 go to step 18
16 else
17 go to step 19
18 end if
19 Send alert to the user
20 Exit.

IV. IMPLEMENTATION

In the process of monitoring and detection of spoiled food, different types of categorized sensors are used. It includes 3 different of sensors : Gas sensor, Humidity sensor, temperature sensor. It also consists of microcontrollers like Arduino UNO and GSM modem.
The Device is developed based on C++. Code consists of three different functions for giving alert message to LED screen and Mobile.
In, void loop() function whenever the gas sensor detects the smell and if(digitalRead(Smell)==LOW) its sends message to registered mobile number as

"BAD SMELL DETECTED",and if(t >45) its send message as "TEMP IS HIGH" , and if(h>=95) it send message as "HUMB IS HIGH". These three different messages are sent to registered mobile number whenever food is tested and spoiled food is detected.

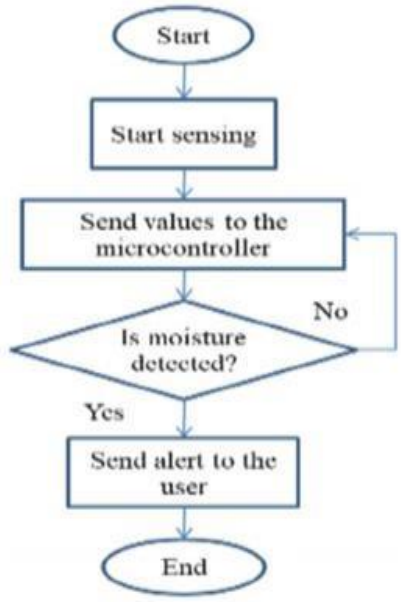

Figure 5: Humidity sensor flowchart

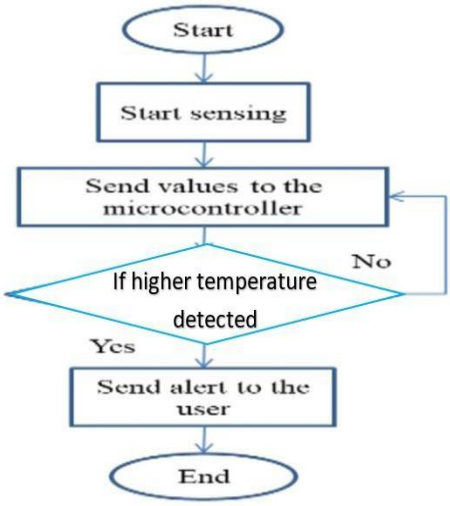

Figure 6 :Temperature sensor flowchart

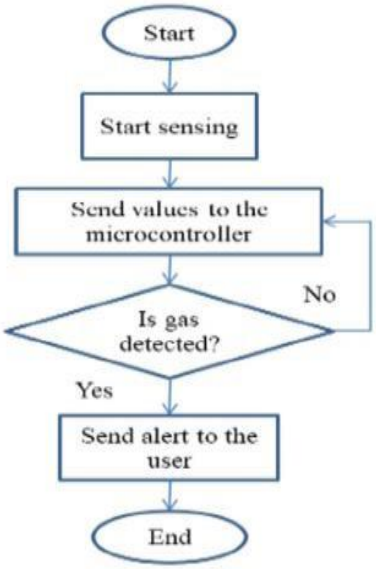

Figure 7: Smell sensor flowchart

IMPLEMENTATION:

```
if(digitalRead(smell)==LOW){
lcd.print("BAD SMELL ");
lcd.setCursor(0,1);
lcd.print("SMS SENDING...");
String SMSData = "BAD SMELL DETECTED";
SendSMS(SMSData)}
if(t>=40){
lcd.print("HIGH TMP NOT CON");
lcd.setCursor(0,1);
lcd.print("SMS SENDING...");
String SMSData = "FOOD TEMP IS VERY HIGH";
SendSMS(SMSData)}
if(h>=95){  lcd.print("FOOD IS HUMID");
lcd.setCursor(0,1);
lcd.print("SMS SENDING...");
String SMSData = "FOOD HUMIDITY IS VERY HIGH";
SendSMS(SMSData)}
;}
```

V. RESULTS

By observing all the problems, different types of sensors are used which are connected to Arduino controller which is then connected to LED screen which gives us the output message and GSM modem is connected to controller, this GSM modem to connected to SIM, which sends the messages to the registered mobile number of the user. Whenever any of the sensors detect the spoilage in food, a message is immediately sent to the mobile and also displayed on the LED screen.

Figure 8: LED DISPLAY

Messages received on mobile

Figure 9: Message Received

Figure 10: Message displayed on LCD Display

VI. CONCLUSION AND FUTURE SCOPE

This study represents monitoring over food incase spoiled food is consumed unknowingly and preventing spoiled food from getting rot for long period of time using sensor-based system. The device proposed in this study is able to find when the food gets spoiled based on some factors and preserve the food for long period by monitoring the conditions. Every time it anticipates food spoiling, it both displays the notice and keeps the user informed. The accuracy of the suggested gadget is 96%.

Applying image processing can help this proposed gadget be improved. , Artificial Intelligence Neural networks, Nano technology etc. to detect the spoilage of the food. To determine how likely and when a food would spoil, this approach can also be improved using machine learning.

As a result, there will be more rivalry among stores to sell fresher, healthier foods, creating a safe environment for all consumers. It is the future revolution in refrigerators to detect food items, monitoring food for prevention before it gets spoiled. The device can also be used in storage marts to allow tracking and detecting the spoilage of the food. The device can also be tested for divergent foods like dairy products, fruits, curries, solid food etc.

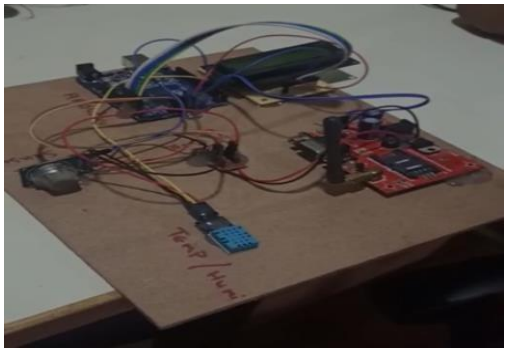

Figure 11: Prototype

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