



## *Identifying Food is Stale or Fresh using Internet of Things*

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**Abstract—** To grow strong and safe, all living things need food. It is an important and necessary material that contains essential proteins, carbohydrates, fats, and other nutrients used for life, development, and vital processes in the body of an organism and to provide energy for functioning. The body's immersion and implementation of food is important for dieting and is expedited by absorption. A healthy and fresh diet is the most important way to keep ourselves fit. The food items kept at room temperature undergo rapid bacterial growth and chemical changes in food. Eating unhealthy food can cause several foodborne diseases which may harm our health. This IoT based system aims to detect the quality and freshness of food using gas sensors. A smart system can detect the freshness of household food like dairy items, fruits, and food items. The identification and selection of a hydrogen sensor, Moisture sensor, and Gas sensor to develop a sensible food freshness detector ensures the freshness of food and tells whether or not to eat it or bin it. The introduction of these sensors into food detection technology has paved the way for smartfood detection.

The proposed system will help people to identify the freshness of food or the quality of food items. In the present time almost everyone is getting affected by foods they consume daily, this is not because of the junk food but the preserved vegetables cause harm to the human bodies. When the food is being stored their nutrient value, oxygen, temperature, and moisture parameter changes from time to time this change in the quality of food helps to monitor the food. Nowadays almost all the human beings pay attention towards the information given or provided in the packets to detect the expiry data of the food which is the major problem arise due to blindly believing on the provided data and risking one's health. To provide safety consumption of food, at every stage this paper has developed a food quality monitoring system using internet of things and detecting it in prior using appropriate gas sensors and alerting an individual about the food spoilage via short message service(SMS) about the food spoilage.

**Keywords—** Food quality, Arduino uno, Methane Sensor, GSM Module, Buzzer, LCD.

### I. INTRODUCTION

Food quality maintenance has become one of the major issues in the world. Recent surveys shows that approximately half of food is going waste due to inadequate maintenance of the environment where the food is stored. In India problem is not food availability but massive food wastage. As per FAO it was estimated that nearly 40% of the food is wasted in India due to spoilage. It was already estimated that by 2050 the world would need 70% more food. However, the pandemic effect seems to be making the situation much more difficult in the coming years. The spoiled items going undetected and onto the hands of the consumer. In all fruits and vegetables industries, the process of checking of quality of items is done manually, mostly by a person sitting across a conveyor belt as the items pass by. Hence, if an automated process is brought into place, it would not only increase the accuracy of spoiled food detection, but also reduce manual manpower required.

It is necessary to develop a system that can help people to identify the freshness of food or quality of food items. Our proposed system gives the good quality (freshness) management in food. It is based on gas sensors. Gas sensors play a vital role to detect the bacterial contamination in food sample. Based on the combination of the sensor outputs quality of the food will be detected. The food we consume can affect in any form of contamination that may occur due to storage or chemical changes within the food. There are several viruses and bacteria that causes food contamination and leads to numerous food borne diseases, for example Norovirus a very contagious virus caused by contaminated food or water.

The status of the food is not fresh all the time. To automate this process, we plan on using a collection of smart sensors with microcontroller like the Arduino Uno. On detection of a spoiled or stale food item, a sound buzzer can be rang to draw attention, moreover this data will be sent to the cloud, as an application of IoT. This enables appropriate authorities to view how often they get spoiled food items and also it alerts an individual about the spoilage of food via SMS.

## II. LITERATURE SURVEY

In this section, an overview of food quality monitoring system using various technologies is discussed.

Paper 1: "EFresh – A Device to Detect Food Freshness" September 2018

In this paper authors Naveed Shahzad, Usman Khalid used biosensor and electrical sensors to check out the freshness of food. A smart system that may sight the freshness of food like farm things, meat, and fruits. The identification and choice of hydrogen ion concentration device, moisture sensor, and the Gas sensor is used to develop a wise food freshness detector that ensures the freshness of food and tells whether or not to eat it or bin it. An android application is developed to select the type of food to be checked

The system ensures the quality of food, whether it is good for eating or not. It does not provide the facility to complain if the device does not provide accurate results. The feedback may recover the issues related to the device.

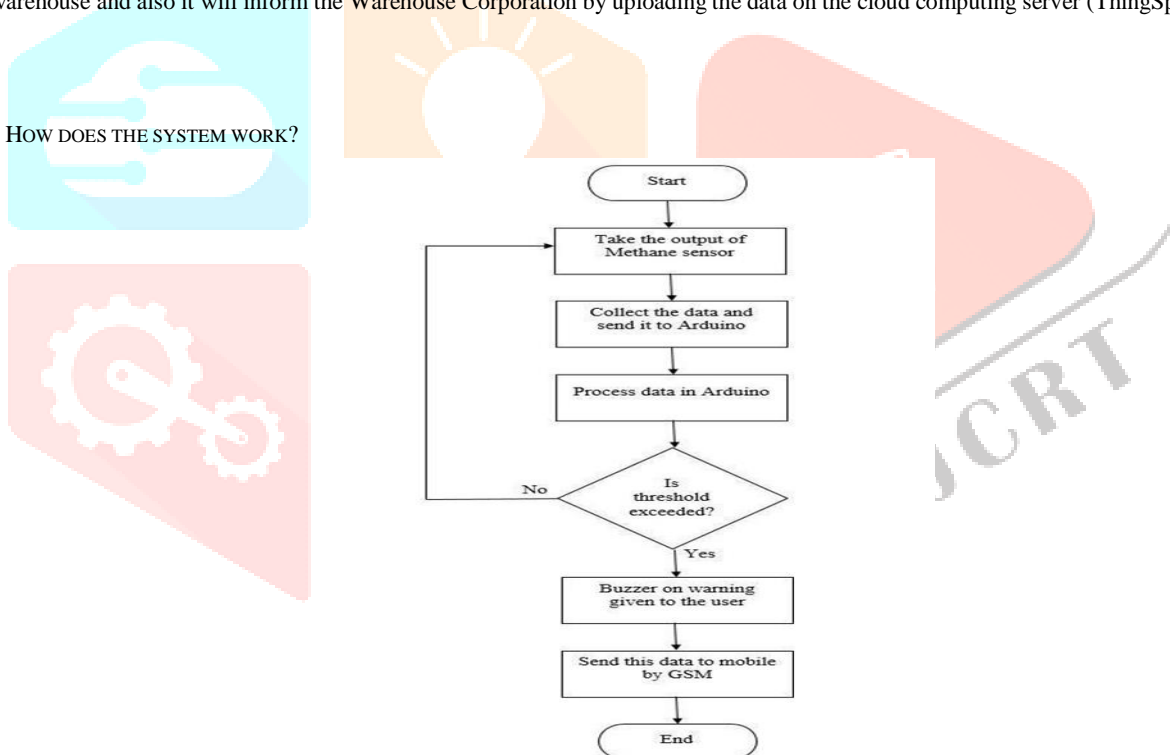
Paper 2: "Food Quality Monitoring System by using Arduino"

In this paper, a similar food quality monitoring device will be designed that will keep watch of environmental factors like temperature, humidity, alcohol content and exposure to light. The device is built on Arduino UNO which is a popular prototyping board. The Arduino board is interfaced with various sensors like DHT-11 to monitor temperature and humidity, MQ6 to detect alcohol content and LDR to measure exposure to light. This is an IoT device and sends the measured sensor data to an IoT platform. The ESP8266 Wi-Fi Modem is interfaced with the Arduino to connect it to the internet via Wi-Fi router. The sensor data is also displayed on a character LCD interfaced with the Arduino UNO. With the power of Internet of Things, the environmental factors affecting the food storage can be monitored from anywhere, anytime and from any device.

Paper 3: "IOT Based Food Monitoring System in Warehouses"

In this paper, the authors Shivani Bhandari, Pooja Gangola, Shivani Verma and Surekha K S successfully interfaced with various sensors such as MQ 3, LDR sensor, DHT11 sensor with Raspberry Pi to monitor and control the environmental conditions in warehouses to prevent decaying and rotting of food items mainly wheat, rice and maize. The system also supported by buzzer as an alarm system which will activate as soon as the threshold value of the sensor crosses a specific value. Data is sent to the ThingSpeak server. The user can get updates related to food grains through ThingSpeak. A login page is implemented for secure access to the database. The system is helpful to monitor the various parameters of the warehouse and also it will inform the Warehouse Corporation by uploading the data on the cloud computing server (ThingSpeak) using IoT.

## III. HOW DOES THE SYSTEM WORK?



The flowchart above shows the flow of our food freshness detection model. The sensor along with its peripheral analog circuitry continuously monitors the sensor output. If the value of the sensor increases above the threshold value of methane in the food then immediately the concentration is displayed on the serial monitor and the condition of the food is displayed on LCD and the buzzer sounds a warning in the form of a continuous or intermittent buzzing or beeping sound. The concerned authorities are alerted via SMS using the GSM and if the threshold value is not crossed the system continues monitoring the sensor value.

#### IV. SYSTEM REQUIREMENTS

To implement IOT model following are the requirements:

##### Hardware needed:

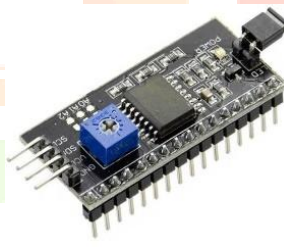
1) *Arduino Uno board*: This board has Atmega328P microcontroller which has 14 GPIO pins, 6 PWM pins, 6 analog input pins and is programmable with the Arduino IDE. It can run on USB power. This board allows many different external peripheral connections like Wi-Fi, Bluetooth and Ethernet.



2) *SIM800L GSM/GPRS*: This module is a miniature GSM modem, which can be integrated into a great number of IoT projects. You can use this module to accomplish almost anything a normal cell phone can; SMS text messages, Make or receive phone calls, connecting to internet through GPRS, TCP/IP, and more. To top it off, the module supports quad-band GSM/GPRS network, meaning it works pretty much anywhere in the world.



3) *I2C interface module*: I2C is short for Inter-IC. And it is a type of BUS. This is designed by Philips semiconductors. I2C is a synchronous, multi slave, multi master packet switched, single-ended serial bus. ie. multiple chips can be connect to the same bus. I2C uses only two bidirectional open collector or open drain lines, Serial Data Line (SDA) and Serial Clock Line (SCL), pulled up with resistors. Typical voltages used are +5 V or +3.3 V, although systems with other voltages are permitted.



4) *Buzzer*: It is a signaling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or game shows. It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound. Initially this device was based on an electromechanical system which was identical to an electric bell without the metal gong (which makes the ringing noise).



##### Software needed:

*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

#### V. CONCLUSION

Food wastage is one of the crucial crises in the world. One of the main reasons of food wastage is improper warehouse management and this is a solvable problem to an extent with the current technological advancement. Over referring to different researches and solutions to this problem, we have come to a realization that the field of IoT can provide a very efficient solution to this problem. Therefore, we have discussed a food quality monitoring system based on IoT that will control different environmental factors such as light intensity, humidity and temperature that are necessary to be maintained at a threshold value to prevent the food from spoilage. It also provides a user interface through an app where they can monitor the light intensity se parameters and at the same time get alerts when the food is spoiled or if there is a fire hazard.

## VI. FUTURE WORK

The Scope of the proposed system can be expanded by incorporating different other sensors like pressure, temperature, moisture etc. Different other techniques like nano technology, artificial neural network can be also be used for further improvement in result. These technique scan use this data for better result in future about food spoilage.

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