Food Quality Monitoring System Based On IoT

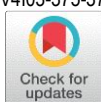## Dr. T. Kalaikumaran[1], A. Amridhasri[2], V. Kanchana[3], M. Kavitha[4], K. Kiruthika[5]

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Abstract: *Food safety and hygiene is a major concern in order to prevent the food wastage. The Quality of the food needs to be monitored and it must be prevented from rotting and decaying by the atmospheric factors like temperature, humidity and dark. Therefore, it is useful to deploy quality monitoring devices at food stores. These quality monitoring devices keep a watch on the environmental factor that cause or pace up decay of the food. Later, the environmental factors can be controlled like by refrigeration, vacuum storage etc. The people want organic food for healthy lifestyle. So, to avoid the problems associated with the food without human interpretation we need such a device which helps to determine the quality of food. There is a requirement of such a device which guide us about the hygienic food. Hence to fulfill this consumer demand we made a device that checks whether the quality of food is good or bad. This paper represents the use of various sensors in the field of the food industry. The sensors like pH sensor, gas sensor, temperature sensor help in identifying the condition of food. This system makes an effective presence in restaurants, households, small scale industries.*

Key Word: *Temperature and Humidity sensor (DHT11), Node MCU (ESP8266), MQ3 Sensor, LCD Display, Alarm system, Embedded C, Android Studio.*

I.INTRODUCTION

Food is an essential part of our lives. Not only does it provide us with the energy we need to go about our daily activities, but it also plays a critical role in maintaining good health. Food is the third most important thing for living beings to provide energy and development, maintain life, or stimulate growth after air and water. In fact, it is one of the most complicated sets of chemicals. Food plays an important role in the promotion of health and disease prevention. Healthy food provides us the nutrients and energy to develop and grow, be active and healthy, to move, play, work, think and learn. Food and water are the main sources of nutrition and strengthening the body, but many of the foods we eat do not have any nutritional value they lead to health problems such as diabetes and heart disease. Our system checks the quality of food by using the PH sensor, temperature sensor, and the odor sensor. The mq3 sensor and MQ135 is the odor sensor which detects the number of harmful gases present in the food this device monitoring the quality of the food which keep watch on factors like temperature, humidity, harmful gases. This paper is purposive to develop a prototype to collect intake sensor data. The required output of the system is displayed on the screen.

II.FOOD QUALITY

Food safety refers to practices and conditions that preserve food quality to prevent contamination and food-borne illnesses during preparation, handling, and storage. The correct Food Safety practices assure that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use. Food quality and safety are the main targets of investigation in food production. Therefore, reliable paths to detect, identify, quantify, characterize and monitor quality and safety issues occurring in food are of great interest.

Quality is the ultimate criterion of the desirability of any food product. The overall quality of a food depends on the nutritional and other hidden attributes, and sensory quality as assessed by means of human sensory organs. The absence of the nutritional qualities and possible presence of food toxins and chemical additives will affect the quality of food which in turn may harm the food consumer. For a food manufacturer the quality of raw material is very important as the end product quality entirely depends on it. For example, red color of tomato is a desirable quality to prepare tomato ketchup.

III.STORAGE OF FOOD

Proper food storage helps to preserve the quality and nutritional value of the foods you purchase, and also helps make the most of your food dollar by preventing spoilage. Additionally, proper food storage can help prevent food borne illnesses caused by harmful bacteria.

Use fresh, perishable foods soon after they are harvested or purchased. Signs of spoilage that make food unpalatable but not a bacterial hazard are the rancid odor and flavor of fats caused by oxidation, slime on the surface of meat, and the fermentation of fruit juices due to yeast growth. Off-odors in foods and a sour taste in bland foods can indicate dangerous bacterial spoilage. However, food can be high in bacteria count even without such signals.

IV.EXISTING SYSTEM

The given food where is it in solid, liquid and semisolid form a given by the texture analysis. The local binary pattern (LBP) is the type of visual descriptor which basically determines the value of texture. The other one is snapshot multispectral and hyper spectral data processing for estimating food quality parameters. In this system by taking the snapshot of particular food the parameters like freshness, spoilage level, and storage temperature are obtained. There is another device named as food sniffer, it works at the freshness and quality of meat items like beef, chicken, and fish only. It is only for meat items. There is no advancement in the dairy and food sectors.

V.PROPOSED SYSTEM

This project proposes a system to analyse the ambient conditions under which the food item is being stored and transported. The proposed solution senses the temperature, humidity, alcohol content as these parameters affects nutritional values of food items. This system makes use of storage units implanted with various electronic sensors which can read those parameters affecting food materials. These quality monitoring devices keep a watch on the environmental factor that cause or pace up decay of the food. Later, the environmental factors can be controlled like by refrigeration, vacuum storage etc.

The proposed solution is designed to use an IoT platform used for logging and monitoring of sensor data. With the power of Internet of Things, the environmental factors affecting the food storage can be monitored from anywhere, anytime and from any device and it gives an alarm when the food is detoriated. This feature is mainly added for elderly and blind people.

VI.WORKING METHODOLOGY

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 connected to Arduino which will sense the gas liberated by food items. 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.

A. Temperature and Humidity Sensor

DHT-11 Sensor – DHT-11 is a temperature and humidity sensor. The DHT11 sensor consists of two main components – one is Humidity sensing component and other is NTC temperature sensor or Thermistor. The Thermistor is actually a variable resistor that changes its resistance with change in temperature. They both sense the temperature and humidity of area and give the output to the IC (which is placed on back side of sensor). The sensor has four pins – VCC, Ground, data Out and NC. The VCC and Ground pins are connected to the common VCC and Ground respectively. The Data Out pin of the sensor is connected to PB0 pin of the Arduino board.

B.MQ3 Sensor

MQ3 alcohol sensor module is used to detect the presence of ethanol, where the sensitive material used for this sensor is SnO2, whose conductivity is lower in clean air. Its conductivity increases as the concentration of ethanol gases increases. It has high sensitivity to alcohol and has a good resistance to disturbances due to smoke, vapor and gasoline. This module provides both digital and analog outputs. It has a high sensitivity and fast response time. Sensor provides an analog resistive output based on alcohol concentration. MQ-3 is an analog as well as digital sensor. The presence of ethanol vapors in food is a sign of decay. So, by MQ3 sensor, it can be detected if food has started decaying. The sensor has four pins – Analog Out, Digital Output, VCC and Ground. The VCC and ground are connected to the common VCC and Ground. The digital output pin is not used therefore is kept not connected. The output of the sensor is drawn from the analog output pin which is connected to the pin A0 of the Arduino board.

C. Node MCU (ESP8266)

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can access to a Wi-Fi network. The ESP8266 is capable of either hosting an application or off loading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware. The module comes available in two models – ESP-01 and ESP-12. ESP-12 has 16 pins available for interfacing while ESP-01 has only 8 pins available for use.

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

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

IX.CONCLUSION
One of the world's most critical issues is food waste. Improper warehouse management is only wonted source of food waste; yet, with today's technology advancements, this is a resolvable issue to some extent. Based on various studies and solutions to the current problem, we have come to the conclusion that the IOT sector will provide a very cost-effective solution to the current problem. As a result, we've addressed how diverse environmental conditions, such as a food-monitoring system powered by IOT, will be managed. Moisture and temperature levels that must be maintained at a certain level to prevent food from spoiling. It also has a user interface through an app that simply monitors the temperature and humidity parameters so that we can keep the temperature and humidity at a safe level and reduce food waste.

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