IOT FRAMEWORK FOR FOOD MONITORING SYSTEM

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ABSTRACT - The Internet of things (IOT) aims at connecting different objects, things using internet. The rapid development of the Internet of Things motivate use to apply for the food preservation domain such as maintain the quality of fruits and vegetable. In this project a system has been proposed to analyze the ambient conditions under which the food item is being stored. In India most of the diseases caused by food borne illness, resulting in more number of hospitalizations and deaths are happened. For this reason we are designing a project called food detection system using iot. It is used to test a freshness food like meat, fruits. Different sensor are used to testing a food quality like, temp sensor used to sense a food temperature level, ph sensor is used to test a salt content of food. The proposed solution senses the temperature, moisture, light parameters of surrounding environment as these parameters affect nutritional values of food items. In this project we have designed and implemented node which works as a sensor node for the fruit storage house as well as central base station is connected to internet to support fruit storage functionalities. Thus aggregated several input as temperature, humidity and averages it to produce single consolidated output based on which the future decisions could be made. Finally this project is integrating the android mobile application which is used to facilitate user interaction and connect through IOT.

Key words: Food freshness, food quality, Sensors, Real time monitoring, nutritive value

INTRODUCTION

Today, in most of the hostel mess and government schools kitchen everybody is getting affected by the food they consume. Milk, fruits like banana and other foods used in daily life, as all of them do not offer quality since their moisture harmful gases vary from time to time. To ensure food safety it should be monitored at every stage of the supply chain. When foods start decaying it produces some gases like ethanol in it. These gases increase with time. The purpose of this system is to detect early food spoilage before signs are visible. Based on the research, the hypothesis is that, as food decay, they emit certain gases which can be detected by Arduino based sensors, and the levels of these gases will vary depending on the extent of the decay. Increased water content in food items changes its chemical composition and pH level. The measurement of parameters like moisture, gas level in food items is necessary to determine freshness and quality of food. It serves the purpose of consumer health protection by maintaining the required standard to preserve the quality of food. The status of the food is not fresh all the time. The analysis of routine measurements aims to detect changes in the nutritional value of food. The food we consume can affect in any form of contamination that may occur due to storage or chemical reaction. within the food. There are several viruses and bacteria that causes food contamination and leads to numerous food borne diseases, for example nor virus a very contagious virus caused by contaminated food or water. Most of the people die of food poisoning globally every year. Maintenance of foods and use of chemicals to artificially increase the time span of food causes people illness. It is essential to develop a system that can help people to identify the freshness of food or quality of food items. Our proposed system may give the good quality (freshness) management in food. It is based on IOT and the different sensors are testing food freshness. Food like meat could not produce any smell they start to rotten. Most meat sellers add salt content meat to make meat fresh. For this reason we can check a temperature level humidity level,The proposed system will help people to identify the freshness of food or the quality of food items. Our purpose is that the system may give better quality and freshness in food. General awareness of nutrients in food must be known by the consumer. Food poisoning has been the source of innumerable diseases that has a bad effect on health. To avoid illness, we use sensors to determine the freshness of household food items like dairy, fruits which can reduce food poisoning.

LITERATURE SURVEY

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 outthe 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 notto 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 itis 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: "Detection and classification of bacteria in common street foods using electronic nose and support vector machine"2017 Authors Jessie R. Balbin, Julius T. Sese, Crissa Vin R. Babaan focused on the classification of bacteria in streetfood. Street food features a major impact on the culture and however, as a result of the dearth of information on correct food preparation, the cleanliness and quality of street food are neglected. A bad microorganism that causes diarrheal diseases and it's exhausting to sight whether or not the microorganism exists, by using an electronic nose, and image processing. This paper aims to design an electronic nose with gas sensors that will detect three common types of bacteria on street foods, namely Enterococcus faecalis, Escherichia coli and Staphylococcus aureus; and to classify if the said bacteria are present in the pre-cooking stage and the bacteria are still present after cooking. The electronic nose system detects the bacteria in the sample street food during the pre-cooking stage and Support Vector Machine detects the bacteria in the sample street food during the post cooking stage. This system lacks the detection of other parameters like moisture, gas level in food.

Paper 3: "Real-Time Milk Monitoring System"2018 Authors Prof. Kadam P. R, Miss. Shinde K. P. describes the scenario of smart city services that are provided to manage the city's assets by integrating information and communication technology (ICT) and the Internet of things (IoT). Different sensors, terminals with a variety of topologies and different application requires security for managing them. To make money day by day the quality of food decreases and it affects the health of people and this creates food safety problems. In this paper, the presented model detects the raw milk for spoilage detection. The proposed system work with a set of different sensors which are connected to the Arduino board and in turn all data will get passed to the android app and according to the value, the system checks the quality of milk and user can easily identify the quality of milk, the user is getting. Along with milk, a system must check other items which will make the system more effective

Paper 4: "The Vegetable Freshness Monitoring System Using RFID with Oxygen and Carbon Dioxide Sensor"2012 In this paper authors Ki Hwan Eom, Min Chul Kim proposed an oxygen and carbonic acid gas concentration observation system for freshness management, which supports radio frequency identification (RFID). Freshness may be checked by varying factors as well as wetness, temperature, oxygen, and carbonic acid gas. This paper focuses on oxygen and carbon dioxide. The concentrations of these two gases are related to freshness and affect the food. This system uses a device for observation of gases and connects the device with the associate RFID tag. The RFID system is relatively easy to manage. With this combined system, it calculated the freshness of vegetables

PROBLEM STATEMENT

It is necessary that the food that we are eating should be healthy in nature. The food that is going from one place to another should be monitored properly so that we can make sure that the food is healthy in nature or not. The regular routine measurement of the food should be done so that the food is good to eat and does not affect our health. We had to continuously monitor the amount of nutrient present in the food so that the food is for the health and hence can be easily consumed by the consumer we have to also focus on the amount of the preservative added in the food so that the food is healthy enough in nature so that good for the health of the consumer.

Food and nutrition monitoring and surveillance involves continuous description of the components of the food and nutrition system for the purposes of planning, policy analysis, program evaluation and trend forecasting .The laboratory had many facility so can easily determine that food is completely good to eat or not. We had a many good equipment in lab so that there is we can find out the food is contaminated or free to eat . Environment condition always matter as we store the food in an good environment at a good temperature that is the temperature is always low so that the rate of bacteria growth or food contamination should be very low so that the food is good to eat so that it can be easily eaten by any and it may not affect the health of any person

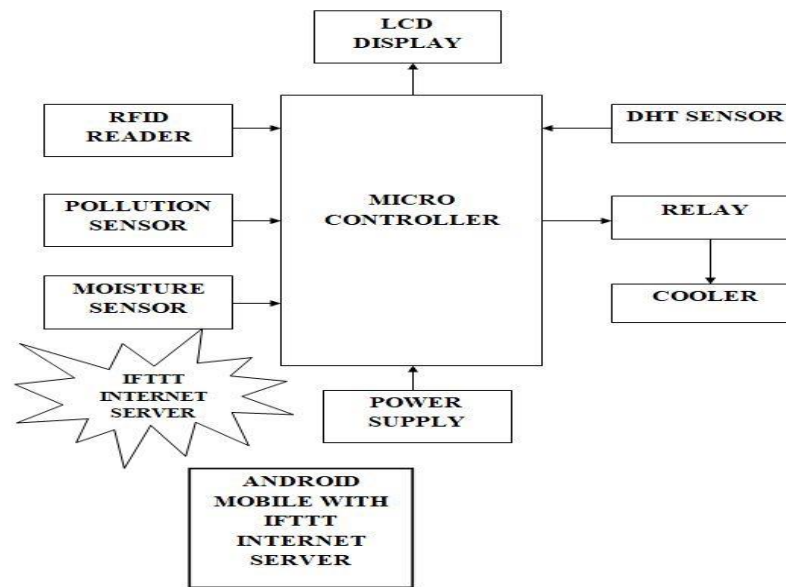# PROPOSSED SYSTEM/BLOCK DIAGRAM

fig 1: block diagram for iot framework for food monitoring system

The objective of this proposed system is to make an electronic device integrated with biosensors that can detect fruit spoilage. The use of sensors that can measure different parameters of food like pH, moisture, and ethanol, and methane level. The block diagram above shows the model of the device. The device consists of a microcontroller NODE MCU electrical and biosensors like Hydrogen sensor, moisture sensor, and ethanol gas sensor, temperature sensor. The proposed solution senses moisture, harmful gases in related fruit. The moisture sensor senses the moisture level with a moisture sensor and alcohol gas level with the MQ3 gas sensor and the hydrogen level with the help of hydrogen sensors from food samples.

This node MCU based IoT device should be installed near fruits . Once it is properly installed and powered on, it connects with the internet via the Wi-Fi module and starts reading data from the interfaced sensors – Hydrogen sensor, MQ3 Sensor and Moisture sensor. The MQ3 sensor detects the emission of ethanol types of gases. If the food/fruits get spoiled, they emit the ethanol type of gases. The MQ3 sensor detects the concentration of such gases and outputs an analog voltage proportional to the concentration of the gas. The analog output is passed to the analog pin of the Arduino which has an inbuilt ADC that converts the analog to a digital value. The Arduino collects data from all the sensors and converts the values to the strings. The values are compared to the threshold values which gives the result that whether the food is fresh or not with a predefined values . The values are sent back to the Arduino. Arduino displays the output on the LCD as "Good to eat" or "Not good to eat" depending upon the food freshness level and also an RFID is used to scan the tag in which the manufactured and expired date and the nutrition's of the fruit can be displayed. If the temperature reaches above the threshold value the cooler will be turned ON automatically to maintain the freshness of the food. The code will get triggered and sends us our warning message through the IFTTT server using the Internet, when the food parameters cross the set value to notify the shopkeeper that the fruit is not fresh.

COMPONENTS REQUREID

HARDWARE REQUIREMENTS

- ➤ CONTROLLER
- ➤ LCD DISPLAY
- ➤ RFID READER
- ➤ MICRO POLLUTION SENSOR
- ➤ MOISTURE SENSOR
- ➤ DHT SENSOR
- ➤ RELAY
- ➤ COOLER
- ➤ POWER SUPPLY

SOFTWARE REQUIREMENTS

- ➤ ARDUINO IDE
- ➤ IFTTT MOBILE / WEB APPLICATION

FUNCTIONS OF COMPONENTS

1. DHT SENSOR

The humidity sensing capacitor has two electrodes with a moisture holding substrate as a dielectric between them. Change in the capacitance value occurs with the change in humidity levels. The IC measure, process this changed resistance values and change them into digital form. The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin . Its fairly simple to use, but requires careful timing to grab data. The digital temperature and humidity sensor DHT11 is a composite sensor that contains a calibrated digital signal output of temperature and humidity.
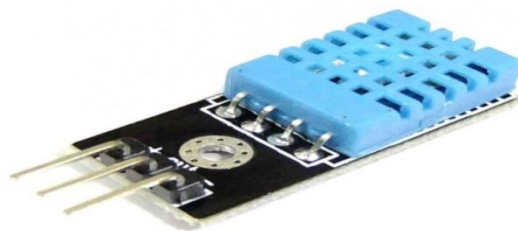

fig 2: dhs sensor

2. RFID READER

Radio-frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. An RFID system consists of a tiny radio transponder, a radio receiver and transmitter. When triggered by an electromagnetic interrogation pulse from a nearby RFID reader device, the tag transmits digital data, usually an identifying inventory number, back to the reader. This number can be used to track inventory goods. RFID tags are used in many industries. For example, an RFID tag attached to an automobile during production can be used to track its progress through the assembly line, RFID-tagged pharmaceuticals can be tracked through warehouses, and implanting RFID microchips in livestock and pets enables positive identification of animals. Tags can also be used in shops to expedite checkout, and to prevent theft by customers and employees.

fig 3: rfid reader

3. MICRO POLLUTION SENSOR

Air pollution measurement is the process of collecting and measuring the components of air pollution, notably gases and particulates. The earliest devices used to measure pollution include rain gauges, in studies of acid rain, and simple soot and dust funnels known as deposit gauges. Modern air pollution measurement is largely automated and carried out using many different devices and techniques. These range from simple absorbent test tubes known as diffusion tubes through to highly sophisticated chemical and physical sensors that give almost real-time pollution measurements, which are used to generate air quality indexes.

fig 4: pollution sensor

4. LCD DISPLAY

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in colour or monochrome. LCDs are available to display arbitrary images or fixed images with low information content, which can be displayed or hidden. For instance: present words, digits, and seven- segment displays, as in a digital clock, are all good examples of devices with these displays. They use the same basic technology, except that arbitrary images are made from a matrix of small pixels, while other displays have larger elements.

fig 5 : lcd display

ADVANTAGES

- Save fruits for longer time.
- Maintain hygiene and clean environment.
- Save data into cloud for future analysis.
- Reduce the commercial loss
- Increase commercial profit.

APPLICATION

- Can be use in fruits and vegetable shops & also use as a domestic purposes.

CONCLUSION

Fruit/Food poisoning has been the source of innumerable diseases, to reduce and avoid illness, we use biosensors and electrical sensors that determine the freshness of household food items like dairy items, fruits, and foods. Detecting naturally emitted gases such as Ethanol as food decay can be used to detect food spoilage. The Node MCU sensors can detect gas emissions and other important constituents like temperature, moisture levels from fruit even before the presence of any visible signs of spoilage. Using sensors to detect the presence of these values among fruit can help detect fruit spoilage early and prevent the consumption of spoiled fruit. These techniques can be further developed to include other types of gas sensors and fruits to increase the sensitivity of such detection methods. This system consists of a hardware device and a web/mobile server application that notification regarding the quality and freshness of fruit.

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