# A Smart Iot Food Quality Monitoring System

**Arulraj S[1], Krishnamoorthi P[2], Prasanth M[3], Ragul V[4], Sasidharan M[5], Rajesh P[6]**
[1]Associate Professor & Head, Dept of Electronic and Communication Engineering
[2, 3, 4, 5]Dept of Electronic and Communication Engineering
[6]Assistant Professor, Dept of Electronic and Communication Engineering
[1, 2, 3, 4, 5, 6] Rathinam Technical Campus, Coimbatore,India

***Abstract-*** *Food safety and hygiene are among the key concerns in order to prevent the wastage of food. However, for lack of technology and ignorance about the effects of humidity, temperature, exposure to light and alcohol content on foods, food safety is not maintained well enough in Kenya. This has led to massive losses in many food stores resulting from food decay.*

*Currently, majority of food stores and warehouses still rely on manual monitoring of the atmospheric factors related to food quality. These conventional food inspection technologies are limited to weight, volume, color and aspect inspection and as a result do not provide a lot of information needed on quality of food. 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.*

*This project is focused on such a food monitoring system which suggests systematic use of various sensors to perform quality monitoring and control of food materials.*

## I. INTRODUCTION

Food contamination can occur in the production process, but also a large part caused by the inefficient food handling because of inappropriate ambient conditions when the food is being transported and stored. There are many factors leading to food poisoning, typically changes in light intensity, temperature, alcohol content and humidity are important factors. A monitoring system capable of measuring temperature and humidity variability during transport and storage is of prime importance.

Today almost everybody is getting affected by the food they consume, it's not only about the junk food, but all the packed foods, vegetables, products consumed and used in daily life,as all of them do not offer quality since their temperature, moisture, oxygen content vary from time to time. Majority of consumers only pay attention to the information provided on the packaging, i.e. the amount of ingredients used and their nutritional value but they forget that they are blindly risking their health by ignoring the environmental conditions to which these packets are subjected. Every product making firm just want to attract more and more costumers towards them and their main motive is to sell the product anyhow like by adding more flavors, coloring chemicals and preservatives to increase the taste and appearance but they forget that these money makingtactics are actually affecting the consumers'health.

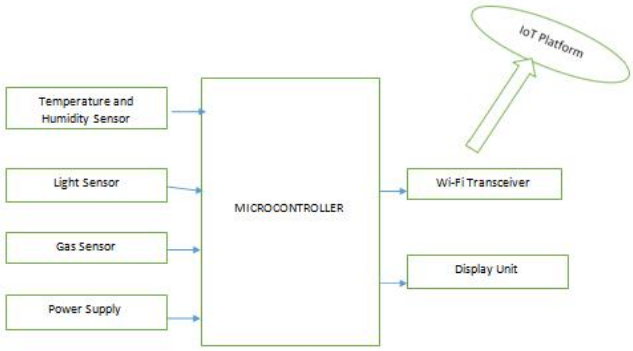
## II. PROBLEM STATEMENT

Spoiled food can be very harmful for people and should therefore not be consumed. Often, the growth of spoilage organisms results in the loss of whole batches of food.Foodsafetyandqualityhasbeenamajorchallengeinthefoods upplychain,storesandwarehouses.Itistheresponsibility of all food service establishments, stores and ware houses to ensure proper safety and quality of food to ensure the health of their customers. Their primary focus should be on implementing the required quality assurance guidelines and standards resulting in process monitoring systems and preventive control measures. It serves the purpose of preventive consumer health protection by maintaining the required standard ambient conditions needed to preserve the quality of food. However, existing systems have been unable to provide food safety guarantees. Currently the performances and analysis of routine measurements, aimed at detecting changes in the nutritional or health status of the food does not guarantee that.

## III. PROPOSED SOLUTION

This project proposes a system to analyze the ambient conditions under which the food item is being stored and transported. The proposed solution senses the temperature, humidity, alcohol content and light parameters of surrounding environment as these parameters affect 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.

**Block Diagram**




**Light Dependent Resistor(LDR)**

A Light Dependent Resistor (LDR) is also called a photo resistor or a cadmiumsulfide(CdS)cell. It is also called a photoconductor. It is basically a photocell that works on the principleofphotoconductivity.Thepassivecomponentisbasically aresistorwhoseresistancevaluedecreases when the intensity of light decreases. This optoelectronic device is mostly used in light varying sensor circuit, and light and dark activated switching circuits. Some of its applications include camera light meters, street lights, clock radios, light beam alarms, reflective smoke alarms, and outdoor clocks.

**MQ-5 Gas Sensor**

The MQ5 sensor detects the emission of ethanol type of gases. If the food/fruits get spoiled, they emit the ethanol type of gases. The MQ5 sensor detects the concentration of such gases and output an analog voltage proportional to the concentration of the gas.

**Controllers**

A controller is a hardware or software that controls the operation of a system by processing, storing and directing the flow of data. It is considered the brain of control systems. The primary controllers used for control operations are; Programmable Logic Controllers, Microcontrollers and microprocessor based controllers.

**Liquid Crystal Display(LCD)**

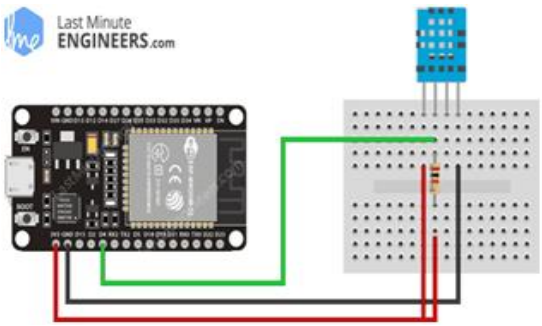
LCDisaflatpaneldisplaytechnologythatiscommonlye mployedintelevisionsetsandcomputer monitors. It isalsousedinscreensformobiledevicesincludingtablets,laptops,a ndsmartphones. The LCD screen has a backlight that provides light to individual pixels arranged in a rectangular grid. Each pixel contains a red, green, and blue RGB sub-pixel that can be turned on or off. When the entire pixel's sub-pixels are turned off, the screen appears black. When all the sub-pixels are turned on, it appears white. On adjusting individual levels of red, green, and blue light, there are several possible color combinations.

**Interfacing DHT-11 Sensor with ESP32**

The study selected to use a DHT-11 sensor whose technology ensures the high reliability and excellent long-term stability.

It senses both the temperature and humidity of area and give the output to the IC (which is placed on back side of sensor).

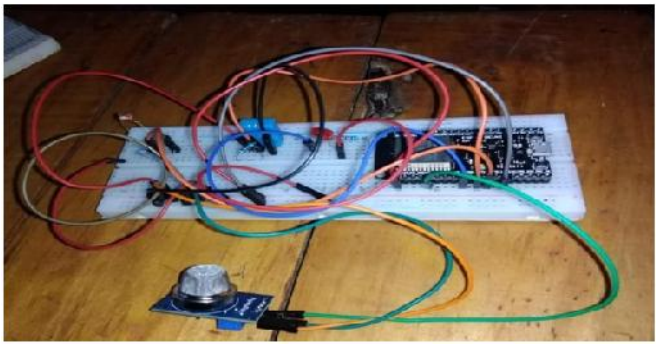
The sensor has four pins - VCC, Ground, data Out and NC. The VCC and Ground pins are connected to the common VCC and Ground respectively. The Data Out pin of the sensor is connected to pin 27 of the microcontroller.




**Gas Sensor Testing on breadboard**

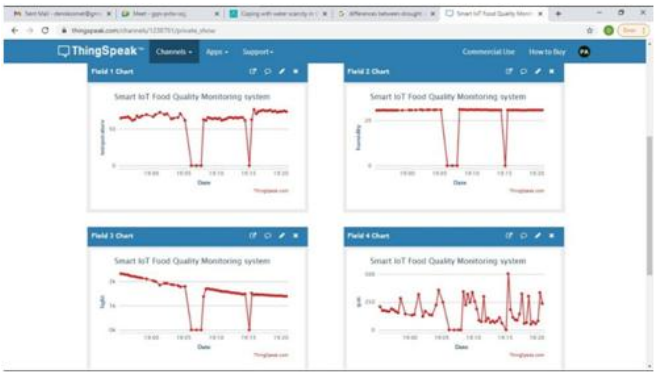
Arduino Uno board was used for ease of programming. It was then interfaced with the gassensor.Theconcentrationofethanolgasintheairwasdetermined.Theimagebelow shows the gas sensor connected to the Arduino Uno Board. The +5V terminal of the sensor connects into the 5V terminal of the Arduinoboard.

The GND terminal of the sensor connects into the GND terminal of the Arduino. The analog pin of sensor is connected to pin AO of Arduino. Digital pin is not used hence not connected.



**Uploading the Data to ThingSpeak**

After programming and connecting the whole circuit, the data collected was uploaded to Thing Speak open source website for monitoring. The displayed data looked as in Figure 4.6 below.




**DHT 11Sensor**

Before the DHT11 is used on the Arduino, we installed the DHT library. It has all the functions needed to get the humidity and temperature readings from the sensor. The program was then entered as follows;

**Gas Sensor**

The library containing all MQ5 functions is added to Arduino IDE then the analog data pin is specified as pin A0. The program is as shown below;

**Final Conclusion**

The food quality monitoring system was able to read temperature and relative humidity in the food store, sense the intensity of light in the food store and detect the emission of ethanol type of gases. It was also able collect data from all the sensors and pass to LCD for display and lastly monitor the sensor data visually online.