Food Quality Monitoring System Using Arduino UNO And Sensors

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Abstract- *This paper describes the design of a simple food quality monitoring system based on temperature, humidity and gas content in food. This System takes the inputs taken from food using sensors(DHT11 and MQ4) and processes the data to check the food quality level in the Microcontroller (Arduino UNO). And based on processed data microcontroller indicates quality level using Buzzer and Displays the condition of the food in LCD Display. And the levels of the parameters in food will be displayed in the Cloud Platform using ESP8266(Wifi Module).*

Keywords- Food Quality, Arduino, Temperature, Gas Content, Methane, LCD Display(16 X 2), ESP8266(Wifi Module),

I. INTRODUCTION

In recent times food wastage is increasing day by day. Wasting food by people is one of the unnoticed terms in our society. It is not intensely done. Maybe due to its decomposition. So to overcome that we are into this project. Due to this project food wastage can be controlled to a certain limit. Once the quality of food is noted, it can be recognized for the purpose. In food Industries using high-tech food quality measurement systems. It provides quality assurance and Quality control in food. But this equipment is hard to implement for household purposes so we are making this project. Our project mainly concentrated on households with low cost. This project has that feature in it and the quality of the food and parameter values displayed in the LCD. Through that the quality of food can be known and wastage can be controlled in the households field. The common way to recognize the food quality is its decaying matter. Decaying food emits gases. By using a gas sensor to take a gas range in food and it will be processed and Indicate the User.

II. SYSTEM ARCHITECTURE

Figure.1 represents the block diagram of the proposed system. It consists of the microcontroller (Arduino UNO), sensors, LCD and Wifi Module(ESP8266). The input is taken from the food using sensors and then is transmitted to the microcontroller(Arduino UNO). The sensors continuously produce the analog values of the food temperature, humidity and gas content. These values are continuously analyzed and print food quality levels in LCD. And Food quality indicates to the user. And using the ESP8266 Wifi module to show the parameter levels in the cloud platform.

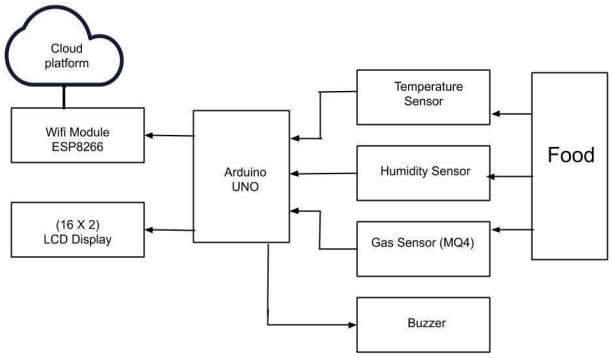


Figure 1.Pictorial representation of the System

A. Temperature and Humidity Sensor (DHT11) :

DHT11 Temperature and Humidity Sensor features of this sensor complex with a calibrated digital signal output. We can achieve high reliability and excellent long-term stability by using temperature and humidity sensing technology and digital-signal-acquisition technique. This sensor consists of a resistive-type humidity measurement component and an NTC temperature measurement component. Because of its high-performance 8-bit microcontroller it leads to excellent quality,anti-interference, fast response, anti-interference ability, and cost-effectiveness. By taking the analog values of the dht11 sensor it gives the level of the temperature and humidity.

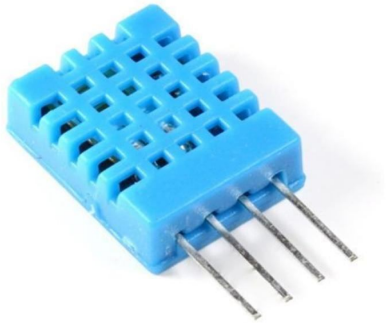


Figure 2. DHT11 Sensor

In DHT11 terminals are VCC, DATA Pin, NC and GND. Its operating voltage is 3.3V to 5V. The sensor can measure warmth from 0°C to 50°C and humidity from 20% to 90% with an exactitude of ±1°C and ±1%.

B. Gas Sensor(MQ4)

MQ series sensors use a small heater inside with an electrochemical sensor to measure different kinds of gas combinations. They can be calibrated, but, to do that a known concentration of the measured gas or gasses is needed for that. This sensor highly detects the natural gases and methane. The common way to recognize the food quality is its decaying matter. The decayed food slightly emits methane gas. Based on the gas content in the food quality will be analyzed and a monitored sensor composed of micro Al_2O_3 ceramic tube, Tin Dioxide SnO_2 sensitive layer, measuring electrode and heater are fixed into a crust made of plastic and stainless steel net. The heater provides necessary work conditions for the work of sensitive components.

Figure 3. MQ4 (Gas Sensor)

In MQ4 Gas sensor terminals are VCC, DATA Pin and GND. Its operating voltage is 3.3V to 5V. The resistance value of MQ-4 is different from various kinds and various concentration gases. By using sensitivity characteristics we have to find concentration of required gas.

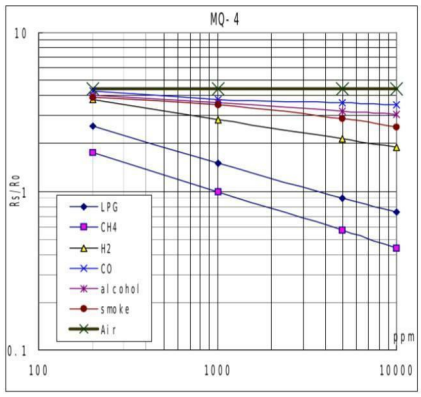


Figure 4. sensitivity characteristics of the MQ-4 for several gases.

Ro is sensor resistance at 1000ppm as required in the clean air. Rs is sensor resistance at various concentrations of gases.

C. Arduino Uno

Arduino is an open-source electronics platform based on hardware and software microcontroller. The Arduino Uno is an 8-bit microcontroller board based on ATmega328. It has 14 digital input/output pins, 6 analog inputs, 16MHz crystal oscillator, an ICSP header, a USB connection, a power jack and a reset button. These are all held in the Arduino Uno board. Basically, connect it to a laptop or computer with the help of USB cable or power it with an adapter.

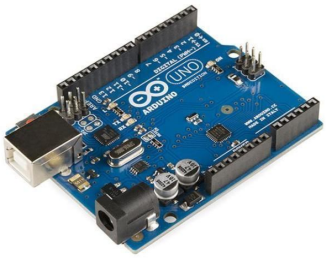


Figure 5. Arduino Uno

Atmega8u2 is the factor used in Arduino Uno it's programmed as a USB to serial converter, while earlier boards used FTDI USB to serial driver chip.

D. ESP8266 (Wifi Module)

The ESP8266 is a Wi-Fi microchip. It is a 32-bit microcontroller with 32 KiB instruction RAM, 80 KiB user data RAM. Esp8266 has inbuilt AT firmware to interact with connected microcontrollers. ESP-01 module has an 8 pin, These are VCC, GND, TX(Transmitter), RX(Receiver), CH_PD(Chip power-down), RST, GPIO 0 and GPIO 1 (General-purpose input and output. Its operating voltage is

3.3V to 3.5V. This wifi module has an IEE802.11b/g/n Standard

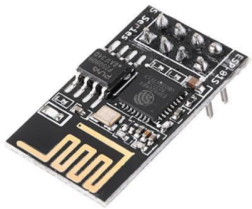


Figure 6. ESP8266

E. LCD (16 X 2)

The term LCD stands for Liquid Crystal Display. It has a wide range application in real time. A 16x2 is very commonly used in various devices, equipment and devices. A 16x2 refers to displaying 16 characters in one line and there are 2 such lines.In this display each character is displayed in a 5x7 pixel matrix. The main benefits of using this module are inexpensive, simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations, etc. By using a potentiometer we can adjust the bias level of the LCD display that means contrast adjustment.

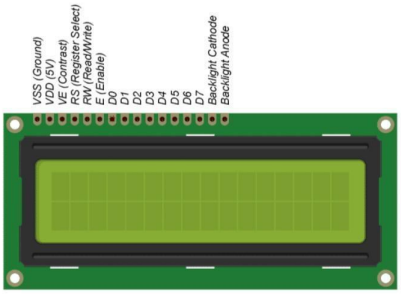


Figure 7. LCD Display

F. Buzzer

A buzzer is an audio signaling device, which may be piezoelectric, electromechanical, or mechanical. A buzzeris a small component to add sound features to our project/system. It is a very small and compact 2-pin structure hence can be easily used on breadboards. This buzzer operating voltage is 4V to 9V DC power supply.

Figure 8. Buzzer

III. DESIGN OF THE SYSTEM

Here we are described briefly about hardware implementation of the system. **Figure 9.** Depicts the diagram of interfacing Arduino Uno and Sensors.

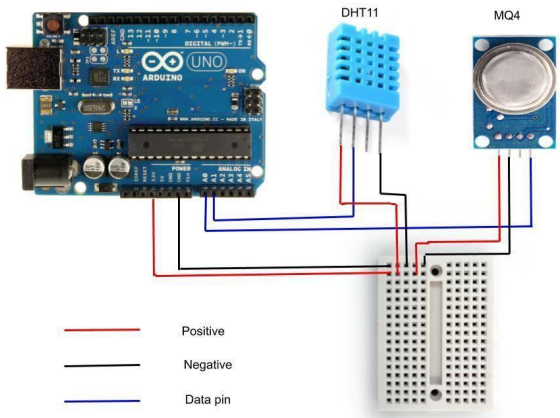


Figure 9. Implementation of Arduino and Sensors

In this implementation the sensors get the inputs from food then it's given to the microcontroller for processing the data. **Figure 10.** Depicts the diagram of interfacing Arduino Uno and LCD.

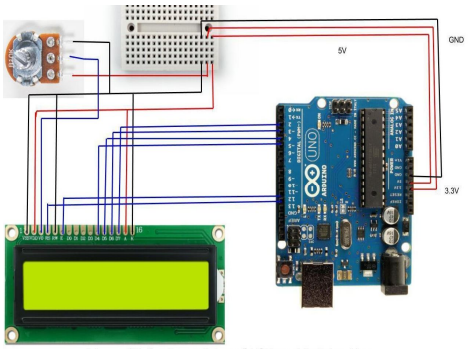


Figure 10. Implementaion of LCD and Arduino Uno

Here, Liquid Crystal Display interfaced with the Arduino Uno. Using the data lines the analyzed data will be

displayed. And by using a potentiometer we can increase and decrease the brightness of the LCD. **Figure 11.** Depicts the diagram of interfacing Arduino Uno and ESP8266 (Wifi module).

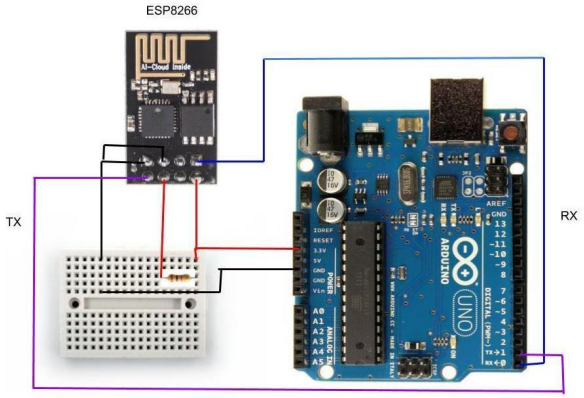


Figure 11 . Implementation of Arduino Uno and ESp8266

Here, the ESP8266 module interfaced with the Arduino Uno. By this implementation the levels of the analyzed parameter will be displayed in cloud platforms to know anywhere in the world.

IV. THE SOFTWARE SYSTEM

A. Arduino Software (IDE)

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the microcontroller(Arduino).It persuade on Windows, Mac OS X, and Linux. Which is platform-independent written in java and based on Processing and other open-source software. The Arduino IDE contains a text editor for writing code, a text console, a message area, a toolbar with buttons for common functions and a series of menus.The project readings and output will be displayed in the serial monitor and Serial plotter.

B. Flowchart of the program

The program is written in the C language **Figure 12.**Depicts the flowchart of the project.

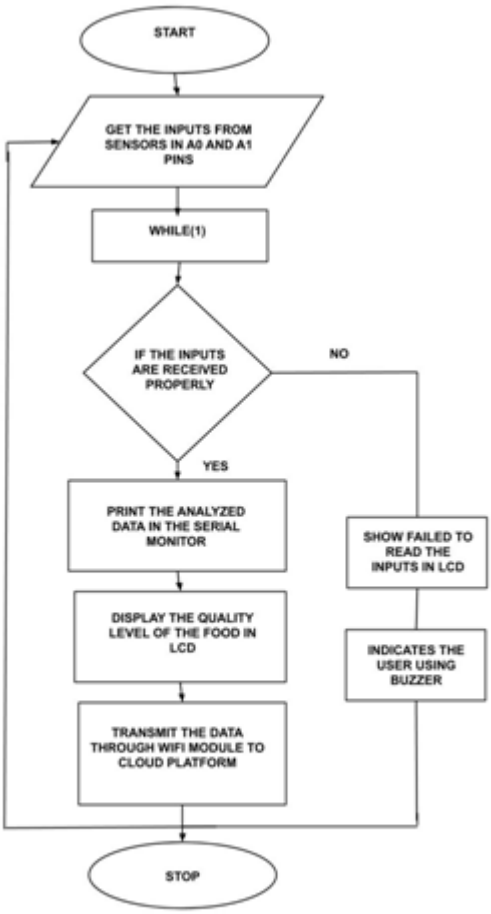


Figure 12. Flowchart of the program

The flowchart starts from getting inputs from the sensors. After getting the input the microcontroller checks whether the inputs are given properly. If inputs are not detected well the LCD shows failed to read the inputs or else the analyzed data will be displayed in LCD and transmitted through the esp8266 module to the cloud platform.

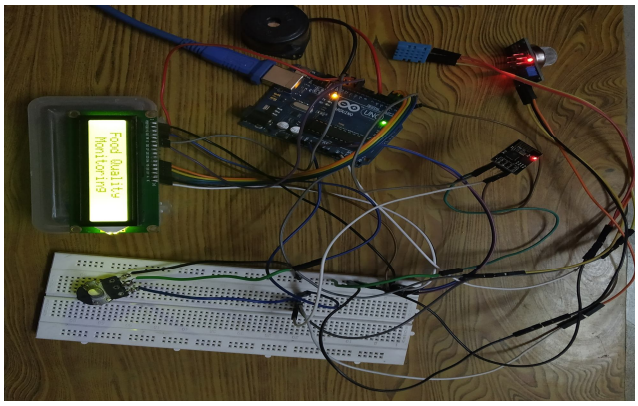
V. WORKING OF THE SYSTEM

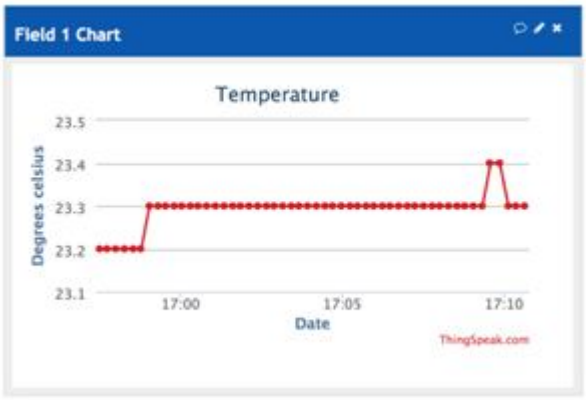
The system gets the inputs from the food using DHT11 and MQ4 sensors. After getting the inputs it's given to the Arduino microcontroller. Then Arduino processes the given inputs and then it shows the food quality level in the LCD. Parallelly the Arduino sends the analyzed data to the cloud platform using the esp8266 wifi module.

VI. RESULT AND DISCUSSION

We could get the display of analyzed data levels on the monitor window and the quality level of the food is displayed in the LCD and parameter ranges are displayed in

the cloud platform.The electronic hardware and software implementation of this project was done successfully.





VII. CONCLUSION

This project is convenient and reduces the potential wastages in households. Our project can be easily understood by the user. Standard of the food can be checked and short term health issues like diarrhea and food poisoning can be controlled

VIII. FUTURE DEVELOPMENT

In this project food quality will be measured after the cooking in households. In the future we add another feature in our project: the quality of food will be measured before the cooking of food that means the quality of the ingredients will be measured. And we can build an android application to monitor the stored food in the households.

REFERENCE

[1] S. Janardhana, J. Jaya, K. J. Sabareesaan and J. George, "Computer aided inspection system for food products using machine vision — A review,"*2013* International Conference on Current Trends in Engineering and Technology (ICCTET), Coimbatore, 2013, pp. 29-33.

[2] Ghulam Mohaydin, Abubakar Chand, Bilal Aziz, Munim Bashir, Junaid Irfan, “Effect of Food Quality on Customer Perceived Satisfaction Level and Mediating Effect of Food Safety on Them “ International Journal of New Technology and Research (IJNTR) Volume-3, Issue-1, January 2017, Pages 34-41.

[3] R. Almaghrabi, G. Villalobos, P. Pouladzadeh,"A Novel Method for Measuring Nutrition Intake Based on Food Image," in Proc. IEEE International Instrumentation and Measurement Technology Conference, Graz, Austria, 2012, pp. 366 - 370.

[4] Naveed Shahzad, Usman Khalid, Atif Iqbal, Meezan-Ur-Rahman ,”eFresh –aDevice to Detect Food Freshness”,International Journal of Soft Computing andEngineering (IJSCE),ISSN: 2231-2307, Volume-8 Issue-3, September2018

[5] T. Brosnan and D.-W. Sun, “Improving quality inspection of food products by computer vision—a review,” *Journal of Food Engineering*, vol. 61, no. 1, pp. 3–16, 2004. Google scholar

[6] Arduino : www.arduino.cc

[7] www.circuitstoday.com (Interfacing the Components).