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IoT Based Food Monitoring System

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Abstract: *Nitrogen, Oxygen, Trace gases and other various mixtures of gases comprises the Earth's atmosphere. Trace gas is usually in small portion and is a mixture of gases include carbon monoxide, methane, carbon dioxide, hydrogen, argon, neon etc. The concentration of these trace has have increased in recent past and have a adverse effect on human health. So, it is very important to determine these gases. Over the last few decades, sensors have developed its applications in several fields of technology. In this paper, IoT framework is provided for food monitoring system for protection of food due to surrounding conditions with array of low cost sensors. The proposed work analyzes temperature, humidity and gas emitted by food as these parameters affect nutritional value of the food items and analyzed results will be displayed on LCD and message will be sent to android phone (or any device which access internet) by using application.*

Keywords: IoT, Sensors, Food Monitoring System

I. INTRODUCTION

Every industry has its own list of unique logistics challenges and issues can arrive from a multitude of sources – product type, mode, receiver, market conditions, etc. Working exclusively within the food, beverage, and consumer product sectors, the transportation professionals at Zip line Logistics know the ins-and-outs of these unique challenges. But what are some common food transportation issues most face. Here are we saw the food transportation issues and try to help by using our project. [1]

Our project aims to solve the problem in transportation of food and beverages due to environmental changes in location while transporting the raw material. Many consumer goods are subject to perishability or freeze ability and require temperature controlled transportation. Demand for this equipment has increased dramatically with the consumer preference for fresh and less processed products while the supply has seen little improvement due to the higher cost of ownership and a more challenging regulatory environment. This means significantly tighter capacity and often higher prices when compared to traditional truckload or dry van[2].

Our system uses temperature as well as humidity sensing of trucks trailer to keep track of vegetables and fruits in their appropriate quality. The sensors are connected to a microcontroller to track the status which is in turn interfaced to an LCD display as well as Wi-Fi connection in order to transmit alerts. If system detects any abrupt changes in trucks humidity or external temperature, the system automatically alerts the user about the trailers' status over IOT and also shows details of humidity and temperature level of environment inside the truck live over the internet. Thus IOT based

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food quality tracking system effectively uses internet to monitor the environment and start the heater or fogger to increase or decrease the temperature or humidity inside the trucks, to maintain the quality of food to be transport.

II. METHODOLOGY

2.1 Hardware Specifications

- DHT11 Temp & humidity Sensor
- ESP8266 Microcontroller
- Wi-Fi Modem
- Android phone
- LED's
- Transformer
- Resistors
- Capacitors
- Diodes

2.2 Software Specifications

- Arduino Compiler
- MC Programming Language: C
- Blynk Android App

III. LITERATURE REVIEW

3.1 Introduction

In this chapter we discuss food quality monitoring systems that currently exist or have been proposed giving both their strengths and weaknesses. A study on our proposed system is done comparing it with these food quality monitoring systems focusing more on how our system addresses their weaknesses. We also do a comprehensive literature study of various components that are likely to be used in the realization of our proposed solution. The study of the components covers areas such as their mode of operation, features, specifications, uses, applications, advantages and disadvantages.[5]

3.2 Existing Solutions

The following solutions that attempt to monitor food quality by monitoring related environmental factors currently exist;

A. Manual Monitoring of Atmospheric and Environmental Factors

Majority of food stores and warehouses still rely on this system of manual monitoring of the atmospheric factors related to food quality. This requires some personnel to routinely visit and check the conditions of the store by taking note of these conditions at some selected time intervals. Increase in labor by routine checkups, risk of injury or harm to the personnel by extreme conditions, delays or even human errors in measurements are among the shortcomings of this method.[10]

B. Smart Food Quality Monitoring System

This study suggests the systematic use of various sensors to perform quality monitoring and control of food materials. More precisely, this system consists of gas, temperature, light and humidity sensors, which provide the essential information needed for evaluating the quality of the packed or stored product. This information is transmitted wirelessly to a computer system providing an interface where the user can observe the evolution of the product quality over time using the Internet of Things technology. This system comes with the following key advantages;

1. Automation of daily tasks leading to better monitoring of devices.
2. The biggest advantage of employing the IoT technology in this system is saving money.

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3. Efficient and saves time

3.3 Temperature and Humidity Sensors

These sensors are used to sense the values of temperature and humidity in the air or particular surrounding.

A. DHT Temperature and Humidity Sensors

These sensors are very popular for electronics hobbyists because there are very cheap but still providing great performance. We have two versions of the DHT sensor, they look a bit similar and have the same pinout, but have different characteristics

DHT 11 Sensor

The DHT11 is a commonly used Temperature and humidity sensor. The sensor comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. The sensor is also factory calibrated and hence easy to interface with other microcontrollers. The sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of ±1°C and ±1%. So if you are looking to measure in this range then this sensor might be the right choice for you. The DHT11 sensor can either be purchased as a sensor or as a module. Either way, the performance of the sensor is same. The sensor will come as a 4-pin package out of which only three pins will be used whereas the module will come with three pins as shown above. The only difference between the sensor and module is that the module will have a filtering capacitor and pull-up resistor inbuilt, and for the sensor, you have to use them externally if required.

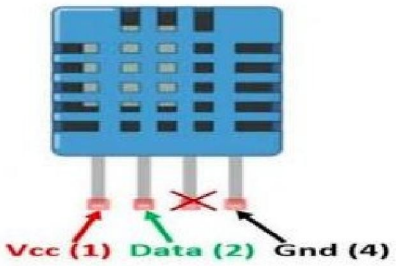

Figure: DTH11 (Humidity and temperature) sensor

ESP8266 WI-FI Module

ESP8266 can be used as an external Wi-fi module, using the standard AT Command set Firmware by connecting it to any microcontroller using the serial UART, or directly serve as a Wi-fi-enabled micro controller, by programming a new firmware using the provided SDK. The GPIO pins allow Analog and Digital IO, plus PWM, SPI, I2C, etc. The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre- programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much Wi-Fi ability as a Wi-Fi Shield offers.

Figure: Wi-Fi Module

The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community. ESP8266 is an impressive, low cost Wi-Fi module suitable for adding Wi-Fi functionality to an existing microcontroller project via a

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UART serial connection. The module can even be reprogrammed to act as a standalone Wi-Fi connected device–just add power. In short, the ESP8266 module is a TTL "Serial to Wireless Internet" device. Providing your microcontroller has the ability to talk to a TTL serial device.

ARDUINO COMPILER

Compiling a program is the process of transforming high-level source code into a low-level object code (binary code) called machine language, which can be understood by the processor. In Arduino IDE AVR-GCC Toolchain is used for compiling the program.

MC PROGRAMMING LANGUAGE: C

MC language is a low-level code interpreted and converted from high-level source code and understood only by the machine. Machine code is transported to the system processor when a specific task, application or program executes even the smallest process. Machine code is also known as machine language (ML).

BLYNK FRAMEWORK

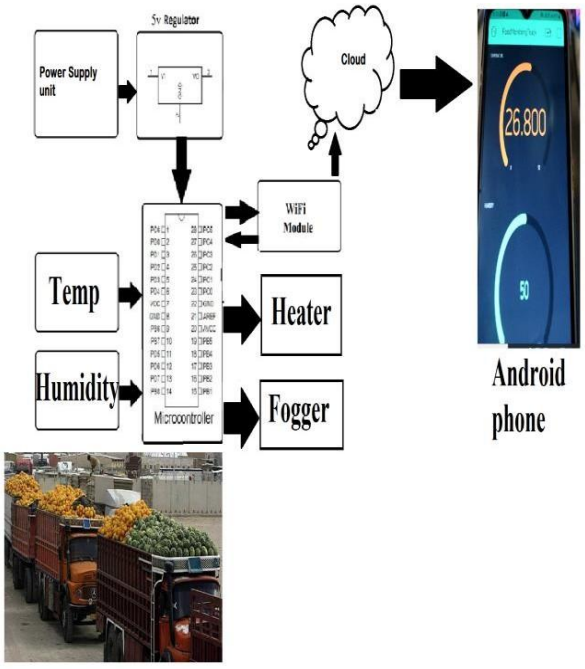
Blynk is an IoT platform for iOS or Android smartphones that is used to control Arduino, Raspberry Pi and NodeMCU via the Internet. This application is used to create a graphical interface or human machine interface (HMI) by compiling and providing the appropriate address on the available widgets.

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things.

There are three major components in the platform :

- **Blynk App**: – It allows you to create amazing interfaces for your projects using various widgets which are provided.
- **Blynk Server**: – It is responsible for all the communications between the smartphone and hardware.
- You can use the Blynk Cloud or run your private Blynk server locally. It's open-source, could easily handle thousands of devices and can even be launched on a Raspberry Pi.
- **Blynk Libraries**: – It enables communication, for all the popular hardware platforms, with the server and process all the incoming and outcoming commands.

IV. BLOCK DIAGRAM



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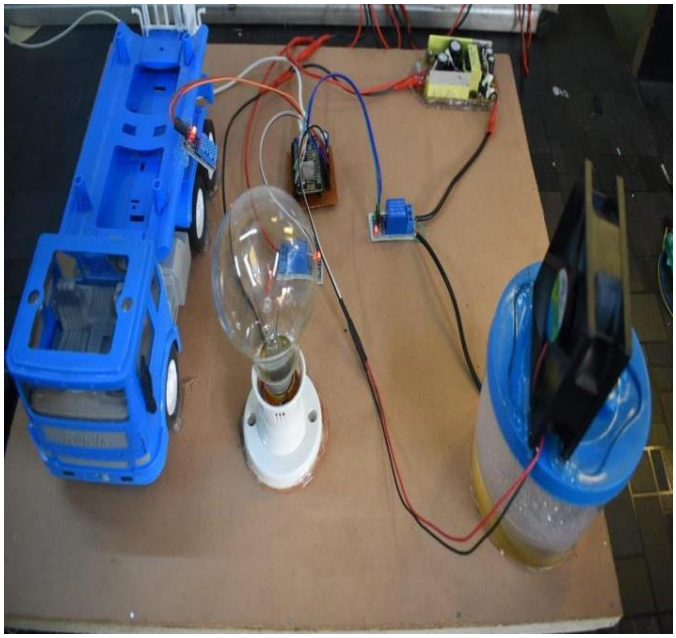
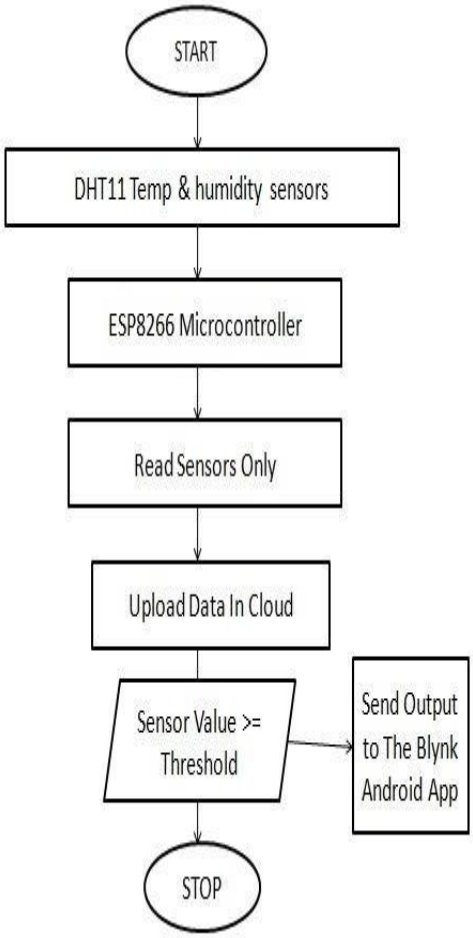
V. EXPECTED OUTPUT



VI. FLOW OF THE PROJECT



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VII. ADVANTAGES

- Easy to monitor and control
- Real time data can be monitor
- Easy to install like GPS system
- Multiple users can access data at same time

VIII. APPLICATIONS

- It can used in medicinal transportation trucks
- It can be used in chemical transport system where temp and other environmental factors affect the quality of product.

IX. CONCLUSION

The proposed food monitoring system using IoT has a wide range of applications in food processing industry. This addresses the critical issues like food waste, food contamination etc. The threshold value of the device is maintained according to the food sample as each food has its own different threshold value. The array of gas sensors helps in reducing the chances of inaccurate readings. The device can be customized and can be used for different other applications. This project uses many low-cost sensors which will reduce the cost and improves the efficiency.

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