

Realtime Stock Management using Ultrasonic Sensor and NodeMCU

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Abstract—This seminar paper describes the development of a Stock management system using ultrasonic sensors and NodeMCU microcontrollers. The system's goal is to offer a precise and effective method for managing inventory levels in real-time. The NodeMCU microcontrollers wirelessly receive this data and interpret it to track inventory levels. The ultrasonic sensors are utilised to detect the distance between the sensor and a stock item.

Keywords— *Stock management, Ultrasonic sensors, NodeMCU Microcontrollers, Real-time, Inventory levels, Wireless data transmission, Distance measurement.*

I. INTRODUCTION

A crucial component of any organisation is effective inventory management, which guarantees that goods are always available when needed while reducing surplus stock levels. Businesses require an effective system that reliably tracks inventory levels in real-time to do this. Manual counting and barcode scanning are two inefficient, time-consuming techniques of inventory management. In order to provide an accurate and efficient approach for tracking inventory levels in real-time, this seminar paper presents the construction of a stock management system that makes use of ultrasonic sensors and NodeMCU microcontrollers. The NodeMCU microcontrollers wirelessly receive and analyse this data to track stock levels. Ultrasonic sensor is used to measure the distance between a sensor and a stock item.

The Report offers a thorough explanation of the system's design, together with a list of all necessary supplies and parts and step-by-step guidelines for putting the system into practise. The study also reviews existing research studies on the use of ultrasonic sensors and NodeMCU for stock management, and compares the benefits and drawbacks of this system to more conventional approaches. The implementation of a stock management system employing ultrasonic sensors and NodeMCU microcontrollers is discussed in this seminar paper in great detail. This information can be very helpful to organisations looking to monitor their inventory levels more precisely and effectively.

II. LITERATURE REVIEW

Realtime Stock Management using Ultrasonic Sensor and NodeMCU is a system designed to manage inventory levels in real-time. It utilizes ultrasonic sensors to detect distance, and NodeMCU microcontrollers to receive and interpret data. The design is comprehensive and supported by detailed explanations of materials and components.

S. Jayanth et. al [1] In this work, an effective inventory management system for a variety of applications involving solid or liquid assets is presented. It uses an ultrasonic transducer and a computer that can connect to the Internet, like a Raspberry Pi, to measure the inventory and send an email to the supplier and/or company staff for placing an order. It also uses a Web page that the system hosts to show the current stock availability..

B. S.S. Tejesh et. al [2] Warehouse inventory management systems are important components in many manufacturing and goods-based techniques. Warehouses are used to store items or products. Since RFID uses a wireless link and the internet to transfer tag data from the transmitter section to open source hardware, it is the best wireless communication technology for warehouse inventory management systems. The Raspberry Pi serves as a central server, keeping track of all the data, and the web page is designed to give the user a handy interface for tracking the products. Compared to current warehouse inventory management systems, the created system has a relatively cheap cost and operates dynamically.

Jasmine Akter et. al [3] The project uses ultrasonic waves to determine distance and has an Arduino interface. The advantages of this sensor when interfaced with Arduino are that a precise distance measurement can be achieved using novel methods. The human audible range is 20Hz to 20kHz. Due to their affordability and great reliability, ultrasonic sensors are frequently employed in robotic movement control, medical applications, and vehicle control. In order to determine the location and distance of an object, this project uses a microcontroller and an ultrasonic sensor.

III. MOTIVATION

The Realtime Stock Management system is an accurate, efficient, and cost-effective solution to inventory management. It uses ultrasonic sensors and NodeMCU microcontrollers to monitor inventory levels in real-time and take proactive measures to maintain optimal levels. This system can help businesses reduce costs, improve customer satisfaction, and increase profitability. Traditional inventory management methods such as manual counting and barcode scanning are time-consuming, labor-intensive, and prone to errors.

IV. METHODOLOGY

The methodology for the development of a realtime stock management system using ultrasonic sensors and NodeMCU can be broken down into the following steps:

1. System Design
2. Hardware Setup
3. Programming
4. Calibration
5. Testing

[1] **System Design:** Designing the system is the initial step in the development process. In order to do this, the requirements must be determined, suitable components chosen, and the system architecture designed.

[2] **Hardware Setup:** The hardware setup comes after the system design phase. Connecting the ultrasonic sensors to the NodeMCU microcontrollers and checking their functionality are required for this.

[3] **Programming :** After the hardware has been configured, the NodeMCU microcontrollers must be programmed to read data from the ultrasonic sensors and send it to a database. This requires using the Arduino IDE, a programming environment for microcontrollers.

[4] **Calibration :** Before it can be utilised to control inventories, the system needs to be calibrated. This requires determining the distance between the ultrasonic sensor and a known object, such a wall, in order to ensure precise measurements..

[4] **Testing:** The system must be tested to make sure it is operating properly before moving ahead. This include validating the measures' precision, the hardware and software components, and the transmission and storage of data. Before being used in a real-world situation, the technology can be tested in a simulated environment.

V. IMPLEMENTATION

To implement a realtime stock management system using ultrasonic sensors and NodeMCU

Step 1 : Download the Arduino IDE from the link.

<https://www.arduino.cc/en/software>

Step 2 : Install the NodeMCU board in the Arduino IDE.

https://arduino.esp8266.com/stable/packageesp8266com_index.json

After that, install the esp8266 platform by opening Boards Manager from the Tools > Board menu.

After installation, choose the ESP8266 board from the

Step 3 : The Firebase library can be downloaded from the link.

<https://github.com/FirebaseExtended/firebase-arduino>

Open Sketch > include library > add.ZIP library and add ZIP library to Arduino IDE.

After that go to Sketch > Include Library Verify that the library you just added available in the list.

Manage Library.

Step 5 : Create a real-time database and Firebase project.FIREBASE_HOST should be set.

Copy your Firebase host into your Arduino code (FIREBASE_HOST) and then open your Realtime Database.Set your FIREBASE_AUTH after that.

Copy your Secret and put it into your FIREBASE_AUTH after opening your Realtime Database and going to Project Overview > Project Settings > Service Accounts > Database Secrets.

In order to connect to a WiFi network using an ESP8266 WiFi module and the Firebase Realtime Database, we must first include the necessary libraries.

```
1 #include <FirebaseESP8266.h>
2 #include <ESP8266WiFi.h>
```

Then we need to define Firebase_HOST, FIREBASE_AUTH, WIFI_SSID, and WIFI_PASSWORD for the Firebase project.

```
4 #define FIREBASE_HOST ""
5 #define FIREBASE_AUTH ""
6 #define WIFI_SSID ""
7 #define WIFI_PASSWORD ""
```

The first line declares a TRIG_PIN constant with the value D6. The second line declares an ECHO_PIN constant with the value D5.

```
9 #define TRIG_PIN D6
10 #define ECHO_PIN D5
```

We have to Initialize Firebase

```
25 Firebase.begin(FIREBASE_HOST, FIREBASE_AUTH);
```

Then sets up the pins for an ultrasonic sensor.

```
29 pinMode(TRIG_PIN, OUTPUT);
30 pinMode(ECHO_PIN, INPUT);
```

Then code emits a brief ultrasonic pulse that can be used to gauge distance by timing how long it takes for the pulse to re-enter the sensor after striking an object.

```
40 digitalWrite(TRIG_PIN, LOW);
41 delayMicroseconds(2);
42 digitalWrite(TRIG_PIN, HIGH);
43 delayMicroseconds(10);
44 digitalWrite(TRIG_PIN, LOW);
```

Then Measure the duration of the echo

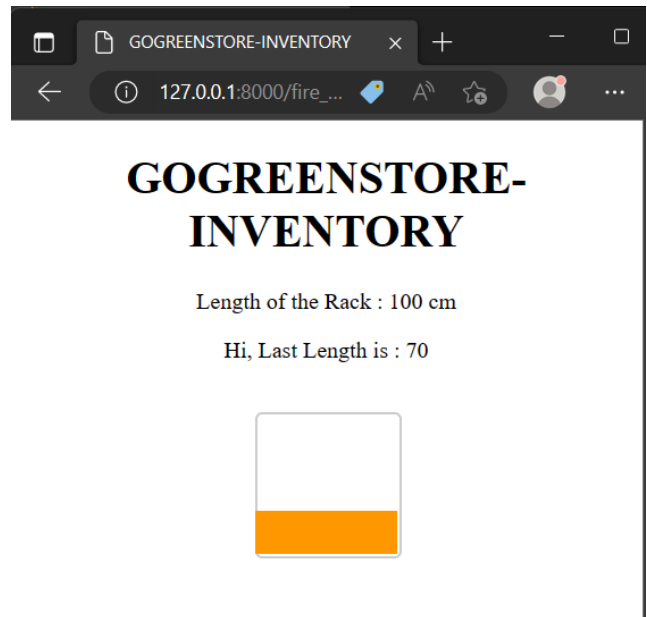
```
48 duration = pulseIn(ECHO_PIN, HIGH);
49 distance = duration * 0.034 / 2;
```

Then Send the distance to Firebase Realtime Database

```
53 FirebaseDatabase firebaseData;
54 Firebase.pushFloat(firebaseData, "/distance", distance);
```

VI. RESULT

The system gives precise and current information on inventory levels, enabling prompt replenishment and avoiding stockouts. The NodeMCU microcontroller wirelessly receives this data and transfers it to the Firebase Realtime Database for simple access and management. The use of ultrasonic sensors ensures accurate distance measurements between the sensor and the stock item. Businesses can boost productivity and profitability by using this approach to save time and resources that would



VII. CONCLUSION

Inventory tracking can be done effectively and efficiently by implementing a real-time stock management system with ultrasonic sensors and NodeMCU microcontrollers. The NodeMCU microcontroller provides wireless data transfer and real-time monitoring, and the integration of ultrasonic sensors enables accurate and precise measurement of the distance between the sensor and stock items. The system's connection with Firebase Realtime Database offers a practical and safe method of

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