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IOT Based Smart Shelve Inventory Management System

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Abstract:
A system based on the Internet of Things, the Smart Shelve Inventory Management System (SIMS) will make managing restaurant and cloud kitchens inventory easier and more efficient. Users will be informed of their inventory levels as well as receive an automated alert in the event that stock levels drop.

People with day jobs and restaurants find it tough to maintain track because it involves human intervention at the time. It is a simple responsibility to keep an eye out for potential waste and burglary problems. In this research, we propose an IOT (Internet of Things)-based food inventory tracking system that will provide real-time monitoring of the kitchen inventory and proper handling.

Automating the measurement and order placement processes reduces manual labor and improves inventory management efficiency. The idea involves using an ultrasonic sensor and an Internet-connected device, such as a ESP32 module, to measure inventory and send report to owners and company personnel for order placement. The system also displays current stock availability on a Web page. Data can be evaluated in real-time to track daily or weekly usage and predict consumption patterns. There is an option to monitor the real-time status and usage history using an app. A Smart Shelve can manage inventory via the Internet of Things.

Keywords:

Internet of things (IOT) , Inventory

Introduction:

The IoT-based smart shelve inventory management system utilizes IoT technologies for modern inventory management. The system utilizes a network of networked devices, sensors, and software to track inventory, monitor product movement, and optimize inventory levels in real-time.

The center of culinary activity is the kitchen, where a variety of food items are kept on shelves. Handling these things can be laborious and time-consuming. ESP32, ultrasonic sensor, power supply, LCD display, buzzer, indication light, and voltage regulator are some of the parts that our system uses to make use of IoT technology. This guarantees smooth tracking of meal amounts. Our technology eliminates the need for daily manual inspections by automating the process of ordering and checking food items. This streamlines the refilling process in addition to saving important time. Users can easily maintain track of their inventory situation and make educated decisions regarding restocking thanks to real-time data that is shown on an LCD screen and timely alerts by buzzer and indication light. Kitchen management is revolutionized by an IoT-based system that provides an easy-to-use platform for effective inventory control. Not only does it enable customers to save time, but it also offers a clever method of positioning.

This paper's primary goal is to create an inventory management system for shelves and provide the data on a computer or smartphone so that kitchen supplies can be organized and manage.

Literature Survey:

[1] Inventory Management System using IOTS: This paper presents an effective inventory management system for a range of applications using liquid or solid goods. Using an IOT-based approach to inventory management, the idea makes use of an ultrasonic transducer and a processing device that can connect to the Internet, like a Raspberry Pi, to measure inventory, send an order placement email to suppliers and/or company staff, and display the current stock availability on a system-hosted webpage (2017).

[2] IoT Based Inventory Management System using Load Cell and NodeMCU:

An automated inventory management system based on sensors and the Internet of Things, using the well-known NodeMCU ESP8266 microcontroller to precisely determine the weight of a specific object or to automatically count the quantity of items on a shelf. Additionally, we will integrate Internet of Things technology with the Thing Speak cloud platform to enable the store owner to conveniently monitor inventory from his home or office. Finally, in the event that a product number falls below a predetermined threshold, we will utilize IFTTT, another well-liked tool, to send an email (2021).

[3] Automation and Monitoring Smart Kitchen Based on Internet of Things (IoT):

The goal of this research is to create an Internet of Things prototype for a kitchen security system. Arduino UNO and four different kinds of sensors are used in the system's design. Temperature and humidity are monitored by the DHT 11 sensor; fire is detected by the IR Flames sensor; gas leaks are detected by the MQ-135 sensor; and human activity in the kitchen is detected by the PIR sensor. After that, the Arduino is connected to the sensor's output, and it controls the relay. In the event of a gas leak, uncontrolled fire, or extreme temperature rise, the relay functions as a fan switch. IN addition to sending data to the server, Arduino will activate the led and the alarm in certain circumstances. The outcomes demonstrate that the system can function in accordance with the required requirements (2017).

[4] IoT Based Smart Inventory Management System for Kitchen

This solution makes inventory management for restaurants, kitchens, and medications more hassle-free and efficient. This will automatically order new things if the amount runs low in addition to informing users of their current inventory. From their SIMS app, users can also manually place online orders to have any item delivered right to their door. In order to track their expenses, users can also create a list for a specified time period. Additionally, the user's order history and status may be monitored via the Android app and website (2018).

[5] Real-time Stock Management using Ultrasonic Sensor and NodeMCU:

This paper details the use of NodeMCU microcontrollers and ultrasonic sensors in the building of a stock management system. Offering an accurate and efficient way to manage inventory levels in real-time is the system's main objective. Inventory levels are tracked by the NodeMCU microcontrollers, which wirelessly receive and interpret this data. The distance between an ultrasonic sensor and a stock item is determined using these sensors (2023).

Existing System:

The IoT based smart inventory management is RFID (Radio Frequency Identification) system is one of the currently in use solutions. The inventory items in this system are identified by RFID tags, which are then read by RFID scanners to determine the item's level and presence. After that, the information is wirelessly sent to a central server for analysis and inventory level management. The inventory will not be updated by this system if you take that product without scanning it. To identify the presence of products, our suggested system developed a variety of sensors, including infrared and load cells.

Proposed System:

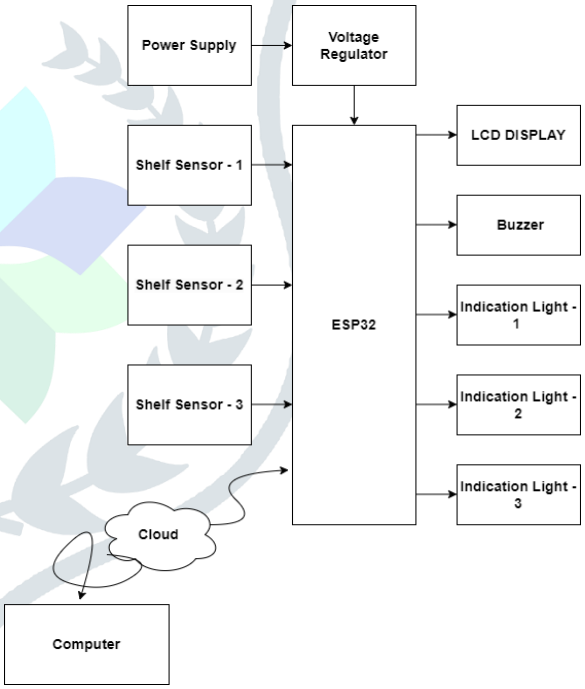


Fig. Block Diagram of Proposed System

The system proposed for Cloud kitchens and restaurants seeking an effective way to manage their inventory can consider the Internet of Things (IoT) smart shelve inventory management system, which is powered by an ESP32 microcontroller and controlled by an FC7805 voltage regulating IC, LCD display, LED light, and Ultrasonic sensors. Accurate, real-time inventory management is ensured by the system through the cooperation of multiple components. To identify inventory items in real time, the system makes use of ultrasonic sensors. Strategically positioned at various points along the storage rack shelf,

these sensors activate in response to the addition or removal of an item from the inventory outs. Real-time inventory item presence is detected by the system through the use of ultrasonic sensors. These sensors are positioned at key points on the storage rack shelf, and they activate when an item is added or taken out of stock. The ESP32 microcontroller gathers the sensor data, processes it, and wirelessly transmits it to the Blynk cloud for additional processing.

The number of products is counted using ultrasonic sensors. The system uses Status LED to give real-time feedback on the inventory status. Depending on the inventory levels, different colors are programmed into the Status LED to display. For example, the LED can be set to show green when inventory levels are high and red when they are low. The proposed system communicates with the Blynk server over Wi-Fi, enabling real-time inventory level monitoring. To lessen the chance of stock outs, the system can also be set up to automatically reshuffle goods when levels hit a predetermined threshold

Methodology:

Both software and hardware are used in the process of creating an Internet of Things (IoT)-based smart shelve inventory management system.

Hardware Description :

#ESP32 Microcontroller

ESP32 is a line of low-cost, low-power system-on-chip microcontrollers that include Wi-Fi and dual-mode Bluetooth. The ESP32 series uses a Tensilica Xtensa LX6 microprocessor in both dual-core and single-core variations, a Tensilica Xtensa LX7 dual-core microprocessor, or a single-core RISC-V microprocessor with built-in antenna switches, RF balun, power amplifier, low-noise receive amplifier, filters, and power-management modules. Expressive Systems, a Chinese startup based in Shanghai, conceived and developed ESP32, which is manufactured by TSMC utilizing a 40 nm technology. It is an upgrade to the ESP8266 microcontroller.

#Ultrasonic Sensor

An ultrasonic sensor is a device that uses ultrasonic sound waves to calculate an object's distance from it. A transducer is used by an ultrasonic sensor to transmit and receive ultrasonic pulses, which are then used to determine the proximity of an object.

 # Voltage regulator

A circuit's voltage sources may fluctuate, which prevents fixed voltage outputs from being produced. The output voltage is kept constant by a voltage regulator integrated circuit. A common voltage regulator integrated circuit (IC) is the 7805 Voltage Regulator, which is a part of the 78xx series of fixed linear voltage regulators used to maintain such variations.

The output voltage of 78xx is indicated by the xx in that number. A regulated power supply with +5 volts and room to add a heat sink is offered by the 7805 IC.

Software Description:

#Aurdino IDE:

One software tool used for programming and developing Arduino boards is the Arduino IDE (Integrated Development Environment). Operating systems compatible with it include Windows, Mac OS, and Linux. It is a free and open-source platform.

#Blynk Server:

The Blynk IoT platform provides a comprehensive software suite that enables the development, implementation, and remote management of electronic devices at any size ,ranging from small-scale IoT initiatives to millions of commercially connected items. Blynk is a mobile app editor and IoT app builder that uses no coding. It is in charge of all communications that take place between the hardware and smartphone. Easily create intuitive Internet of Things applications and manage devices, data, and clients in a safe cloud environment using Blynk's low-code platform.

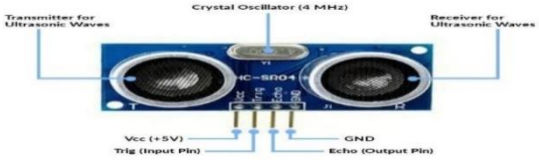
Future scope:

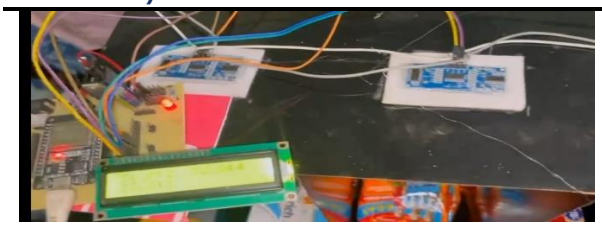
In this proposed system, we only produced three shelf prototypes for this suggested design. Similar to this, multiple shelf prototypes can be made to distinguish various foodstuff items in the kitchen. Additionally, a database can be made with Blynk Cloud to store previous inventory item records

Outcomes:

The Smart Shelve Inventory Management System prototype is finally developed. We tested the functionality the functionality of the suggested system was found to be function well.

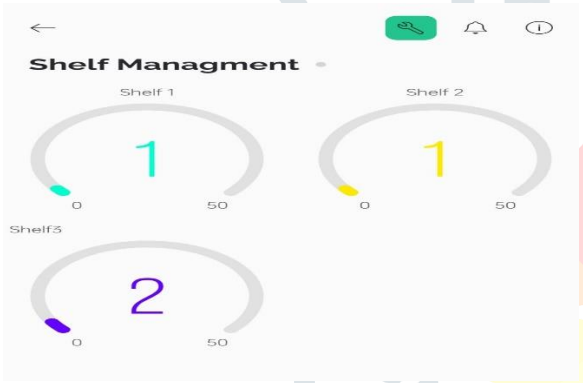
ESP-WROOM-32 module with ESP32-D0WDQ6 chip





[A] Implementation of Hardware

[B] System shows the inventory Level & Graphs of shelve all three Shelves on Web Dashboard



[C] Inventory Levels of shelve 1, shelve 2 & shelve 3 on mobile application

Conclusion:

In conclusion, developing and programming the hardware and software components, testing the system, and making sure it delivers accurate and dependable real-time data on inventory levels are all part of the planned work on the IoT-based smart shelve inventory management system.

The smart inventory initiative can be supported by its deployment, as it is a crucial prototype due to its low cost, effective design, and ease of

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