A Review on Smart Grocery Tracking System

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Abstract **- Smart Grocery Tracking System aimed at automating the way we manage household groceries. The system uses a load cell to measure the weight of items like rice, sugar, and flour in real time. The small analog signal from the load cell is amplified and converted into a digital signal using the HX711 amplifier. This data is then processed by the ESP32 microcontroller, which connects to Wi-Fi and sends the information to the Blynk IoT platform. Through the Blynk mobile app, users can monitor grocery levels, set threshold limits, and receive alerts when an item is running low. The system offers a simple and practical solution to avoid manual checking, reduce waste, and ensure timely restocking. It is cost-effective, easy to use, and ideal for modern smart kitchens. Keywords: Smart Grocery Tracking System, Load Cell, HX711 Amplifier, ESP32, Blynk IoT, IoT-Based Inventory Management, Smart Kitchen Automation, Real-Time Weight Monitoring, Wi-Fi Enabled Grocery Tracker, Threshold-Based Notification.**

I. INTRODUCTION

In today's busy world, keeping track of household groceries can be a real challenge. Most people still rely on manual methods like checking containers or writing shopping lists, which often leads to buying too much or forgetting to restock essentials. To solve this, the Smart Grocery Tracking System offers a simple and automated way to monitor grocery levels using IoT (Internet of Things) technology. The system works by placing a load cell under grocery containers

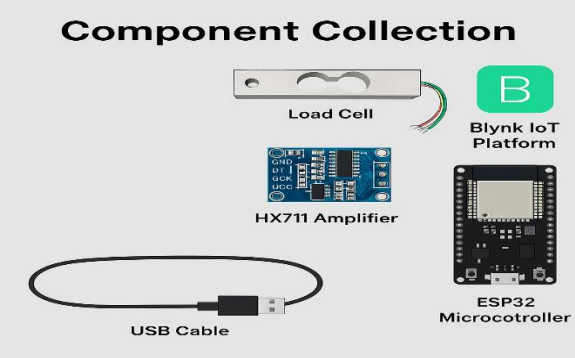

Figure 1. Component of System

to measure their weight. That data is then passed through an HX711 amplifier, which turns the analog signal from the load cell into a digital one. An ESP32 microcontroller collects this data and sends it over Wi-Fi to a mobile app built using the Blynk IoT platform. This app shows the live weight of groceries and alerts the user when any item is running low. Smart kitchen systems like this are a growing part of home automation. By using connected devices and sensors, these systems can track real-time data, learn usage habits, and even suggest when to restock items.

II. LITERATURE SURVEY

Sifat Rezwan, Wasit Ahmed, Mahrin Alam Mahia, Mohammad Rezaul Islam in IoT Based Smart Inventory Management System for Kitchen presents an IoT-based Smart Kitchen Inventory System (SIMS) using Arduino Mega, NodeMCU (ESP8266), weight sensors, and LDRs. It automates grocery monitoring through a smart cabinet and provides real-time updates via a website and mobile app. The system notifies users when items run low and enables online ordering. It offers a low-cost, energy-efficient solution, aiming to simplify kitchen management and reduce shopping hassle.[1]

The paper presents an RFID-based inventory management system that leverages IoT and RFID technologies to automate inventory tracking. It highlights how RFID can improve stock monitoring, reduce manual errors, and enable real-time visibility of inventory levels. The system is built using an ESP8266 NodeMCU and integrates with the Blynk IoT platform for remote access and alerts. The author discusses practical implementation in warehouse environments and outlines how the system enhances operational efficiency while offering a low-cost, scalable solution.[2]

Nagaria, B., Shroff, P., & Mehrotra, R. (2019) in IoT Based Inventory System for Stock Management proposed the development of an Internet of Things (IoT) based inventory management system utilizing a load cell and an ESP32 microcontroller. The load cell is used to measure the weight of inventory items, and the ESP32 processes this data and transmits it over Wi-Fi to a central system or cloud service for monitoring and analysis [4].

Patil, C. S., & Pawar, K. N. in Grocery Management System Using Internet of Things proposed a smart grocery management system that leverages Internet of Things (IoT) technology to automate and enhance household inventory tracking. The system employs sensors to monitor the quantity of grocery items in real time. When the quantity of an item falls below a predefined threshold, the system sends notifications to the user, prompting timely replenishment. The integration of IoT facilitates continuous monitoring and efficient management of household groceries, aiming to reduce manual effort and minimize waste. It doesn't perform as accurately when it comes to measuring bulk items like rice or flour.[3]

III. RESEARCH METHODOLOGY

The methodology followed in this research project is based on the design, development, and testing of an IoT-enabled grocery tracking system using a hardware-software integration approach. The goal is to create an automated and user-friendly solution for monitoring grocery levels in real time and notifying users when items fall below a set threshold.

- Problem Identification

The research began by identifying the common issue of inefficient household grocery management. Traditional methods, such as manually checking containers or using written lists, are time-consuming and error-prone. This creates the need for a smart system that can automatically monitor grocery usage and alert users when restocking is needed.

- Planning the System

We chose the main components for our system: a load cell to measure the weight of groceries, an HX711 amplifier to convert the signal into a format the system can understand, and an ESP32 microcontroller to handle the data and connect to Wi-Fi. We designed a simple circuit that connects all these components and allows them to work together.

- Testing and Validation

Extensive testing was conducted by placing different weights on the load cell to simulate real-world usage. The system was observed for accuracy, speed of data transmission, notification reliability, and responsiveness of the mobile dashboard.

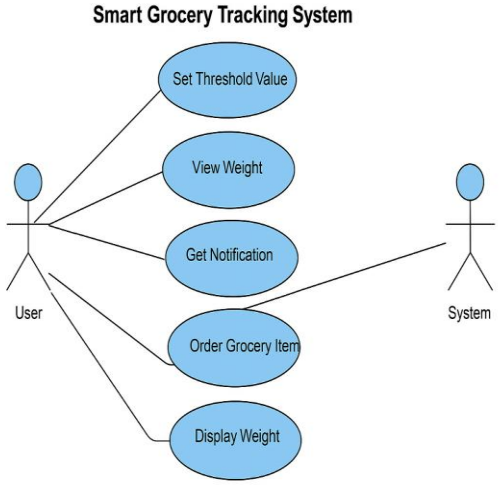

Figure 2. UML diagram of smart grocery tracking system

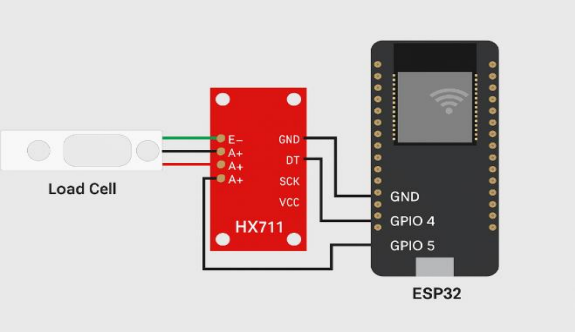

Figure 3. Circuit Diagram of System Connection

IV. RESULT AND CONCLUSION

After successfully building and testing the Smart Grocery Tracking System, the results were very promising. The system accurately measured the weight of grocery items using the load cell and updated the values in real time on the Blynk mobile app. It can implement threshold-based monitoring for

abnormal readings. If any sensor data exceeds predefined thresholds, trigger an alert/notification mechanism. It is a popular Internet of Things (IoT) platform that allows users to build custom applications for controlling and monitoring various hardware devices and projects.[2]. The ESP32 handled the data processing and Wi-Fi connection smoothly, and the Blynk dashboard was easy to use, even for people with no technical background.

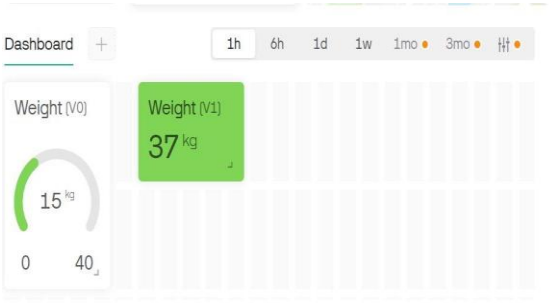

Figure 4. Blynk IOT Dashboard

Through multiple tests with different containers and weights, the system proved to be consistent and reliable. It was able to detect small changes in weight, notify the user without delay, and maintain a stable connection to the internet during operation. Users could also adjust threshold values directly from the app, making the system flexible and user-friendly.

V. CONCLUSION

The Smart Grocery Tracking System offers a simple and smart solution to a common household problem: managing groceries efficiently. By combining affordable hardware components with IoT technology, the system helps users track their grocery levels automatically and receive alerts when it's time to restock. It reduces the need for manual checking, prevents running out of essentials, and even saves money by avoiding overbuying.

This project proves that with the right integration of sensors, microcontrollers, and a cloud platform, daily tasks like grocery management can be made smarter, easier, and more efficient. It's a practical step toward creating smarter kitchens and more connected homes.

V. FUTURE ENHANCEMENT

While the current system works well for tracking a single grocery item, there's a lot of potential to make it even better in the future. One big improvement would be to add support for multiple containers, so users can track the weight of several grocery items (like rice, sugar, flour, etc.) at the same time using one system.

Another useful upgrade would be to connect the system with voice assistants like Alexa or Google Assistant. This would let users ask for updates about their groceries without even opening the app.

We can also make the system smarter by adding machine learning. It could then learn a user's shopping habits and predict when items will run out, even before they do.

In the future, the system could also support auto-ordering from online grocery stores. So, when something is running low, it can place the order for the user automatically.

Lastly, the system can be made more efficient by adding battery-saving features and offline data storage. That way, it would work even during internet outages or when power is limited.

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