IOT BASED SMART REFRIGERATOR FOR INTELLIGENT FOOD MONITORING

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Abstract:
The concept of a smart refrigerator using the Internet of Things (IoT) focuses on enhancing conventional refrigeration systems with intelligent monitoring and connectivity features. By integrating IoT-enabled sensors and microcontrollers, the refrigerator can monitor parameters such as temperature, humidity, and energy consumption in real time. It can also track the availability of stored items, send alerts for expired or low-stock products, and help reduce food wastage. Through wireless connectivity, the system enables remote access via mobile or web applications, allowing users to check inventory status, receive notifications, and optimize usage. This innovation improves user convenience, ensures better food management, and promotes energy efficiency. The proposed system demonstrates how IoT technology can efficient lifestyle.

Keywords*:* Smart Refrigirator, Food Expiry Detection,Automatic Restoring Alerts,Health & Nutritional Tracking,Temperature & Humidity Sensor,Remote monitoring,Weight/Load Sensor

1. INTRODUCTION

A smart refrigerator is more than just a cooling appliance; it is an intelligent system that combines sensors, microcontrollers, and wireless communication technologies to provide advanced features. These features include real-time monitoring of temperature and humidity, automatic inventory tracking, expiration date notifications, remote access via smartphone apps, and even integration with online grocery platforms. By leveraging these capabilities, smart refrigerators help reduce food wastage, optimize energy consumption, and offer a higher level of convenience to users. In this project, we propose the design and implementation of an iot-based Smart Refrigerator that addresses some of the most common issues faced in household food management. The system will include sensors to detect temperature, humidity, door status, and the presence of food items. The data collected from these sensors will be processed using a microcontroller (such as Arduino) and transmitted to a cloud platform.

2. LITERATURE SURVEY

Smart Refrigerator Using IoT (2019) This study utilized an ESP8266 microcontroller and temperature/load sensors to monitor the fridge's internal state. It provided real-time alerts via SMS and

displayed data on an IoT dashboard. Vision-Based Inventory System (2020) A system using a Raspberry Pi and a camera was proposed to automatically recognize food items using image processing techniques. The model also used OCR to detect expiry dates from packaging. IoT-Based Fridge with Recipe Suggestions (2021) Researchers implemented a fridge that used image recognition and ingredient matching to suggest recipes to the user. It also monitored food expiration and provided notifications.

3. OBJECTIVES

Objectives of our Smart Refigerator are :

• Detects the amount and type of food inside the refrigerator.

• Orders food automatically when items are out of stock with the permission of owner.

• Tracks food validity and notifies users before expiry.

• Monitors internal environmental conditions for food preservation.

• Alerts the user via LCD and app if temperature exceeds safe levels.

• Detects open door and closes it automatically if unattended.

• Sends real-time data to an IoT application for remote monitoring.

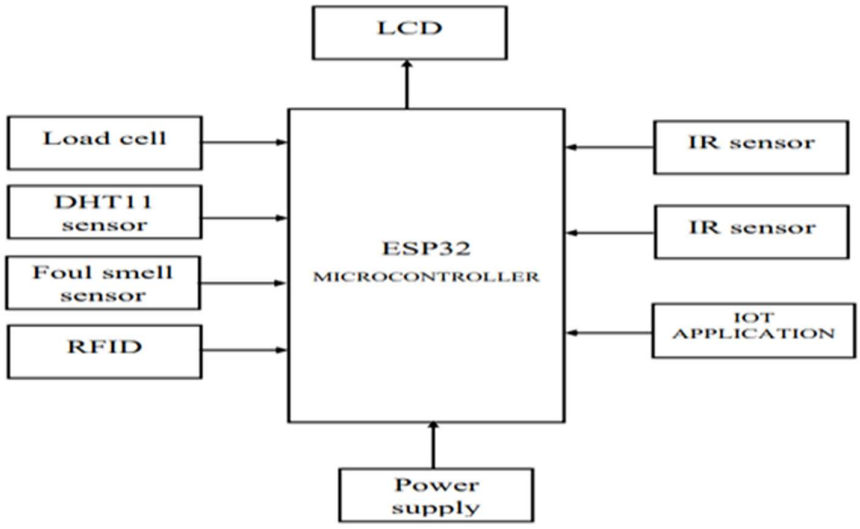
• Includes face recognition and password authentication for access.

• Supports control through voice commands using smart assistants.

4. METHODOLOGY :

The smart refrigerator using IoT works by integrating various sensors, a microcontroller, and cloud connectivity to monitor and manage food storage efficiently. Sensors such as temperature, humidity, weight, and door sensors collect real-time data about the internal environment and items stored inside the refrigerator. This data is processed by a microcontroller (like Arduino or ESP32) and transmitted to an IoT platform via Wi-Fi or MQTT. Users can access this information through a mobile or web application, where they receive alerts if the door is left open, temperature rises, or items are nearing expiry. The system not only helps in maintaining optimal storage conditions but also assists in reducing energy wastage and managing groceries effectively by providing timely notifications and remote control options.

6. BLOCK DIAGRAM



7. RESULTS

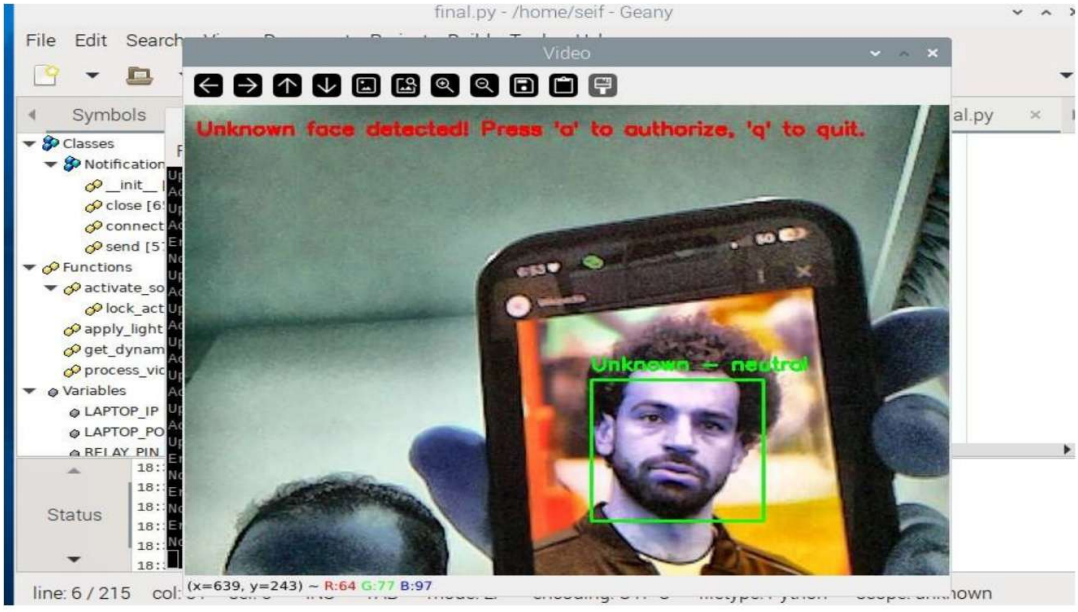


Fig 7.1 Face recognition

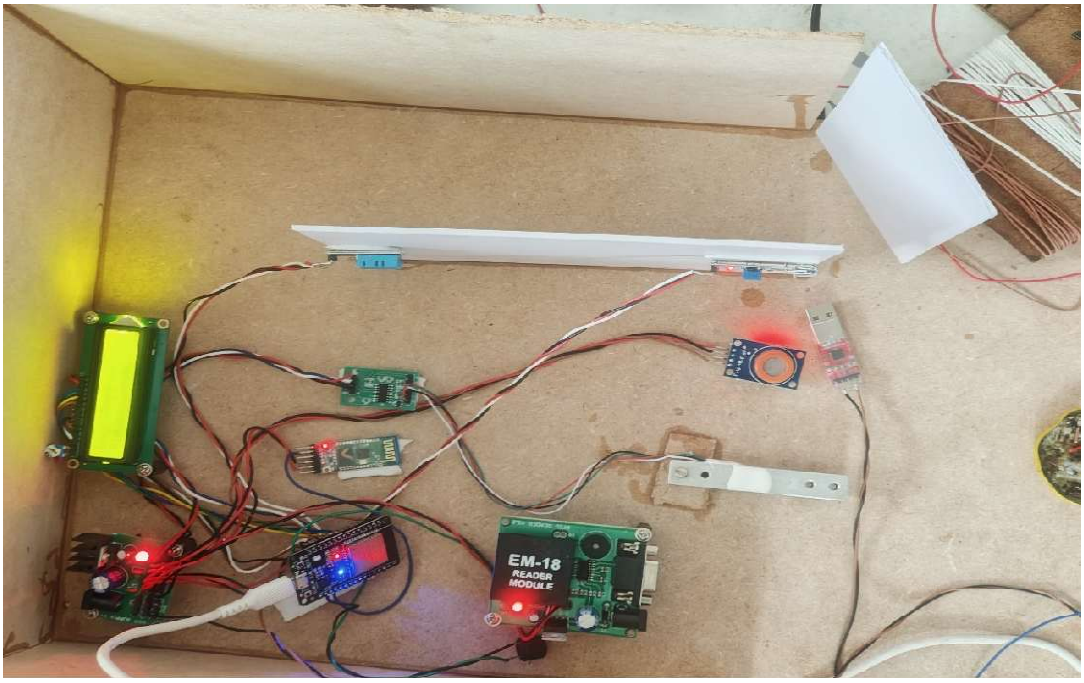


Fig 7.2 Hardware Connection

8. CONCLUSION

The Smart Refrigerator using IoT brings intelligence to traditional food storage by integrating sensors, connectivity, and automation for better management. Users can monitor and control the refrigerator remotely through mobile applications, while real-time alerts help in tracking food freshness and expiry dates. This feature reduces food wastage and ensures healthier food habits. Energy efficiency is also achieved by optimizing cooling based on usage patterns. The system supports automatic updates of shopping lists, making it easier for users to manage groceries. It further offers convenience by notifying users of low or expired items. IoT connectivity ensures seamless integration with other smart home systems. The design highlights how technology simplifies everyday tasks in a modern household. At the same time, it contributes to sustainability by saving both energy and resources. Such innovations show how IoT can enhance lifestyle and bring more comfort to daily life. Overall, the Smart Refrigerator using IoT is a futuristic solution that improves efficiency, promotes sustainability, and enhances user experience.

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