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Smart DigiRation System

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Abstract
This project provides an effective solution over traditional ration distribution system. In traditional ration distribution system there are lots of challenges faced by users as well as ration distributor such as manual weighing of goods, delay in distribution, corruption etc. To overcome on these challenges created smart digiration system which has automated ration dispensing mechanism and effective authentication system which reduces corruption and manual efforts. Use of Raspberry pi and other effective components in smart digiration system makes an innovative and technologically advanced approach to streamlining the process of distributing ration supplies to beneficiaries.

Keywords: Smart DigiRation System, Digital Ration, Ration Distribution

1. Introduction

In rural area, ration beneficiaries are often faces an issue during distribution which causes delay in ration supply to users. These types of issue occurs due to , in traditional ration distribution system, authentication check and weighing of goods system is separate , that's why it consumes lots of time both of supplies and receiver. For these type of challenges during ration distribution, Smart DigiRation System plays an important role because it has ability to automate entire system.

Smart DigiRation System contains a large container which has combined authentication system as well as dispensing mechanism. Integration of the power of Raspberry Pi with this system offers a reliable, automated, and efficient solution that minimizes human intervention, reduces errors, and ensures transparency in ration distribution. By leveraging Raspberry Pi, this system can provide an intelligent, cost-effective, and scalable solution to monitor, manage, and distribute rations in a more automated, efficient, and transparent manner. Raspberry Pi is a popular choice for such applications due to its low cost, small size, and flexible capabilities. It can easily interface with a variety of sensors, cameras, biometric devices, and communication modules, making it an ideal platform for developing IoT (Internet of Things)-based solutions like the Smart Ration Distribution System

The smart digiration system includes effective authentication system which provides accurate dispensing of goods to beneficiaries. Use of RFID card for user authentication provides functionality and success of smart digitization systems, driving efficiency, security, and convenience across various applications like access control, data tracking, and automation. It incorporates various components, including RFID or

biometric sensors for user authentication, electronic weighing machines for precise measurement, and cloud-based data storage for real-time monitoring and analytics.

The Smart Ration Distribution System is an innovative solution designed to enhance the efficiency and transparency of public distribution systems (PDS). PDS is an essential component of many government schemes that aim to provide essential food grains and other commodities at subsidized rates to economically weaker sections of society. However, existing systems often suffer from inefficiencies such as long queues, fraudulent activities, and lack of accountability. Thus traditional ration distribution system relies heavily on manual processes, which can lead to inefficiency, corruption, and errors. In contrast, a smart digitization system using Raspberry Pi automates most processes, providing faster, more secure, and more efficient ration distribution, while also being cost-effective and scalable.

2. Objectives

- **To automate Beneficiary Authentication**: Implement a reliable and secure authentication process using RFID, biometric sensors, or mobile apps to ensure that only eligible recipients receive ration supplies.
- **Accurate Ration Dispensing**: Utilizes electronic weighing machines for accurate dispensing of goods such as rice, grain etc.
- **Transparency and Accountability**: Record and store all transaction data on a cloud-based system in real-time, enabling easy monitoring, auditing, and analysis by authorities.
- **To Minimize Manual Intervention**: Reduce human involvement in the ration distribution process due do atomization and minimize errors, delays, and corruption.
- **To Prevent Ration Diversion and Stock outs**: The use of RFID sensors and inventory tracking ensures that rationed goods are distributed according to the set quotas, reducing the chances of diversion or theft. Additionally, the system can send alerts about low stock levels, helping authorities replenish supplies before stock outs occur.
- **To Support Environmental Sustainability:** Reduce paper-based processes and smart digiration system helps to minimize environmental waste.

3. Applications

- **Public Distribution System (PDS):** Smart diration system is a generalized system which can be used for any public distribution system such as medicine, fruits etc.
- **Educational Institutions**: Implement in schools and universities to manage the distribution of meals under mid-day meal schemes or similar programs. The system can help ensure that students receive their meals on time, and it can track consumption data for better planning.
- **Agricultural Produce Distribution:** Farmer's cooperatives and agricultural organizations can use the system to distribute different types of seeds, fertilizers etc.
- **Healthcare Facilities:** Implement in hospitals and healthcare centers to manage the distribution of nutritional supplements, meals, and other essential supplies to patients, particularly in large facilities where distribution managing is complex.
- **Government Scheme**: Often government declares some welfare program for needy people such as food , cloths , medicine and other distributions , for these types of program system plays a crucial role.

4. Flow Chart

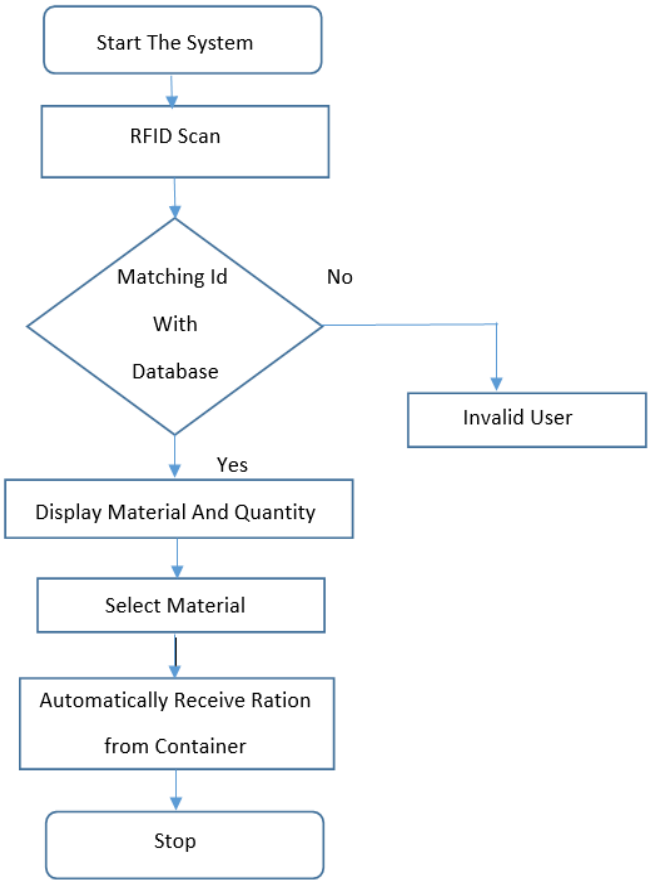


Fig.1 Flowchart of Smart DigiRation System

5. Block Diagram

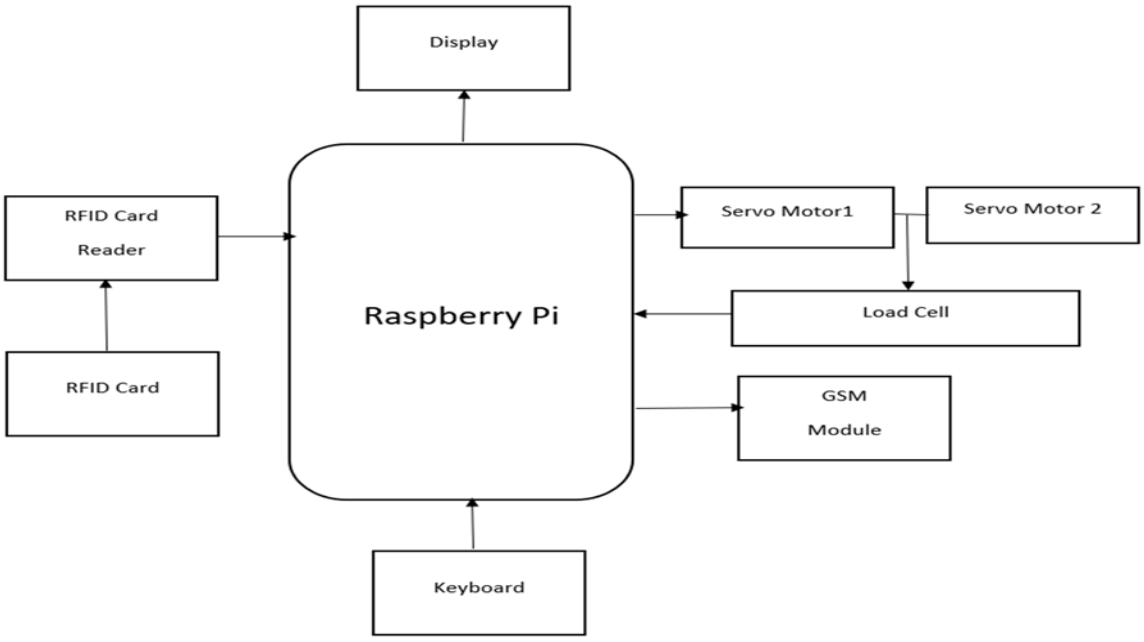
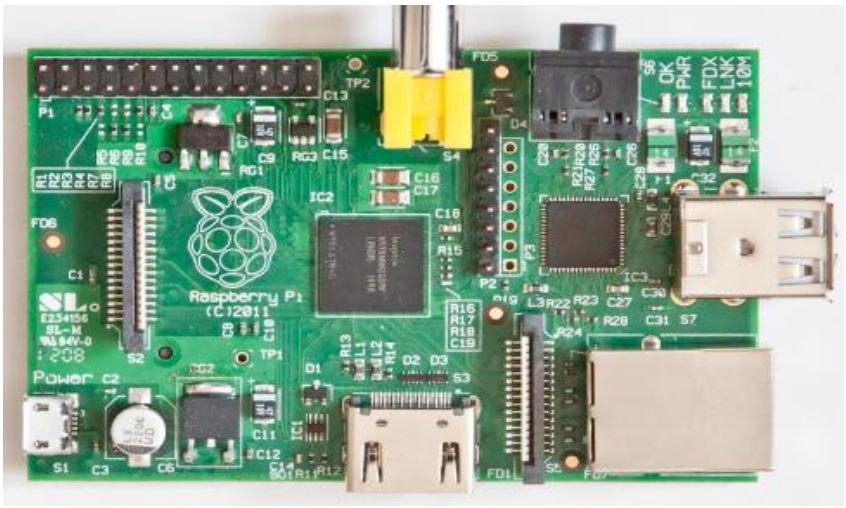


Fig.2. Block Diagram of Smart DigiRation System

6. Major Components

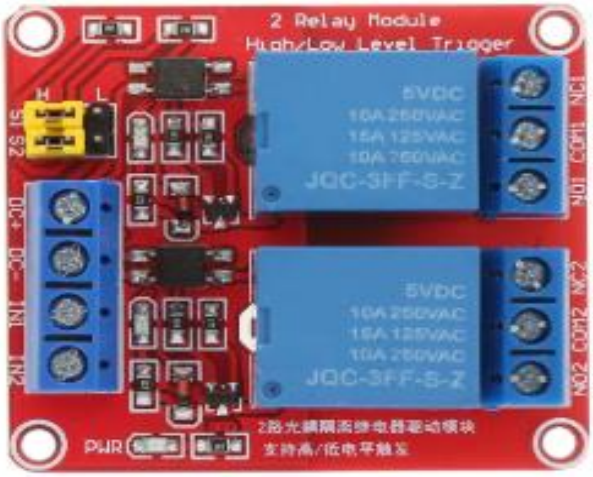
- **RFID Card** : Radio frequency identification cards for ration card holders

- **Raspberry Pi** : Suitable for integrating other devices such as sensors and helps in system automation



- **LCD Display**: The LCD display can show details such as user's name, family ID, and assigned good quantity.

- **Relay Module**: In a Smart Ration Distribution System, a Relay Module plays a crucial role in controlling and automating various hardware components that are essential for the system's operation



- **DC Motor:** DC motor can be used to automate the dispensing of ration items, such as grains, rice, wheat etc.

- **Keypad** : User can enter OTP received after authentication to check validity of user

- **DC Motor Driver**: DC motor driver plays a crucial role in controlling the operation of DC motors that are used for dispensing ration items.

7. Working Principle:

- **RFID based Identification:** Each eligible person is assigned an RFID tag .The RFID reader is installed at the ration distribution center (e.g., near the entrance or dispensing counter).When an individual presents their RFID card to the reader, the system verifies their identity and retrieves their ration card details from database.

- **Eligibility Check:** Once eligibility is confirmed, the Raspberry Pi activates a servo motor or solenoid valve to cloud server. This includes checking the user's ration card details, available balance (remaining rations), and current entitlements (such as monthly limits).If the user is eligible, the system proceed to next step , if not it will display invalid user

- **Ration Dispensing:** Once eligibility is confirmed, the Raspberry Pi activates a servo motor or solenoid valve to release the correct amount of ration (such as grains, rice etc.) based on predefined quantities. A load cell or weight sensor is used to measure the amount of food being dispensed to ensure the correct quantity is provided

- **Transaction Logging:** Each transaction (ration distribution) is logged into a database along with the user details, ration quantity, and time of distribution. This ensures transparency and prevents duplication or fraud by tracking all distributions. The logs can be stored locally on the Raspberry Pi.

8. Project Photos

9. Conclusion

The Smart Ration Distribution System using Raspberry Pi enhances efficiency, transparency, and security in public ration distribution. By utilizing RFID technology and automation, it ensures accurate beneficiary identification and prevents fraud. The system streamlines operations, reduces human error, and provides real-time data for better accountability. Raspberry Pi's cost-effectiveness makes it scalable, allowing easy implementation across various locations. Despite challenges like connectivity in rural areas, this system offers a modern solution to improve ration distribution, ensuring fair and timely delivery of essentials

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