

Automatic Ration Distributions Based on RFID Technology

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Abstract: *The current Indian government is taking all possible measures to transform India into a DIGITAL INDIA. Today's India is heavily reliant on automation. As India is a developing country, many poverty line people depend on public distribution system (Ration) for their livelihood. The present public distribution system involves a lot of corruption in the civil supply, including variations in the quantity of the ration items supplied, the need to wait in line for an extended period of time, which was inconvenient and time-consuming for a consumer, and the distribution of ration items to those without ration cards for higher-valued goods. This project implements radio frequency identification technology (RFID) for ration distribution in a smart and secure way. The system utilizes RFID technology to enable seamless and automated tracking, authentication, and distribution of ration items to eligible beneficiaries. The key components of the proposed system are RFID tags, readers, and backend databases, which includes communication protocols and security measures to ensure data integrity and confidentiality. The system also incorporates features such as real-time monitoring, and automated alerts for potential fraud or anomalies.*

Keywords: RFID Reader, RFID Tags, Arduino UNO, LCD, Ration Distribution

1. Introduction

The RFID-based smart and secure ration system using Arduino UNO presents a transformative solution for the traditional ration distribution system in India. This system leverages Radio Frequency Identification (RFID) technology and Arduino UNO microcontroller to create an efficient, transparent, and secure method of managing and distributing subsidized food grains through the Public Distribution System (PDS). India, with its vast population and diverse socioeconomic landscape, faces numerous challenges in ensuring the fair and efficient distribution of subsidized food grains to its citizens. The existing paper-based ration card system often suffers from issues such as leakages, corruption, and inefficiencies, leading to the denial of benefits to deserving individuals and wastage of valuable resources. To overcome these challenges and enhance the effectiveness of the ration distribution system, the integration of RFID technology with Arduino UNO emerges as a promising solution.

The RFID-based smart and secure ration system introduces the use of RFID tags, which serve as digital identifiers for ration cardholders. These tags are embedded with unique identification details, entitlement information, and other relevant data of the beneficiaries. The Arduino UNO microcontroller acts as the central processing unit, facilitating the seamless communication and coordination between the RFID tags, RFID readers, and the centralized database. During the ration distribution process, beneficiaries present their RFID tags to the RFID reader connected to the Arduino UNO. The reader captures the tag's data, including the cardholder's identity and entitlements, and verifies it against the centralized database. This authentication process ensures that only eligible beneficiaries receive their entitled quantity of subsidized food grains, minimizing the chances of fraud, leakage, and corruption.

The integration of Arduino UNO with the system adds intelligence and automation to the entire workflow. The microcontroller manages the real-time tracking and monitoring of ration distribution, maintains accurate records of supplies and transactions, and generates comprehensive reports for administrative purposes. Furthermore, automated notifications can be incorporated, notifying both the beneficiaries and the administrators about important updates and reminders related to ration distribution. By adopting the RFID-based smart and secure ration system using Arduino UNO in India, the government can achieve several significant outcomes. These include improved transparency and accountability in the ration distribution process, reduced leakages and corruption, enhanced efficiency and accuracy in record-keeping, and targeted delivery of subsidized food grains to the rightful beneficiaries. This system holds immense potential to streamline the ration distribution system in India and ensure that the benefits reach those who need them the most, thereby promoting food security and social welfare.

The proposed system comprises two main components: RFID tags and an Arduino UNO microcontroller. Each ration cardholder is assigned a unique RFID tag that contains essential information such as their identification details, ration entitlements, and other relevant data. The Arduino UNO microcontroller acts as the central processing unit, responsible for reading and processing the information from the RFID tags. During the ration distribution process, the ration cardholders present their RFID tags to the RFID reader connected to the Arduino UNO. The reader captures the tag's data, which is then authenticated and verified against the centralized database. The system ensures that only authorized cardholders receive their entitled rations, reducing the chances of fraudulent practices.

The Arduino UNO, equipped with appropriate programming

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logic, manages the entire workflow of the system. It facilitates real-time tracking and monitoring of ration distribution, maintaining accurate records of supplies, and generating reports. Additionally, the system supports automated notifications, alerting both ration cardholders and administrators about important updates, such as remaining ration balance or upcoming distribution schedules. The RFID-based smart and secure ration system offers several benefits over traditional manual methods. It eliminates the need for physical paper-based ration cards, reducing paperwork and administrative overheads. The system ensures fair distribution, reduces human errors, and promotes transparency in the allocation of ration supplies. The proposed system holds tremendous potential for implementation in various contexts, including government ration distribution programs, refugee camps, and humanitarian aid organizations. By leveraging RFID technology and Arduino UNO microcontroller, it offers an efficient, secure, and intelligent solution to address the challenges faced by traditional ration distribution systems.

2. Literature Survey

"Design and Implementation of an RFID-based Ration Distribution System" by Jain, P., et al. (2017) This paper presents a detailed study on the design and implementation of an RFID-based ration distribution system using Arduino UNO. It discusses the advantages of RFID technology in improving the efficiency and transparency of the ration distribution process. The authors present a prototype system and evaluate its performance in terms of accuracy, security, and scalability.

"Smart Ration Distribution System using RFID and Arduino" by Devi, K. K., et al. (2018) This research paper proposes a smart ration distribution system based on RFID technology and Arduino microcontroller. It focuses on the design and implementation of an efficient and secure system to ensure fair distribution of ration supplies. The authors discuss the integration of RFID tags with Arduino UNO and the use of biometric authentication for enhanced security.

"RFID-Based Ration Card System for Fair Distribution of Subsidized Food Grains" by Reddy, A. S., et al. (2019) This conference paper presents a novel approach to improve the distribution of subsidized food grains using RFID technology. The authors propose an RFID-based ration card system that utilizes Arduino UNO for data processing and communication. The paper discusses the system architecture, implementation challenges, and potential benefits of the proposed system.

"An IoT-Based Ration Distribution System using RFID and Arduino for Efficient Supply Chain Management" by Sahu, P., et al. (2020) This article explores the application of IoT (Internet of Things) in the context of ration distribution using RFID technology and Arduino UNO. It discusses the integration of RFID tags with Arduino-based smart devices to create a connected and intelligent system for efficient supply chain management. The authors highlight the potential of this system in reducing wastage and ensuring timely distribution of ration supplies.

"Development of an RFID-Based Ration Distribution System using Arduino" by Sharma, A. (2021) This thesis focuses on the development and implementation of an RFID-based ration distribution system using Arduino UNO. It provides a comprehensive overview of RFID technology and its application in the context of ration distribution. The author presents the system architecture, design considerations, and evaluation of the implemented system in terms of efficiency and security.

These literature sources provide valuable insights into the design, implementation, and benefits of RFID-based smart and secure ration systems using Arduino UNO. They discuss the advantages of RFID technology, the integration of Arduino UNO for data processing, and the potential impact of such systems on improving transparency, efficiency, and accountability in ration distribution processes.

3. Proposed Methods

Fig. 1 depicts the block diagram of an automatic ration materials distribution system based on RFID technology. This system is made up of a number of components, including a keyboard, GSM, motor driver, microcontroller, RFID, and microcontroller.

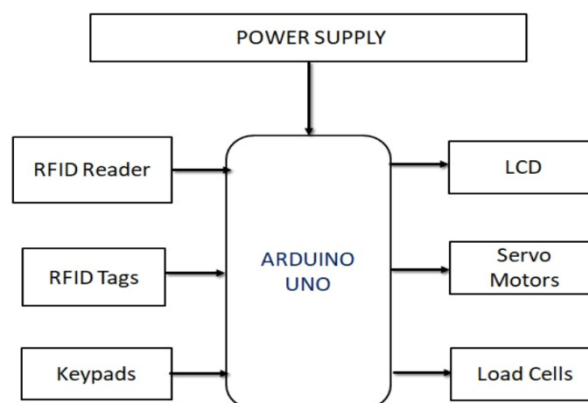


Figure 1: Block diagram for proposed configuration

3.1 Power Supply Circuit Diagram

The power supply is crucial for electronic circuits because it gives microcontrollers and other electronics devices the necessary power. Fig. 2 displays the power supply circuit diagram.

3.2 Microcontroller Circuit

The mechanism for distributing rationed supplies is powered by a microcontroller. There are several applications, including those that automatically regulate products, car engine control systems, medical devices, remote controls, office equipment, appliances, power tools, toys, and other embedded systems. The microcontroller is smaller and less expensive. Fig. 3 displays the circuit diagram for the microcontroller. The microcontroller receives the necessary clock signals from the 12 MHz crystal oscillator. Arduino UNO Microcontroller: The Arduino UNO acts as the central processing unit of the system. It is responsible for reading and processing the information from the RFID tags,

managing the data flow, and coordinating the various components of the system.

3.3 Motor with Driver Circuit

The motor driver circuit is used to provide proper matching between motor and circuits is as Fig.4.

3.4 LCD Display

A flat panel display, electronic visual display, or video display that makes advantage of the light-modulating capabilities of liquid crystals is known as a liquid-crystal display (LCD). Light is not directly emitted by liquid crystals.

Applications for the LCD include computer monitors, televisions, instruments, cockpit displays for aircraft, and signage. the most prevalent in consumer electronics and have mostly supplanted cathode ray tube (CRT) displays in devices including video players, game consoles, clocks, watches, calculators, and telephones. Compared to a CRT, the LCD panel is more energy-efficient. When compared to other gadgets, the power consumption is extremely low. The LCD circuit diagram is shown in the Fig.5.

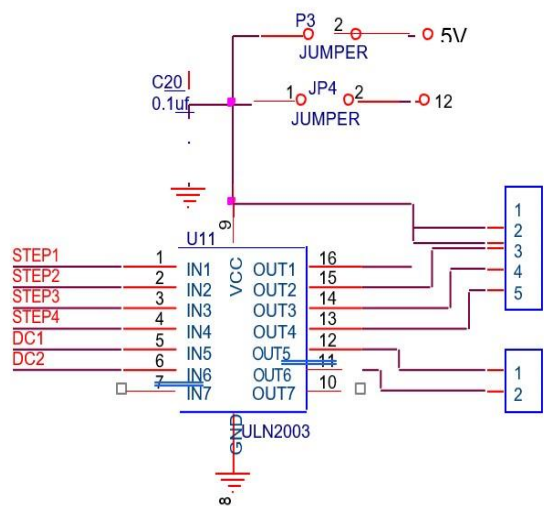


Figure 4: Motor Circuit

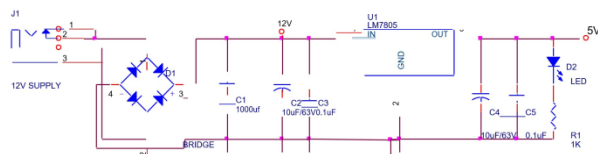


Figure 2: Power Supply

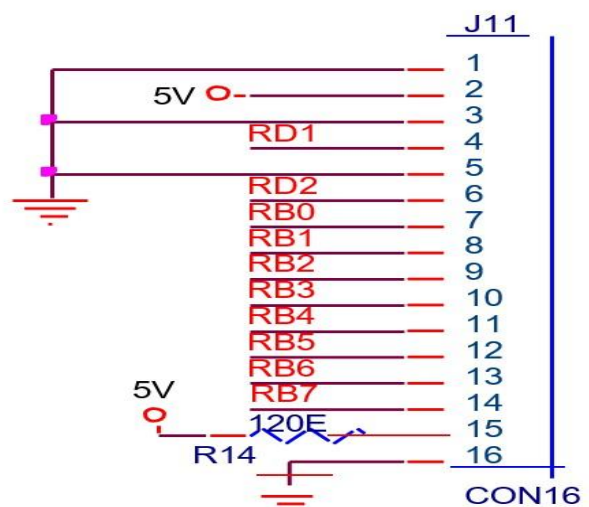


Figure 5: LCD display circuit

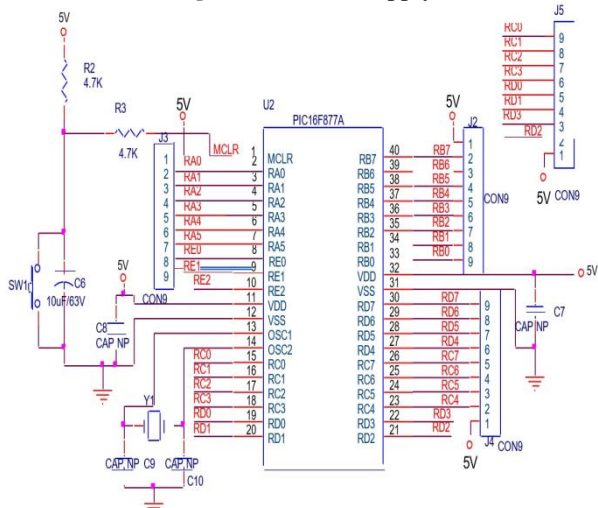


Figure 3: Microcontroller Circuit

4. Proposed System Configuration

The proposed system for the RFID-based smart and secure ration system using Arduino UNO aims to revolutionize the traditional ration distribution process by leveraging RFID technology and the Arduino UNO microcontroller. This system introduces automation, transparency, and security to ensure efficient and targeted distribution of subsidized food grains to eligible beneficiaries. The key components and functionalities of the proposed system are as follows:

- **RFID Tags:** Each ration cardholder is assigned a unique RFID tag that contains essential information such as their identification details, entitlements, and other relevant data. These tags serve as digital identifiers and are securely embedded with beneficiary information.
- **Arduino UNO Microcontroller:** The Arduino UNO acts as the central processing unit of the system. It is responsible for reading and processing the information from the RFID tags, managing the data flow, and coordinating the various components of the system.
- **RFID Readers:** RFID readers are deployed at designated Fair Price Shops (FPS) or distribution centers. These readers communicate with the RFID tags presented by the beneficiaries and capture their data, including identity and entitlements.

- **Centralized Database:** A centralized database stores the information of all ration cardholders, including their identification details, entitlements, and transaction records. The database serves as the reference for verifying the authenticity and eligibility of the beneficiaries during ration distribution.
- **Authentication and Verification:** When a beneficiary presents their RFID tag to the RFID reader, the system authenticates and verifies the tag's data against the centralized database. This process ensures that only authorized cardholders receive their entitled quantity of subsidized food grains, minimizing the chances of fraudulent practices.
- **Real-time Tracking and Monitoring:** The Arduino UNO, with appropriate programming logic, enables real-time tracking and monitoring of ration distribution. It maintains accurate records of supplies, tracks the movement of ration stocks, and generates reports for administrative purposes.
- **Automated Notifications:** The system supports automated notifications to both ration cardholders and administrators. Beneficiaries can receive notifications regarding their remaining ration balance, upcoming distribution schedules, and other relevant updates. Administrators can be alerted about critical events such as low stock levels or irregularities in distribution.

The proposed RFID-based smart and secure ration system using Arduino UNO offers numerous benefits over traditional manual methods. It enhances efficiency, transparency, and accountability in the ration distribution process, reduces paperwork and administrative overheads, and ensures that the subsidized food grains reach the deserving beneficiaries accurately and timely.



Figure 6: Proposed system prototype

The system holds tremendous potential for implementation in India's public distribution system (PDS), contributing to the effective management of subsidized food distribution, reducing leakages, and promoting social welfare. By leveraging RFID technology and Arduino UNO microcontroller, this proposed system brings intelligence and automation to the ration distribution system, addressing the challenges faced by traditional methods and enhancing the overall effectiveness of welfare programs. The RFID-based smart and secure ration system using Arduino UNO presents a transformative solution for the traditional ration distribution system, addressing the limitations and drawbacks of the existing manual processes. This proposed system harnesses the power of RFID technology and the Arduino UNO microcontroller to create an efficient,

transparent, and secure method of managing and distributing subsidized food grains to eligible beneficiaries. By integrating RFID tags with Arduino UNO, the system ensures accurate identification and verification of ration cardholders, minimizing the chances of fraud, leakage, and corruption. The use of a centralized database enables real-time tracking and monitoring of ration distribution, streamlines data management, and facilitates targeted delivery of subsidized food grains.

The proposed system offers significant advantages over the existing system. It enhances efficiency by automating processes, reducing paperwork, and improving data accuracy. The system promotes transparency and accountability by providing real-time tracking, monitoring, and generating comprehensive reports. It also addresses the vulnerabilities of the existing system, such as fraud, diversion, and inefficiencies in resource allocation. Implementing the RFID-based smart and secure ration system using Arduino UNO in India and other countries can have a profound impact on the welfare of citizens. It ensures that subsidized food grains reach the deserving beneficiaries accurately and timely, promoting food security and social welfare. The system contributes to the effective management of ration distribution, reducing leakages and corruption, and enhancing the overall efficiency of welfare programs. As technology continues to evolve, the RFID-based smart and secure ration system can be further enhanced by integrating with other advanced technologies such as biometric authentication and IoT for even greater efficiency and security.

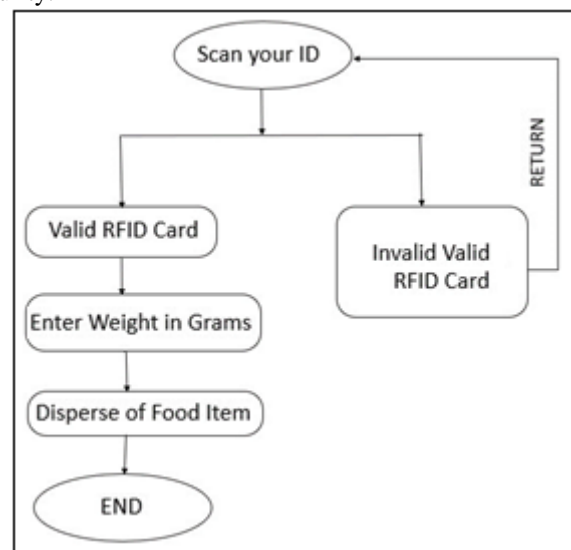


Figure 7: Flow Chart of Working Model

5. Result and Discussion

The Automatic Ration Materials Distribution based on RFID Technology used to distribute or vend the liquid or solid material, which is used for Ration materials distribution in ration shops. Initially everyone will be provided an RFID or smart Card, instead of a ration card. If the customer needs to get any ration material, the user has to show the ration RFID tag card to the RFID reader Kit, the reader that is incorporated with the project kit will recognize the RFID numbers show by the user. Each user will have a unique number, which is not visible to the

user.

This recognized RFID number will be given to a microcontroller, which compared the input number with the database. Before starting the system, the unique RFID number of the ration user will be programmed in the controller, such as User name & address details, date of expire of ration card, etc., so that the controller will recognize the data coming from RFID by comparing with the database.

Once the user is identified, the microcontroller will check whether the user has already bought the ration item belongs to that month. If not then, ration items to be dispensed will be displayed on the LCD screen, the user has to feed the comments that which ration item they are going to buy. If the user, select the ration item for purchasing purposes then the controller will calculate the amount of his or her buy and check with the amount of weight dispersed of ration item.

6. Output Results



Figure 8: Ration materials distribution kit

The ration materials distribution kit is an essential resource package designed to ensure equitable distribution of food



Figure 9: Show your RFID card

The Fig.9 shows how the LCD display Kit shows when power supply is given.

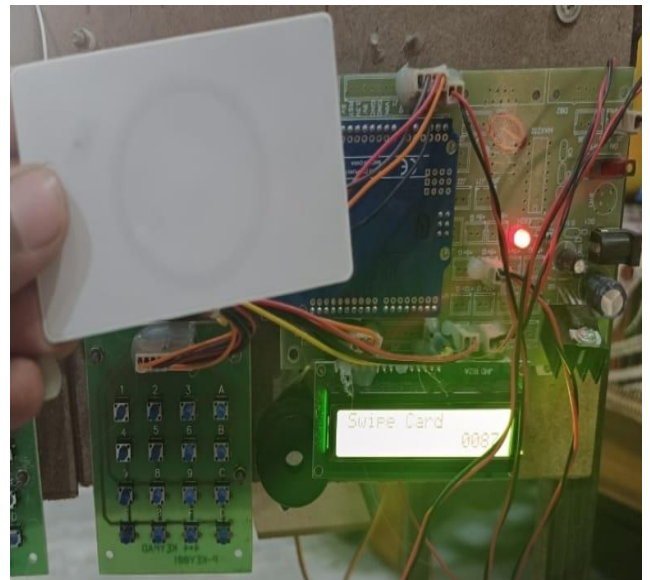


Figure 10: Scanning of RFID card

Fig. 10 shows the scanning of RFID cards in the Ration materials distribution kit enables efficient and accurate tracking of beneficiaries.



Figure 11: Scanning of invalid RFID card

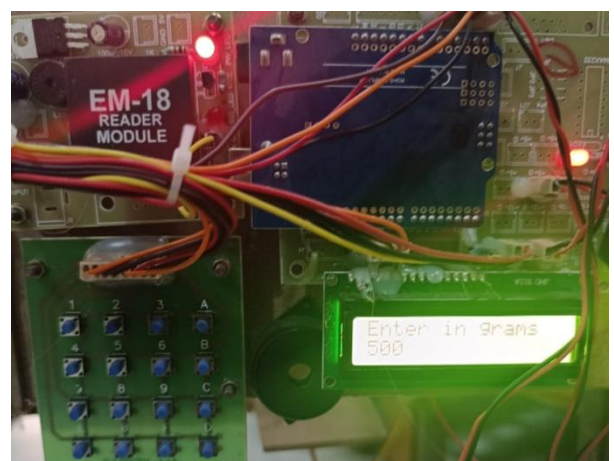


Figure 12: When a valid RFID is scanned

Fig.12 ensuring seamless distribution and reducing the risk of fraud or duplication by taking input Weight



Figure 13: Disperse of Food item

Fig. 13 shows the disperse of food items involves the systematic and organized distribution of essential sustenance to individuals

7. Conclusion

The RFID-based smart and secure ration system using Arduino UNO offers a promising solution to the challenges faced by the traditional ration distribution system. By leveraging RFID technology and Arduino UNO, this system brings automation, transparency, and accuracy to the distribution process, ultimately benefiting both the beneficiaries and the administrators involved in ensuring the fair and efficient distribution of subsidized food grains.

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