

IOT Based E-Rationing System

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Abstract

The implementation of an IoT-based E-Rationing System utilizing RFID (Radio Frequency Identification) and Arduino technology presents an innovative solution to enhance the efficiency, transparency, and security of public distribution systems (PDS). Traditional rationing systems face numerous challenges such as fraud, misuse, manual errors, and inefficiencies in managing stock. This proposed system addresses these issues by automating the rationing process through RFID-enabled identification and an Arduino-based microcontroller for real-time monitoring and control. The integration of IoT technology enables remote monitoring of ration stock levels, preventing shortages or wastage, and ensuring timely restocking. Additionally, the system ensures that only authorized individuals receive the correct quantities of essential goods, minimizing fraud. By automating ration distribution and record-keeping, this IoT-based E-Rationing System promises to streamline PDS operations, reduce operational costs, and provide a more accountable and transparent solution for public food distribution.

Keywords: *IoT, E-Rationing System, RFID, Arduino, Public Distribution System, Automation, Transparency, Inventory Management, Fraud Prevention.*

INTRODUCTION

The ration distribution process is a government welfare programs aimed at ensuring food security for vulnerable populations. Established to provide essential commodities such as rice, wheat, sugar, and kerosene at subsidized rates, this system plays a crucial role in mitigating

hunger and poverty among low-income households. The traditional ration distribution process involves verifying eligibility of beneficiaries using Biometric. These individuals or families are issued ration cards, which serve as their proof of entitlement. Monthly quotas of essential goods are allocated to each household based on the number of family members, and these goods are distributed through a network of fair price shops and keeping records of transactions in ration card. It provides essential commodities at subsidized rates but can face issues like inefficiencies and corruption. In some ration store dealers involve in malpractices like diverting a food grain to open market to make profits. As a result, there is possibility of beneficiary sent back with a no stock sign even though there are food grains in stock.

An E-Rationing System is an electronic solution proposed to automate the process of distributing ration supplies, such as food grains and other essentials, to eligible citizens. The traditional manual rationing system often involves physical ration cards and manual entries, which are prone to errors and misuse. An E-Rationing System leverages technology like RFID (Radio Frequency Identification) and microcontrollers, such as Arduino to streamline secure the distribution process. This system ensures that only authorized individuals can access their allotted rations, thus minimizing fraud and enhancing efficiency.

An IoT-based E-Rationing System using RFID and Arduino aims to address these issues by automating and streamlining the ration distribution process. This system ensures transparency, minimizes human intervention, and provides real-time data for monitoring and analysis. The RFID card has a unique identity wide variety. The beneficiary scans the cardboard on an RFID reader that is interfaced with the microcontroller kept at the ration shop. As soon as beneficiary is tested via password, the device asks the beneficiary to pick the appropriate amount of material.

PROBLEM STATEMENT

The Public Distribution System (PDS) is a critical component in ensuring that essential commodities, such as food grains and other subsidized goods, are distributed to eligible beneficiaries. However, the traditional PDS faces several significant challenges:

- **Inefficiencies in Distribution:** Manual processes and lack of automation result in long wait times, administrative delays, and errors in ration distribution. like RFID (Radio

Frequency Identification) and microcontrollers, such as Arduino to streamline secure the distribution process. This system ensures that only authorized individuals can access their allotted rations, thus minimizing fraud and enhancing efficiency. An IoT-based E-Rationing System using RFID and Arduino aims to address these issues by automating and streamlining the ration distribution process. This system ensures transparency, minimizes human intervention, and provides real-time data for monitoring and analysis. The RFID card has a unique identity wide variety. The beneficiary scans the cardboard on an RFID reader that is interfaced with the microcontroller kept at the ration shop. As soon as beneficiary is tested via password, the device asks the beneficiary to pick the appropriate amount of material. This often leads to overcrowding, poor service quality, and dissatisfaction among beneficiaries.

- **Fraud and Misuse:** The PDS is prone to corruption, fraud, and pilferage. Ineligible individuals may receive rationed goods, while eligible beneficiaries are either excluded or given incorrect quantities. Manual record-keeping also increases the risk of errors and unauthorized access to the system.
- **Lack of Transparency:** Without a real-time system, it is difficult to monitor transactions or verify that rations are being distributed correctly. The absence of transparent reporting mechanisms hinders accountability and can lead to mismanagement.
- **Inventory Management Challenges:** Stock levels of rationed goods are often poorly tracked, leading to shortages, wastage, or delays in restocking. The lack of real-time monitoring can cause inefficient allocation of resources, especially in remote areas or high-demand periods.
- **Operational Costs:** Manual verification, paper-based records, and human oversight increase the operational costs of the PDS, creating unnecessary overhead for the government and rationing agencies.

OBJECTIVES

- To study on E-Rationing distribution process.
- To design and develop an automated E-Rationing system using IOT technology.

- To implement RFID-based system to authenticate users.
- To provide secure data management and real time updates

SYSTEM ARCHITECTURE

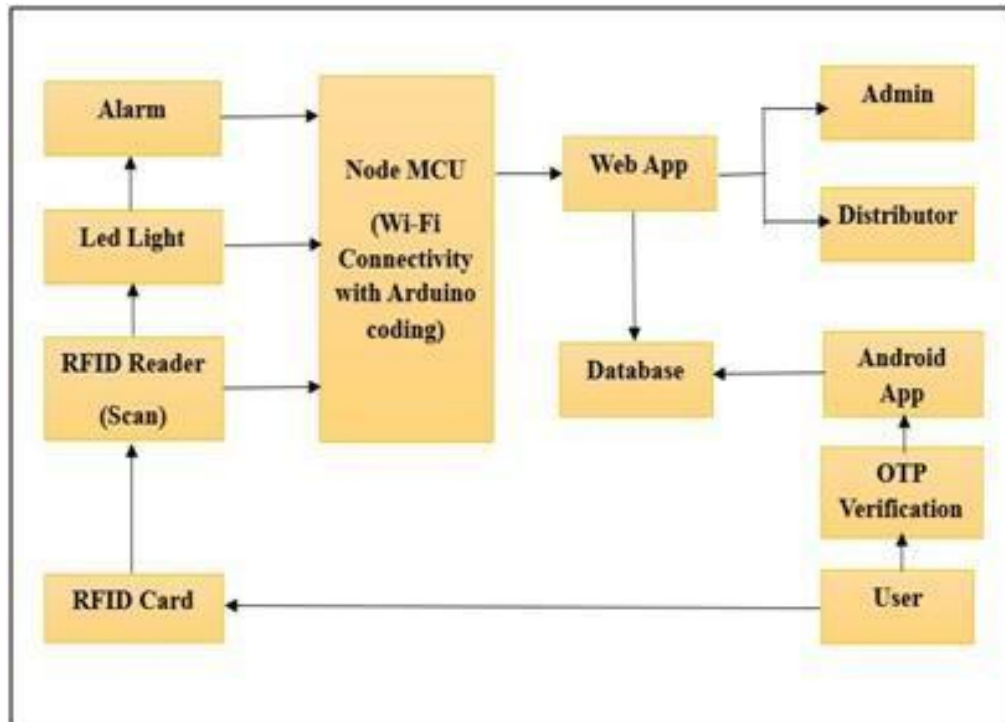


Figure no.1: System Architecture

Architectural design consists of several components such as user, RFID reader, OTP verification, Arduino, web app, android app and database. The user arrives at the fair price shop with a RFID card entitled to him/her. The user has to be validated, which includes authentications.

It includes swiping the RFID card over RFID reader. Users are validated on checking the RFID Card ID from the database. His/her RFID card ID is used to fetch information on to the main interface.

MODULES

There are two Modules

1. Software Module

- System Controller

- Distributor
- Access Controller

2. Hardware Module

SYSTEM CONTROL MODULE

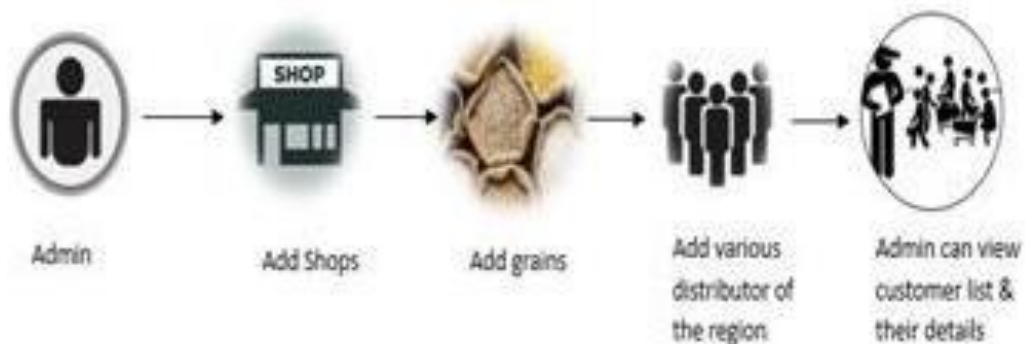


Figure no. 2: Flow of System Control Module

The web application can be accessed by the admin. Admin and Distributor share the same web application.

- System Control Module (Admin) can login the system by its username and password.
- After words the admin can add the shops, grains, and distributors of various region.

Admin give the username and password to each of the distributor of the region. Also, admin can view the customer list and can see the detail information of the customer.

Distributer Module



Figure no. 3: Flow of Distributer Module

The web application can be accessed by the distributor by its username & password.

- Distributor scans the RFID card and add the customer details to the card.
- Distributor can view the customer list and product list of the customers after the verification of the customers distributor gives product to the customers.

ACCESS MODULE



Figure no. 4: Flow of Access Module

- The Android application can be accessed by the user by its username & password.
- Customers can login to the application by their username & password.
- Customers can view the product details like price, weight that they will get. Also view the history of the product they purchased.

Hardware Module

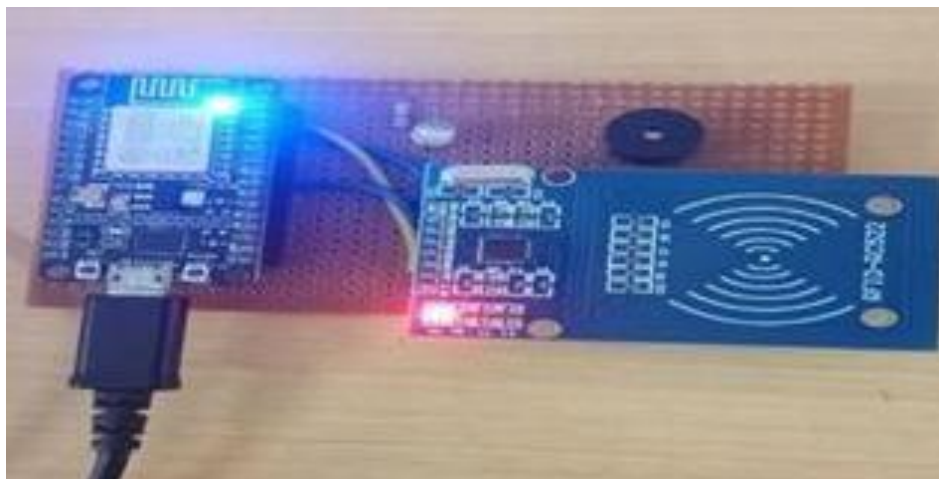


Figure no. 5: Hardware System

CONCLUSION

The implementation of an IoT-based e-rationing system using RFID technology significantly enhances the efficiency, transparency, and accountability of the public distribution system (PDS). By automating the process of ration distribution and integrating real-time data monitoring through IoT, the system minimizes human intervention, thereby reducing corruption, fraud, and leakage of resources.

RFID cards provide a secure and user-friendly means of identification for beneficiaries, ensuring that only eligible individuals receive their entitled goods. Furthermore, the system can be easily scaled and integrated with government databases like Aadhaar for additional verification and tracking, promoting a more inclusive and robust welfare distribution mechanism.

In conclusion, this smart rationing solution not only streamlines operations and improves user experience but also sets the foundation for a more transparent and accountable public welfare system, contributing to better governance and equitable resource allocation.

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