

SMART RATIONING SYSTEM

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Abstract— One of India's biggest and most significant economic measures is the rationing system. This policy's main objective is to offer food grains to the populace at a reduced cost in accordance with their individual economic backgrounds. All around India, ration shops that have been approved by the government are available to give people access to food security. While being supported by the government, this system has several flaws and restrictions. The proprietors of ration shops might stockpile food grains in order to sell them for more money on open markets. As a result, the eligible persons either receive less than they are entitled to or do not obtain the goods that are lawfully allotted for them. People occasionally might not even be aware that rations are available at the stores. The dealer can also enter transactions incorrectly or sell food at prices much higher than those advised by the government. These frauds cause the rationing system to become severely corrupt. Additionally, there is no trustworthy method in place for the government to obtain confirmation of the distribution of food grains. By removing human participation from the entire process, the Smart Rationing System contributes to the reduction of systemic malpractices while ensuring that everyone receives their fair share of essential necessities.

Keywords— Finger print sensor, Ration system, GSM, IoT, Dispensing, Database management.

I. INTRODUCTION

In India, the Smart Ration System is a modern and revolutionary public distribution system (PDS) that uses biometrics and GSM technology and is highly helpful for effective, precise, and automated ration distribution. The suggested method intends to prevent problems such excessive food grain storage, manual and inconsistent entry in stock records, and manual effort by automating the ration shop and making user identification easier. Automation is used for tasks including client identification, the distribution of goods, billing, and data update, among others. Two techniques are used to authenticate the eligible users: first, a fingerprint sensor R307 and second, a password. Next the database is checked for the user's account, and if a match is discovered, the user is recognised as a genuine user; otherwise, it is an invalid user. Upon user authentication, the user is prompted to enter the quantity of commodities they desire from their available balance. Two solid goods, such as rice, wheat, etc., and one liquid commodity, such as oil, paraffin, etc., are to be distributed using this system. Data is updated in the database after commodities are distributed properly. The user receives this information through SMS with the help of a GSM module so that they can monitor their past purchases. By logging into the website, the user may also view information about the product and their available balance. This renders the entire transaction secure and free of corruption.

II. LITERATURE SURVEY

A. Existing Systems

There are several research papers which provide us useful details as well as various approaches to build a smart dispensing system.

In Ref. [7], the automated ration distributing mechanism helps to curb any fraudulent activities. Fingerprint verification is used to authenticate eligible users and prevent unauthorized access. The fingerprint validation process uses Minutiae extraction-based algorithm. The products and their quantities are selected with the help of an Android application to verify the details of the products that are to be purchased. To login in the app, the consumer can enter username and password. The various options available for the user in the app include the “View” option to view the user’s profile. The “Enroll” option can be used to enroll the user’s fingerprints. The “Purchase” option shows the list of available options for that particular user regarding the food products that can be procured based on the corresponding limit. The delete option can be used to delete a particular person’s detail or data that is wrongly entered. Products like rice and sugar are connected to DC motors for dispensing to the consumers. A hydraulic valve arrangement is used for dispensing oil. All these units are controlled with the help of Raspberry-Pi. The details of the dispatched commodities are sent to the user automatically via SMS. The user details and their respective transactions are stored in the database.

In Ref. [8], the project is formulated in such a way that the consumer who needs the goods from the public distribution system can follow the procedure to enter the validated 12-digit serial number on the government website. That shows all the details on the webpage about the consumer based on the serial number because already the information is enrolled in the 11 government’s registration website, which communicates with the microcontroller that incorporates an embedded system. And then it shows the option to choose the language, products, kilograms, and confirm the required cost for the products. It will be able to withdraw the goods; if the balance is efficient, the system will continue to deduct the amount for the required goods. Suppose The balance is inefficient. When the system displays an insufficient balance, the process will shut down automatically. In modern automatic ration distribution systems, through two containers that are connected to the microcontroller—

one that houses the liquid submersible pumps for kerosene and another that contains the materials to be poured—the mechanical assembly, along with the servomotor, helps to provide the required amount of rice, sugar, wheat, etc. for the kerosene. Here, the main difference in the formulation of the project is the microcontroller used, the Arduino Mega 2560, and the LDR L293D is used to determine whether the goods are available in the container or not.

In Ref. [1], a biometrically secured ration system with fingerprint scanner for user authentication using Raspberry Pi. Also allows users to track their transactions using an Android app.

In Ref [2], a camera is used to scan the QR code which is already present on the Aadhaar card, and the information that we get by scanning the Aadhaar card QR code is compared with the information already stored in the database.

B. Project Methodology

In this project, an automated system is developed for dispensing ration items to eligible consumers. The consumers’ accounts are validated using user’s respective fingerprints using fingerprint module [6]. The particular account is searched and verified in the database for the purpose of validation. After successful validation of account, the items are dispensed as per the consumers’ eligibility. This makes the whole transaction process reliable and corruption free [3] [9].

III. PROPOSED SYSTEM

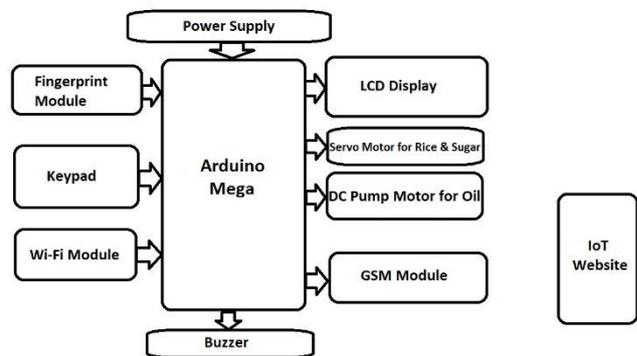


Fig 1. Block Diagram

In the proposed system, we are developing a smart rationing system [4]. Each user will go through a authentication process which is done using biometric

technology. Biometric technology involves the use of fingerprint module. Along with biometric system we are giving the user another option for authentication which is password. Once the system is turned on Wi-Fi module extracts the information about user from the IoT website. The LCD display the commodities available along with the balance amount user has with his account. Along with this it also displays when the SMS of information containing balance and commodities left is sent on the LCD screen. Keypad is used to give inputs. Servo motor DC pump motor are used to dispense solid and liquid commodities respectively. Arduino Mega is the microcontroller used to control all the above mentioned processes.

A. Hardware Requirements

- R307 Optical Fingerprint Reader Sensor Module: To scan the fingerprint of the user and store it in database with a certain ID which helps to authenticate users .
- Mega 2560 ATmega2560-16AU Board: It is used to process the input data i.e. the authentication part and based on which it controls the motors for dispensing the food items along with displaying user's information through LCD.
- ESP-07 ESP8266 Wi-Fi Wireless Module: To establish connection between Arduino Nano and RASIoT website.
- LM259 6s Voltage Regulator: It is used to regulate the voltage throughout the circuit.
- GSM Sim800C Module: For establishing normal message communication between the system and user.
- Servo Motor: For dispensing solid commodities. The dispensing action is performed upon microcontroller's instruction.
- L298 Motor Driver DC Pump Motor: Dispenses liquid commodities. The dispensing action is performed upon microcontroller's instruction.
- 4x4 Keypad: To enter the user inputs. Arduino Mega takes input's from the keypad.

- I2C 20x4 Arduino LCD Display: Displays the user information on screen. Information displayed is extracted from Arduino Mega which extracts information from IoT website using Wi-Fi Module.
- LED: Two LED's are used of Green and Red colour to indicate valid and invalid response respectively.

B. Software Requirements

- Proteus: Proteus Software is a tool to simulate and test electronic circuits. It includes libraries of different modules, using which we can simulate circuits. It is two-dimensional. circuitry designer. It was invented by Labcentre Electronics. This tool also helps with PCB design. With the tool Auto replace, it places components on the PCB automatically and allows the user to change position as per need. It also gives the functionality of drawing tracks between boards on a PCB board. Hence, it is very useful for hardware designers.
- Arduino IDE: In addition to a textbook editor for writing law, a communication area, a textbook press, a toolbar with buttons for constantly used operations, and a number of menus, the Arduino Integrated Development Environment, occasionally known as the Arduino Software(IDE), is also available. In order to upload programs and communicate with them, it connects to the Arduino tackle.
- VS Code: It is an open source and free to use integrated development environment. visual Studio Code is a streamlined law editor with support for development operations like debugging, task handling, and interpretation control. It aims to give just the tools a inventor needs for a quick law- figure- debug cycle and leaves more complex workflows to fuller featured IDEs, similar as Visual Studio IDE.
- HTML: It is an acronym for "Hyper Text Markup Language", and is used for creating basic structure of any webpage.
- CSS: It is an acronym for "Cascading Stylesheets", and is generally used for web

page visualization and presentation, formatting of layout and designing of a webpage.

- Javascript: It is a programming language that is used to control the functioning and working of different components embedded within a webpage.
- Bootstrap: Bootstrap is a free, open source frontal- end development frame for the creation of websites and web apps.It helps us to create device friendly websites along with large collections of template designs.
- PHP: The term "Hypertext Preprocessor" refers to a popular general-purpose open source scripting language that is especially well suited for web development and may be incorporated in HTML.
- Database Connectivity using MySQL: A connection is a feature of computer science that enables user interaction with database server software. Whether located on the same system or in another location, a user can connect to the database server. Therefore, connections are necessary if we wish to communicate with the database server to transmit commands and get responses in the form of result sets. We will discover numerous methods of connecting to MySQL Server in this article. The MySQL command-line client program enables both interactive and non-interactive communication with the database server. This program is located in the MySQL installation folder's bin directory.

C. Construction

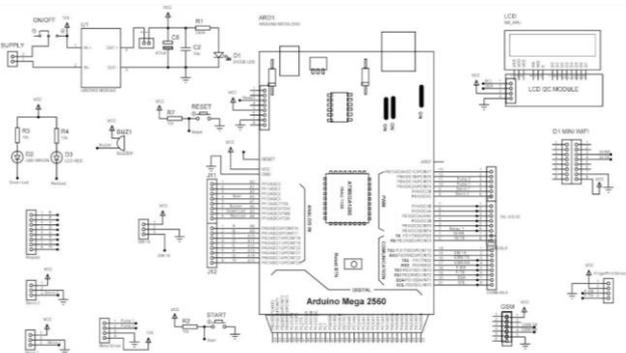


Fig 2. Circuit Diagram

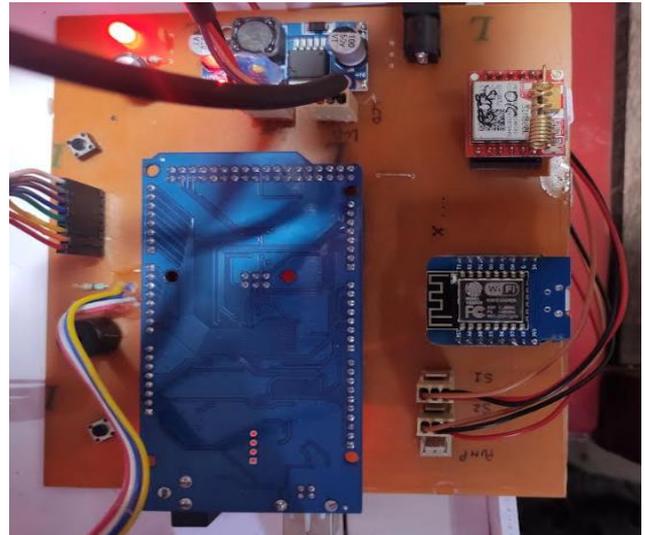


Fig 3. Hardware Module

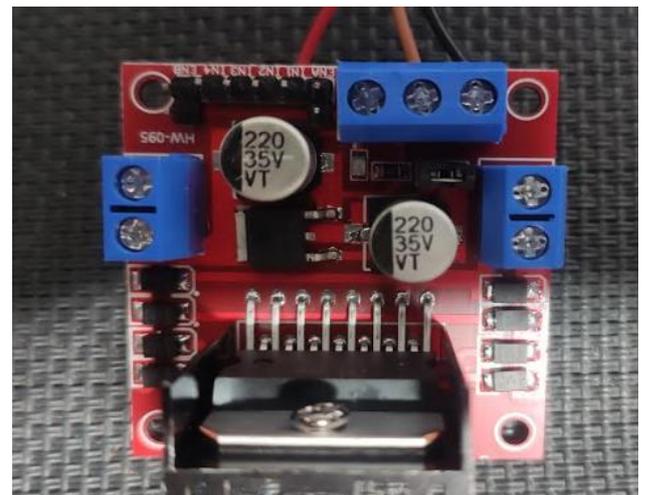


Fig 4. Pump Motor Driver

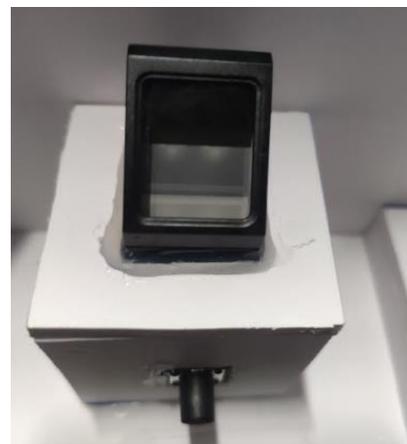


Fig 5. Fingerprint Scanner



Fig 6. Keypad

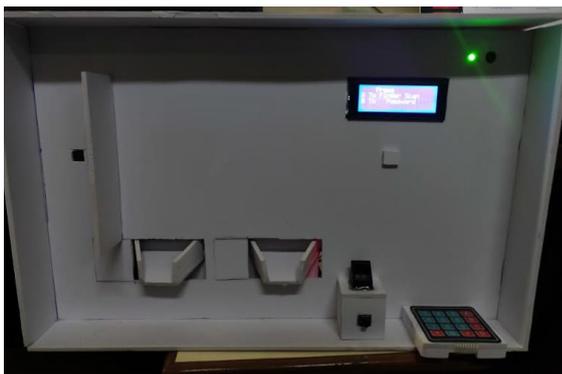


Fig 7. Final System

The construction is done in such a way that firstly the Fingerprint sensor R307 is connected to Arduino mega 2560 microcontroller board. The 5V and the Gnd pin of the Fingerprint sensor is connected to the Vcc and Gnd pin of the Arduino Mega board. The Txd and Rxd pins of the fingerprint sensor are connected to the Rx1 and Tx1 pins of the Arduino mega board. Buzzer is provided to notify the authentication of the customer. Positive terminal of the buzzer is connected to the Vcc and negative terminal is connected to the A6 pin of the Arduino Mega board. Two Led's Green and Red are used for displaying valid user and invalid user respectively. They are connected in such a way that one end is connected to Vcc via a 10k resistor and other end is connected to pin A5 and A4 of the Arduino Mega board respectively. We have used a LCD along with its LCD I2C module connected to it, the SCL of the LCD I2C module is connected to the SCL pin of the Arduino

Mega board also the SDA pin of the LCD I2C module is connected to the SDA pin of the Arduino Mega board, also its Vcc and Gnd are connected to Vcc and ground respectively. The voltage regulator module LM2596S is used to regulate the voltage throughout the circuit and acts as a step down DC-DC voltage converter. The GSM module SIM800I is used for sending SMS to the customers. The Vcc and Gnd pin of the GSM module are connected to the Vcc and ground respectively, and along with that the Tx and Rx pin of the GSM module is connected to the Tx2 and Rx2 pin of the Arduino Mega board. PCINT16,17,18,19,20,21,22 and 23 pins of the microcontroller are for the Keypad. PH6 and PH5 pins of the microcontroller are for the 2 servo motors. PCINT5 and PCINT4 pins of the microcontroller are for the 2 Pump motors. The ESP D1 Mini wifi module is used for making connection with the IOT website. The Rx and Tx pins of the wifi module are connected to the Tx and Rx pins of the Arduino Mega board respectively.

D. Working

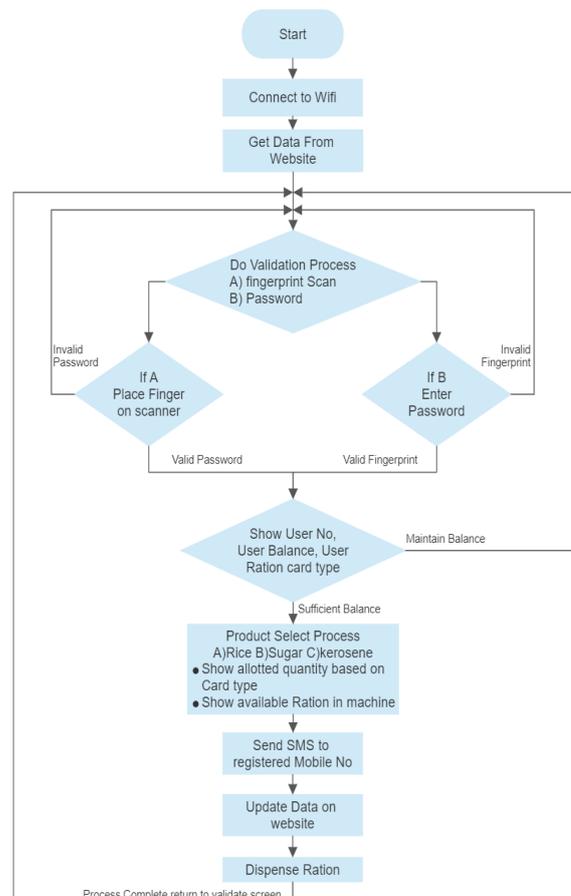


Fig 8. Flowchart

After the system is powered up, the first step is that the system connects to the wifi and gets the data from the website. Then the Authentication of the consumer happens. The consumer has two options for authentication first, by fingerprint scan and second, by entering password. If the consumer's account is not validated, the consumer may try again. If the account is validated, then that particular consumer's account data is displayed on the LCD screen. As per the eligibility, the required amount of items can be entered via a keypad. The relay then triggers the dispensing process. This transaction is then relayed to the consumer via SMS, which concludes the current transaction [10].

list page shows us the is of customers which are currently using this facility of smart rationing system.

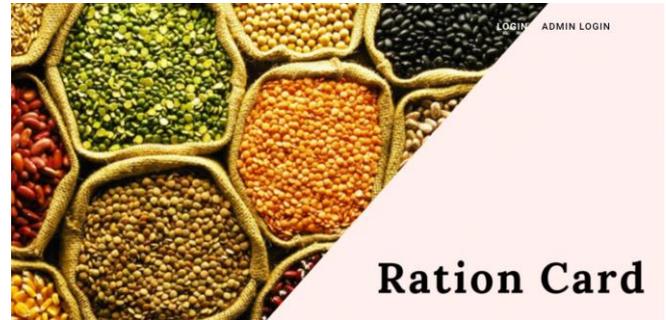


Fig 9. Home page

E. Website Interface and working of Smart Rationing System

Once you go onto the link of smart rationing system

(<http://finalyeariotprojects.co.in/ration/index.php>) you will be viewing the Home page of the website [5]. Over there on the navigation bar there are two buttons. One for user login and one for admin login. Once you click on the user login button then you will be directed to the sign in page where the user has to enter username and password to validate himself/herself. Over here the user can reset his/her password also. Once the user logs in himself/herself then he/she would be directed to the user dashboard where his/her purchase details are visible. On the left side of the user dashboard there are three buttons namely Add Balance, My details and Clear Transactions. By using the add balance button the user can add extra amount to his account if his wallet gets empty. By clicking on the My Details button the user can view his/her details like id, username, email-id, category of card. And by clicking on the clear transactions button his/her transactions will be deleted from the user dashboard. On the right side of the user dashboard there is a logout button, to logout from the website. The admin login dashboard comprises of list of all the customers, information of all the customers, option button to reset password, delete customer and view customer. On the left side of the admin dashboard there are four buttons add customer, change limit cost, view transactions and customer list. Once you go onto the add customer button, you can add a new customer by filling its required details. By using the change limit cost-button you can change the cost of particular products which are being dispensed as well as you can change the quantity of products allocated to particular type. On view transactions page you can view all the transactions made by all the customers. The customer



Fig 10. User Dashboard

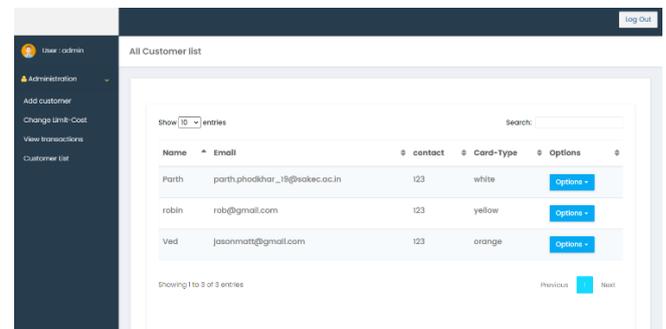


Fig 11. Admin Dashboard

IV. RESULT AND CONCLUSION

Step 1

Selection of user authentication method.



Fig 12. Authentication Methods

Step 2

If A is selected, then scan the fingerprint.

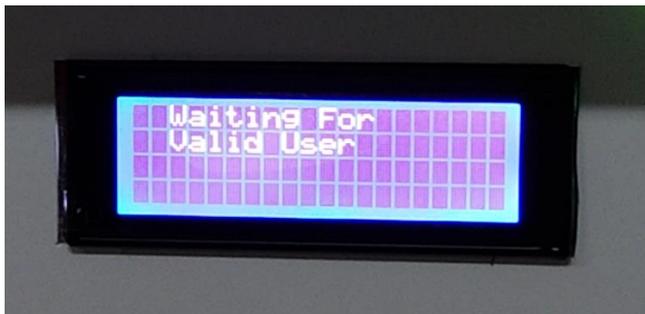


Fig 13. Waiting for user



Fig 14. Fingerprint Scan

If B is selected, then enter the password.



Fig 15. Enter Password

Step 3

Valid User

For Fingerprint Scan:



Fig 16. Match Found



Fig 17. Valid User

For Password:



Fig 18. Valid Password



Fig 19. Valid User

Invalid User:
Repeat step 2



Fig 20. No match found



Fig 21. Invalid User

Step 4

Enter the amount of products required as per the eligibility and availability.



Fig 22. Select Products



Fig 23. Select Quantity of products

Step 5

Dispensing the commodities.



Fig 24. Rice dispensing



Fig 25. Sugar dispensing



Fig 26. Dispensed product 1 (Rice for reference)



Fig 27. Dispensed product 2 (Wheat for reference)



Fig 28. Dispensed product 3 (Water for reference)

Step 6

Transaction details sent by SMS to the user.



Fig 29. SMS Sent



Fig 30. Received SMS

V. FUTURE SCOPE

1. Payment Gateway
2. For better understanding, the interface and website can be made available in different languages (regional languages).
3. App can be developed for the beneficiaries to check the commodities available.
4. Automatic weighing system can be implemented for precise quantities.

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