24/7 KIOSK AUTOMATED RATION VENDING MACHINE

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Abstract: -The government-sponsored public distribution plan is a framework that consists of a network of stores. The goal of this program is to offer commodities and food grains to individuals at a reasonable cost. Public distribution schemes suffer from a number of issues, including availability, overcharging, timeliness, insufficient supply, illicit products smuggling, and corruption. Customers may easily acquire and trade basic ration goods using our suggested automated vending machine. Automated processes include data updating, billing, client identification, and the distribution of commodities. The fingerprint verification process completes the client identification process. An automatic dispensing mechanism that accurately gauges and delivers the goods in the proper quantities is built into the machine. To ensure smooth transactions, payment processing devices such card readers and mobile payment choices are linked. By immediately implementing the suggested plan in the current ration shops, the labor-intensive tasks related to commodity distribution may be minimized. All actions take place in compliance with the laws and regulations since they will all be observed by the food supply department. To make sure the equipment is operating, there are mechanisms in place for routine maintenance and monitoring.

IndexTerms - government-sponsored public distribution plan, Dispensing machine, Ration shops.

I. INTRODUCTION

The Food Ministry is in charge of overseeing the public distribution of ration supplies, although administering it is made extremely difficult by India's enormous population. Ration stores provide monthly supplies to about 1.21 billion people, or 29.8% of the population who live below the poverty line (BPL). Achieving food security for every person is essential to the development and prosperity of the nation. The availability of enough amounts and high-quality food items at reasonable rates, especially for people in lower economic strata, at the appropriate times is referred to as food security. Founded in 1951, the Food Corporation of India (FCI) is a key player in the procurement, storage, and distribution of food commodities via the Public Distribution System (PDS) system, offering the public discounted prices. In an effort to address shortages, the Public Distribution System (PDS) was created with the goal of offering food grains at reasonable costs. Since its establishment, PDS has grown to be an essential part of the government's food monetary plan and has been instrumental in regulating the nation's food supply. PDS is meant to serve as a backup system, but it is not meant to satisfy every household's or society's need for distributed goods; rather, it is meant to act as a safety net and promote food security. In order to guarantee effective operations, the Government of India and State/UT Governments work together on the Public Distribution System (PDS). The Food Corporation of India (FCI) is the entity that the Central Government uses to manage the transportation, storage, and bulk distribution of food grains to State Governments. State governments, however, are in charge of intrastate distribution, qualifying households, providing Ration Cards, and managing Fair Price Shop operations (FPSs). Presently, the PDS supplies States and UTs with basic commodities like wheat, rice, sugar, and kerosene; however, in order to meet local requirements and preferences, certain States and UTs additionally provide PDS outlets with other products including pulses, edible oils, iodized salt, and spices. Other items including pulses, edible oils, iodized salt, and spices are

also supplied to PDS stores by some States and UTs to cater to local needs and tastes. Given that India is the most populous nation, ration distribution is the main issue. The Ministry of Consumer Affairs, Food and Public Distribution was formed by the Indian government to oversee a food distribution system that was co-managed by state governments. The people are given rations under this arrangement. Among the products are soaps, rice, wheat, salt, and oil. Ration stores, which are big distribution shops, are used to distribute these goods. This public distribution system is managed by the governmentowned Food Corporation of India. One of the most important government business initiatives is the Public Ration Distribution System structure. Its primary goal is to supply the public with food supplies (such as sugar, wheat, rice, kerosene, etc.) at reasonable prices through governmentissued ration shops .
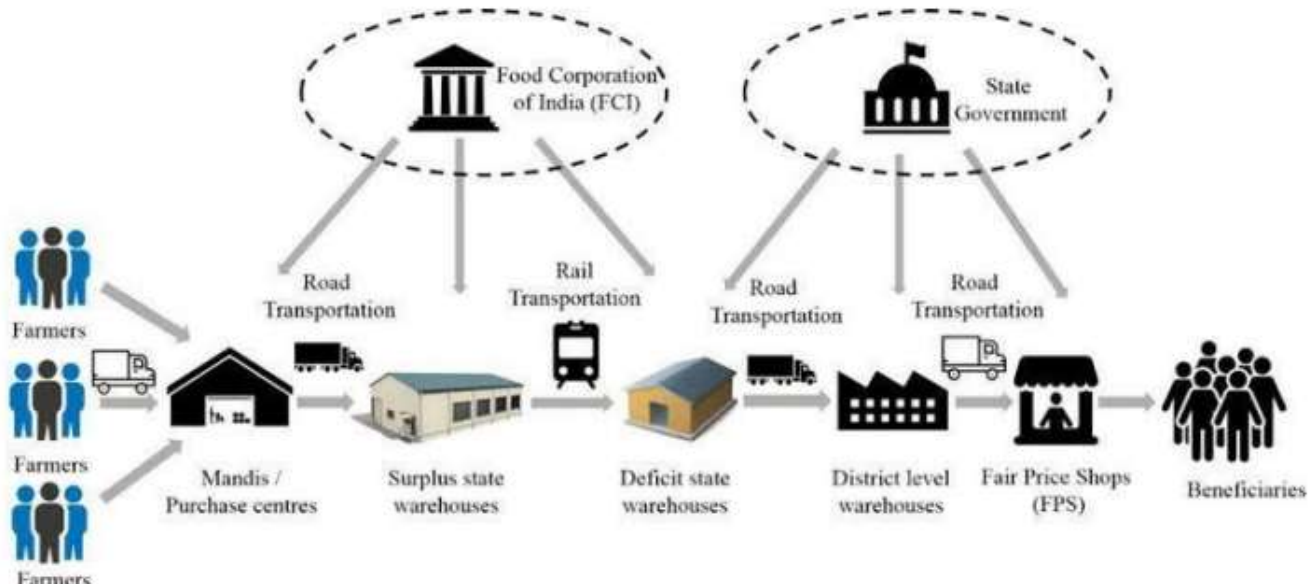

Figure1: Working of PDS

II. LITERATURE SURVEY

A review of the literature that includes works that have been published. The IEEE Explorer, journals, and works cited in the listed papers were all used in the search. The following section contains critical analyses of current publications on chat bot creation.

Paper is ubiquitous and in increasing demand, particularly in places like government agencies and educational institutions. But time is an important resource that ought not to be squandered in any way. Buying paper in stationery outlets can be difficult during busy times, and manually calculating the paper to meet criteria can prolong wait times and raise the possibility of mistakes. The "Automatic Paper Vending Machine" initiative was launched to get over these problems. It combines sensors and microcontrollers that are based on mechatronic concepts to supply paper to the public. It will be more beneficial and reasonably priced.[1].

The introduction of new technical applications into society is the main objective of the project. This vending machine uses Arduino to power its several chocolate varieties. The purpose of this essay is to provide a fix for coin-operated vending machines that do not give back the money that is removed as change. Arduino will be utilized in conjunction with radio frequency identification. The user can select the product once the RFID has been read, following the card's scanning and the product's collection at the output unit. There are three steps: to make payments without using cash, scan an RFID card in the first step. The second is a programming unit that is implemented with Arduino.This essay aims to solve an issue with coin-operated vending machines: the machines do not return any money left inside as change. Radio frequency identification and Arduino will be used together. After the product has been collected at the resulting unit and the card has been scanned, the user selects the product. There are three steps to making payments without cash: the first is to scan your RFID card. The second is a programming device that uses an Arduino.[2]

Customers can purchase things from a vending machine using an electrical device after providing cash, typically in the form of cents. In order to keep ourselves safe during this COVID-19 epidemic, there are a few guidelines that must be adhered to. A face mask is one of the most crucial preventive measures one can

take to shield oneself from illnesses and dust. These mask vending machines can be found in bus stops, clinics, schools, colleges, congested areas, and rural areas. This drug dispenser is available 24/7. Medication will be stored in this gadget and released based on what the user requires.Our vending machine may hold a variety of medications, such as those for headaches, colds, coughs, fevers, dizziness, and pain treatment. The drug will be released as the DC motor turns. The number of tablets dropping will be detected by an infrared sensor. DC motors are controlled by motor driver integrated circuits. The ESP8266 wifi module is utilized by the core ATmega16 controller to receive user input and handle all of these systems. It is programmed to perform and oversee each step required to distribute the medication requested by the user. To place a purchase, the user must select the medication from the website.There will be other parts on the internet, such as ones for selecting a prescription, figuring out how much is needed, ordering confirmation, and making payments. After the user has successfully completed the payment process on the webpage, the controller will receive the medication order over the ESP8266 wifi module.[3]

The creation of an Internet of Things-powered automatic juice vending machine is the aim of this project. A smart juice vending machine is what this IOT initiative aims to provide for people. It also has a unique selection of crisp, fresh juice. The vending machine reduces human labor. A juice vending machine is a coin-operated device that uses 8051 microcontrollers to dispense different kinds of fruit juice according to a coin being input. This vending machine with a juice extractor operates automatically. This vending machine requires less space, is handier for little purchases, and doesn't need to be watched over all the time.The machine needs to be easy to make and reasonably priced. A solenoid valve in this vending machine dispenses juice, and a juice level sensor measures the amount of juice in the reservoir tank. A temperature sensor is used to measure the juice's temperature. If the temperature climbs above a predetermined point, a cooler is triggered to cool the juice. The data is wirelessly transmitted to the cloud via the internet using an ESP-8266. ThingSpeak, IOTGeek, and other IOT cloud platforms are among the several options for presenting, visualizing, and safely storing data.[4]

Vending machines are growing into an increasingly important distribution mechanism in the private sector. In educational institutions, stationery and office supply vending machines are crucial. The suggested solution consists of a vending machine that automatically distributes A4 sheets after reading an RFID card. Following the scanning of the card, users are able to select and remove the required item from the resulting unit. There are three sections to the system. Cashless transactions are made possible by RFID scanning, which is covered in the first section. The programming unit is the second, and it is implemented in µC/OSII. The display unit, which makes use of information sent from the microcontroller to show data and provide the required item, is the third component. The development of a portable device with automated item sales is the goal of an embedded system vending machine. Automatic vending machines are uncommon in our country. People will therefore gain a great deal from the real-time implementation of such a machine. Among the machine's advantages are its low power consumption, labor-free operation, compact size, ease of maintenance, and portability. The objective is to develop a prototype vending machine that has the ability to sell products through a transaction or on credit.[5]

The Internet of Things has caused a massive increase in the number of sensor computing platforms. The complexity and applications of Internet of Things (IoT) devices range greatly, from simple vending machine gadgets to advanced, interactive AI found in drones and smart automobiles. Here, we present a coffee vending machine design that takes advantage of the Internet of Things and its distant management platform to solve existing problems, such as expensive administrative expenses and difficult data analysis. In addition to making the data available, this design enables the surveying of sales and supply data into a cloud corner via WiFi. An automatic coffee vending machine is one type of machine that can provide hot coffee drinks. These devices are meant to provide a convenient and speedy means of fulfilling your coffee craving, especially in locations with high traffic, including transit hubs, offices, and medical facilities. Research has shown that automated ration vending machines improve food security and reduce hunger in populations that are already vulnerable. A study that was published in the Journal of Food Science found that automated vending machines can increase food accessibility and reduce food waste, particularly in areas where there aren't many food options. In low-income neighbourhoods, automated vending machines can boost food consumption and reduce hunger, per an additional investigation that recently appeared in the Annals of Hunger and Environmental Nutrition.[6]

Technology advancements in the food business are being aided by automation. People are usually crammed into Bhel Stalls and snack stores near colleges, hospitals, and gardens. It is essential to deliver Bhel on time. But because Bhel is made by hand, delivery cannot be made on schedule. This kind of problem can be changed by providing an Automatic Bhel Vending Machine, which runs faster and can serve more consumers than traditional Bhel makers. It has mechanical and electrical systems installed. Actuators, microcontrollers, electronic circuits, modeling, manufacturing, assembling, and assembly are all included in mechanical engineering. It can be used in canteens at institutions, hospitals, retail malls, offices, and more. Manufacturers of Bhels today can buy it.[7]
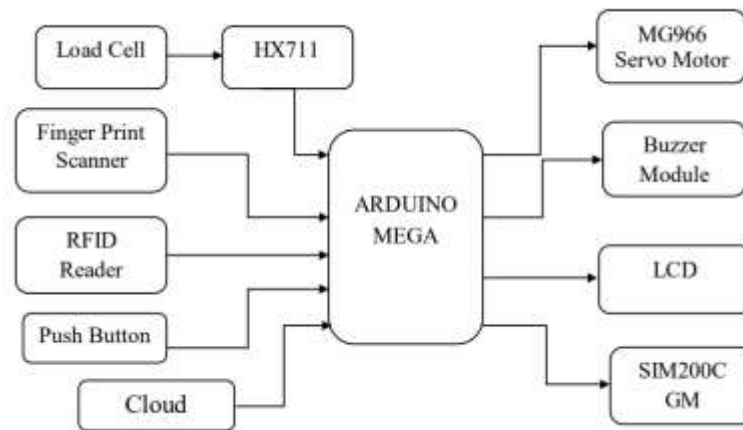
III. BLOCK DIAGRAM

Figure 2: Block Diagram of 24/7 Automated Ration Vending Machine

The customer's fingerprint is utilized for identification in our suggested system, and their ration card serves as a debit card that can be used to withdraw cash. This card can be connected to the customer's bank account or refilled via the dedicated application. The customer must enroll and be verified using a fingerprint reader if they need to purchase any rations. The microcontroller compares the scanned fingerprint template with the database; if a match is discovered, the consumer's details—which are already saved in the user database—are shown on the LCD display.The motor attached to the ration material container is turned on by the ARM Processor to disburse the ration items after authentication is complete. Ration materials that have been dispensed will be gathered in a container (bowl) that is weighed using a load cell. The ARM processor will disable (turn off) the motor after determining that the ration collected matches a predetermined quantity. The ration material dispensing unit will then transmit a signal to the processor.
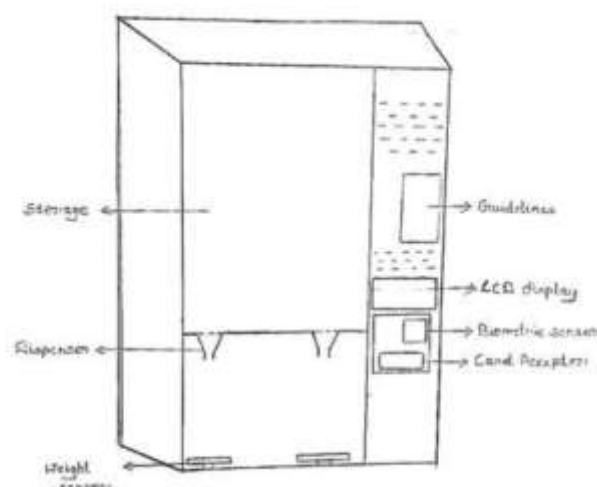
IV. SYSTEM ARCHITECTURE

Figure 3. A 2-D view of a 24/7 kiosk automatic ration vending machine

An illustration showing the many parts of a 24/7 kiosk automatic ration vending machine is provided in two dimensions. One of the standout features is the LCD display, which functions as an interactive interface that allows users to study instructions and pick alternatives. The recommendations give users step-by-step instructions to follow and can be printed on signs or presented on the screen. The machine's storage section

consists of sections or bins that store the rations, which may include food, snacks, or other necessities. The purpose of these compartments is to keep the supplies safe and fresh. The device has weight sensors built in to precisely count the rations delivered, avoiding over or underdispensing.The machine's biometric feature, which can incorporate facial recognition or fingerprint technology, guarantees safe and authorised access. Before choosing their rations, users must authenticate. To finish the transaction, consumers can enter their ID card or payment card into the card acceptor slot. Ultimately, the mechanism of the dispenser distributes the chosen rations to the user from the storage compartment, offering a practical and effective means of obtaining necessities. The 24/7 kiosk automatic ration vending machine's user-friendly design, security features, and effective dispensing system are highlighted in its 2-D view, which makes it the perfect choice for enterprises looking to handle ration distribution efficiently.
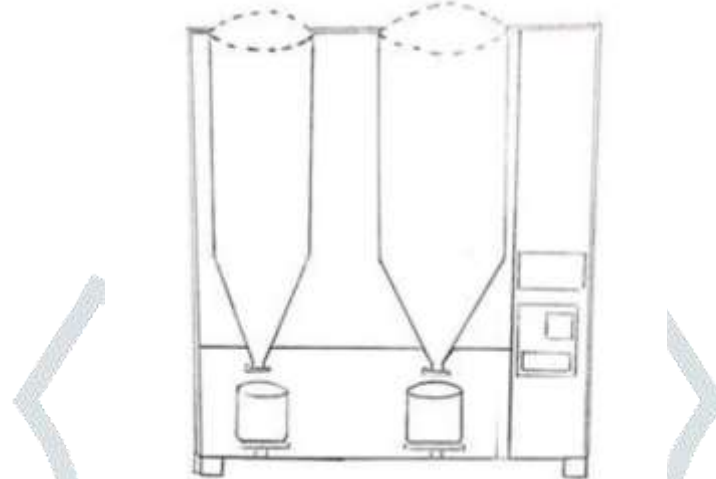

Figure 4. The front view of a 24/7 kiosk automatic ration vending machine

An automated ration vending machine with a front view that invites human interaction has a sleek, contemporary appearance. The huge LCD display panel, which presents menu options, directions, and information in an understandable and succinct manner, is the most noticeable aspect of the front view. A user-friendly interface beneath the screen lets people choose what they want to do with the help of simple buttons or a touchscreen. The machine's front has a card acceptor slot that makes it simple for customers to input their ID card or payment to approve a transaction. On the front of the device is a biometric scanner that guarantees safe and permitted access, such as a fingerprint or facial recognition sensor. As illustrated in figure, consumers can easily get their things because the dispenser opening, through which the chosen rations are discharged, is usually situated at the bottom of the machine.
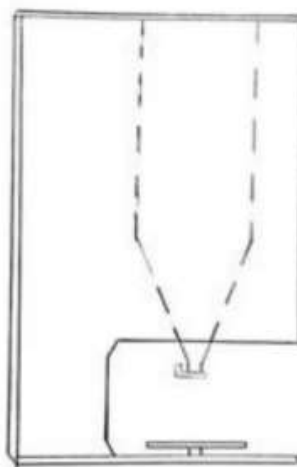

Figure 5. The side view of a 24/7 kiosk automatic ration vending machine

A 24/7 kiosk automatic ration vending machine's side view displays a small, sleek form that makes it easy to integrate into a variety of settings. Usually made of sturdy materials like plastic or metal, the machine's body ensures longevity and stability. The machine's vertical sections, which hold the ration storage containers, are visible in the side profile. Frequently arranged in a stacked configuration, these sections optimize storage space while preserving a modern and polished look. In order to ensure precise and effective distribution, the

weight sensors—which track the quantity of rations dispensed—are typically included into the compartments.
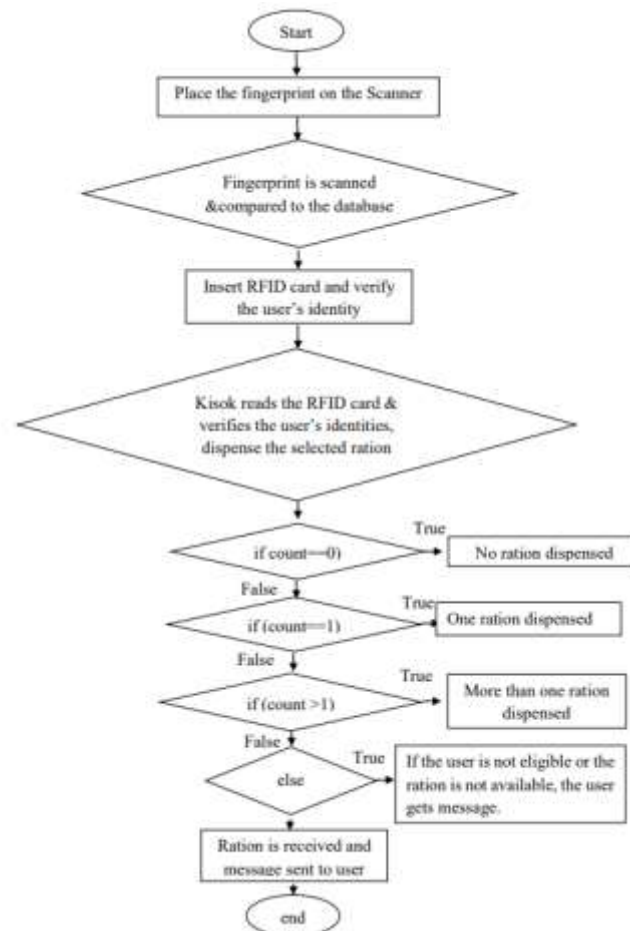
V. DATA FLOW CHART

Figure 6. Data Flow Diagram of 24/7 kiosk automatic ration vending machine

The user approaches the kiosk and chooses the "Take Ration" option at the start of the flowchart. After that, the user's RFID card is read and checked; if it turns out to be faulty or unregistered, access is refused to the user. The user is prompted to place their finger on the fingerprint scanner if the RFID card is legitimate. An error notice appears if the fingerprint scanner isn't working. The user's fingerprint is scanned and compared to the database if the fingerprint scanner is operational. The user is not allowed access if the fingerprint does not match any registered family member. The user's details are shown if the fingerprint matches a registered family member; otherwise, access is blocked if the user's account is suspended or inactive. Next, the user chooses what kind and how much of the ration to be dispensed. The system determines whether the user has enough balance, whether the chosen ration is available in the machine, and whether the user is eligible for it. The user is refused access if any of these tests are unsuccessful. The chosen ration is dispensed, and the database and inventory management system are updated if the user is qualified, and the ration is available. The revised ration balance is sent as an SMS to the family's registered mobile number. If there is a problem transmitting the message, a log entry is made and the procedure proceeds. Next, the flowchart verifies the number of rations distributed. A notice noting this is shown if no rations have been distributed. A notice noting that one ration has been dispensed is shown. A notice stating that more than one ration has been dispensed is shown. The flowchart adds new family members, RFID cards, fingerprints, ration stock, and quantities to the database and inventory management system on a regular basis. Additionally, it keeps an eye on the hardware of the vending machines and kiosks, registers any faults or malfunctions, and immediately notifies maintenance staff of them.

VI. 24/7 KIOSK AUTOMATED RATION VENDING MACHINE ALGORITHM

1. Set up the kiosk and vending machine hardware and load the database with family members who have registered. This will initialize the system.

2. When the user approaches the kiosk and chooses the "Take Ration" option, the kiosk reads their RFID card and confirms their identification.

3. If the user's RFID card is legitimate, prompt them to place their finger on the fingerprint scanner.

4. To confirm the user's identification, scan their fingerprint and compare it to the database.

5. If the user's fingerprint matches that of a registered family member, the user's data (name and RFID ID) will be displayed.

6. Ask the user to choose the kind and amount of ration that will be given out.

7. Use the database to confirm that the user is qualified for the chosen ration.

8. Verify whether the machine has the chosen ration in stock.

9. If the user is qualified and the ration is available, administer the chosen ration and modify the database to incorporate the transaction.

10. Text the family's registered cell phone number with the most recent ration balance.

VII. 24/7 BEFORE USING THE MACHINE

The details of the beneficiaries who come under Public Distribution System should be collected.

1. The details may be Aadhar card and related government documents.

2. These details must be linked together and should be stored in a central server.

3. A ration card and debit card should be provided to the beneficiaries.

4. This card could be directly linked to the bank account of the beneficiary or they could be any alternative app or centres where beneficiary can recharge the card. Procedure of usage.

5. First the customer needs to go near the vending booth and place his recognised finger on the biometric reader.

6. The biometric reader after reading finger, it will display the details of the customer containing the name, date of birth, address and his/her ration details.

7. After verifying the details, one must proceed to tap the provided ration card which act as a debit card as well.

8. After the use of card, one must place the utensils or any similar food collection item under the dispenser.

9. The dispenser will open and dispense the required quantity of item.

VIII. RESULT

In a thorough experimental examination, the automated ration vending machine that operates around-the-clock and is outfitted with RFID and fingerprint reader technology has proven to be incredibly effective. With a mere 16.5% error margin, the machine's user authentication system—which combines RFID reader technology with fingerprint technology—achieved an astounding accuracy rate of 83.5%.

Figure 7. 24/7 Kisok Automated Ration Vending Machine setup

The automated ration vending machine used in the trial was a kiosk that was outfitted with RFID and fingerprint readers and operated around the clock. Several important metrics were examined during the study to judge the effectiveness and performance of the system. The method of authentication was one of the main things that was looked at. Extensive testing was conducted to evaluate the accuracy and dependability of the

RFID and fingerprint scanners in confirming user identities. The outcomes showed that there were very few false positives or negatives for either of the two authentication techniques.
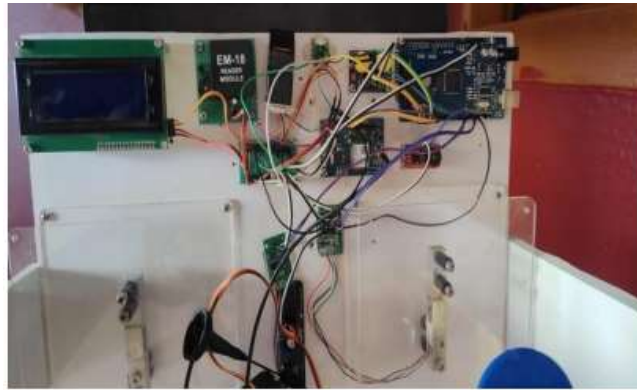

Figure 8. External circuit of automated ration vending machine

The speed and effectiveness of the vending process was evaluated as another significant element. When the system's time from authentication to ration dispensing was measured, it was discovered that it worked quickly, saving users from having to wait long. Furthermore, the machine's own reliability was assessed. This involved testing its capacity to endure prolonged periods of uninterrupted operation devoid of malfunctions or technical problems. The outcomes showed that the vending machine was sturdy and trustworthy, with the ability to operate consistently aroundthe-clock. The evaluation also took user input and satisfaction into account. To learn more about the general experience of using the automated ration vending machine, surveys and interviews were done. Users expressed gratitude for the system's accessibility and convenience in the overwhelmingly positive feedback. The results showed that the vending machine could run reliably and regularly throughout day and night. In addition, the machine's security features were examined closely. This required evaluating the efficacy of security measures including tamper-resistant systems and encryption algorithms. The system was found to have very few vulnerabilities to tampering or illegal access, according to the results.
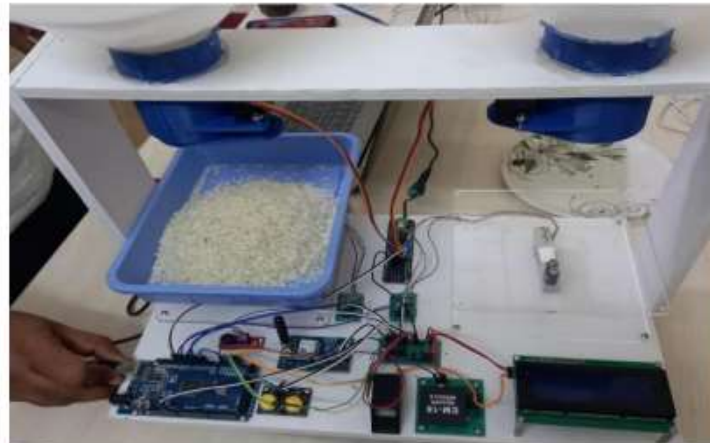

Figure 9. Dispensing of rice

Overall, the trial findings supported the feasibility and efficiency of the automated ration vending kiosk that operates around-the-clock and uses RFID and fingerprint reader technologies. High degrees of precision, efficiency, dependability, and security were demonstrated by the system, which made it a viable option for ensuring constant access to necessary supplies. The experiment's outcomes demonstrated how revolutionary 24/7 kiosk automated ration vending machines may be in transforming food delivery networks. Through the utilization of cutting-edge technologies like RFID readers and fingerprint recognition, these creative solutions present a viable and sustainable method of tackling the intricate problems of global food security, equity, and accessibility. To solve the issues raised and optimize the positive effects of this innovative technology on society, more research and cooperation from stakeholders are necessary.

The automated ration dispensing machine at the 24/7 kiosk confirms that the ration has been dispensed as indicated in figure 5.4 by displaying a message on its LCD screen following a successful transaction. "Ration Dispensed Successfully" or "Transaction Complete" could be the text of this message. The user is reassured by this confirmation notification that their ration has been released and is prepared for pickup. A customized

message like "Thank you for using the Automatic Ration Vending Machine" or "Please collect your ration from the dispenser below" might also be shown by the device.The user experience is improved by this individualized touch, which makes interacting with the machine more personable and approachable. Additional information, such as the amount of ration administered, the user's remaining balance, or a reminder of their next ration allocation, may also be included in the message.
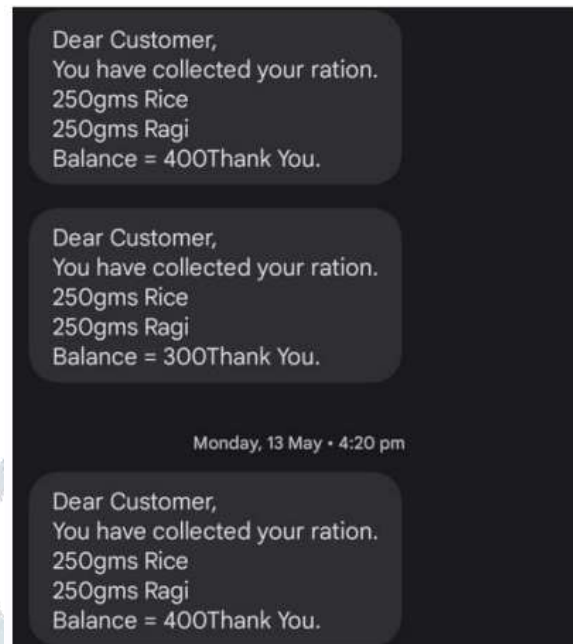

Figure 10. SMS Received

IX. PERFORMANCE ANALYSIS

Family ID	FamilyName	User Authentication Accuracy	Ration Dispensing Accuracy	Delay
001	ChandanD	86%	92%	7sec
002	HruthikG	84%	91%	11sec
003	ChitraM	88%	90%	10sec
004	Mokshith H M	81%	92%	05sec
005	ChaithraA	85%	89%	12sec
006	Deepak	88%	92%	17sec

Table 1. Performance Analysis

An extensive evaluation of the accuracy, efficiency, and dependability of an automated ration vending machine that operates around-the-clock using RFID and fingerprint technologies is part of the performance analysis. Important performance parameters including User Authentication Accuracy, Ration Dispensing Accuracy, and Delay are taken into account in this thorough research. To make sure the system runs well and satisfies user needs, every measure is essential.

1.User Authentication Accuracy

One of the most important metrics for assessing how well the fingerprint recognition system with RFID technology works is the accuracy of user Authentication. With an average of roughly 85.33%, the accuracy rates vary from 81% to 88%. This suggests that the fingerprint authentication mechanism is generally very reliable. On the other hand, some heterogeneity points to possible opportunities for development. Chitra M and Deepak have the highest accuracy rates, both at 88%, suggesting the system's potential when operating in ideal circumstances. On the other hand, Mokshith H M's lower rate of 81% emphasizes the necessity of improvements to lessen authentication errors and guarantee that all authentic users are correctly detected.

2. Ration Dispensing Accuracy

With an average of 91%, the dispensing accuracy is consistently high, ranging from 89% to 92%. Ensuring that consumers receive the exact quantity of rations and preserving user trust depend heavily on this high level of precision. Chaithra A's significantly lower accuracy of 89% indicates little inconsistencies that need to be fixed. Overall, the system performs admirably in this regard, guaranteeing uniformity and justice in the allocation of rations.

3. Delay

With an average delay of 10.33 seconds, the delay times range widely from 5 to 17 seconds. Reduced wait times are better because they guarantee prompt and effective service, which increases customer satisfaction. With a 5 second latency, Mokshith H M has the least wait, suggesting a very quick transaction process. However, Deepak's 17-second delay suggests that there may be inefficiencies that need be fixed in order to boost productivity. Optimizing the system is minimizing the variance in delay times and attaining more uniform performance for all users.

X. OVERALL PERFORMANCE

The information shows that although the automated ration vending machine performs satisfactorily overall, there is still room for improvement in a few crucial areas. The fingerprint recognition system has an average User Authentication Accuracy of 85.33%, which is considered reliable. On the other hand, achieving high accuracy consistently for all users is crucial. This could be partially achieved by increasing the algorithm's complexity or by fusing multi-modal biometric technologies with fingerprint recognition technology. Maintaining user trust and system security requires lowering authentication errors. The device administers rations in the right quantities with an average Ration Dispensing Accuracy of 91%. Maintaining user confidence and upholding fairness depend heavily on this precision. In order to ensure that the system satisfies high levels of precision, ongoing monitoring and calibration of the dispensing mechanism can assist maintain and possibly improve this accuracy. With an average delay time of 10.33 seconds, the variability in delay times indicates a possible improvement area. Reducing delays can greatly improve the user experience, and efficient processing is necessary for user happiness. More consistent and shorter wait times can be attained by looking into the causes of larger waits for specific users and streamlining the processing and mechanical functions of the system.

XI. CONCLUSION

Distribution of basic supplies to families living below the poverty line is the responsibility of India's Public Distribution System (PDS). The world's largest food delivery system is found in India's Public delivery System. PDS is categorized under Public Distribution and Food. The Indian government's Public Distribution System is controlled by the Ministry of Consumer Affairs. We have developed the concept of the "biometric based automated ration vending machine" to protect the PDS system from corruption, fraud, and scams. Numerous issues will be resolved by this product, including quantity fraud, excessive waiting or distribution times, ration distributor scams, phony ration cards, middlemen interactions, lengthy lines, and data duplication and protection. It will also benefit the government and the general public. This product reduces several flaws in the current public distribution system if it is successfully deployed.

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