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Design and Development of Low Cost Automated Ration System Using IOT

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Abstract: ***The Automated Ration Distribution System (ARDS) is a state-of-the-art technological system designed to improve the efficiency, fairness, and accuracy of ration distribution. The ARDS combines artificial intelligence, machine learning, and data analytics to automate the distribution process, lower errors, and ensure equitable access to essential food supplies. Among the primary characteristics are user-friendly interface, data analysis, biometric verification, and intelligent inventory management. The technology facilitates data-driven decision-making, optimizes resource distribution, lowers shortages, detects and eliminates fraud. By fostering fair access to essential goods and promoting transparency in the allocation of rations, the ARDS has the potential to revolutionize rationing, particularly in crisis- affected areas.***
Keywords: Automated public distribution, CloudDatabase, IOT, Software Development.

I. INTRODUCTION

A revolutionary approach to solving the problems with ration distribution operations is the Automated Ration Distribution System (ARDS). The ARDS incorporates cutting-edge approaches and digital technology in an effort to increase efficiency, transparency, and equitable access to rations. Manual errors, lengthy wait times, and instances of malfeasance commonly reset traditional ration distribution systems, leading to resource inefficiencies and injustices. These issues directly affect underprivileged groups, causing food insecurity and endangering the wellbeing of both the person and the community. The ARDS has created a comprehensive solution to streamline the entire process after realizing the need for an improved procedure.

The essential tenet of the ARDS is the automation of various aspects of distribution, from inventory control through beneficiary tracking and identification. By combining AI and ML algorithms, the system provides real-time monitoring and analysis of data related to ration availability, demand trends, and distribution logistics. This data-driven strategy enables decision-makers to make informed decisions and optimize resource allocation because it is based on exact and current information. One essential component of the ARDS is the intelligent inventory management system. Utilizing sophisticated algorithms, the system can efficiently track and manage rations, ensuring timely replacement and reducing the risk of shortages. This increases resource delivery effectiveness, reduces waste, and ensures that those who need them most receive them. The usage of biometric authentication is a key component of the ARDS. The methodology makes use of methods like fingerprint or iris scanning to make sure that the intended beneficiaries receive their meals. This lowers the risk of identity fraud and increases the transparency and accountability of the distribution process.

Distribution of rations could be revolutionized by the application of the ARDS, especially in resource-constrained regions and crisis-affected areas. The approach encourages openness, accountability, and equal access to basic food supplies by automating and expediting the process. The ARDS is a key advancement in tackling the problems with ration distribution, thereby enhancing the lives and well-being of vulnerable groups.

II. LITERATURE REVIEW

1) Jinali Goradia and Sarthak Doshib's Automated Ration Material Distribution System It emphasises the potential of ARMDS to revolutionise the distribution process, as well as the importance of more research and interdisciplinary collaboration to maximise its benefits.
2) Golden Bagul ,Brendon Desouza, Tejaswini Gaikwad and Ankush Pananti created the Smart Ration Card Automation System. In this system QR codes will be provided instead of current ration cards. User database is stored which is provided by government,. Fingerprint scanning will be done for security and authentication purpose.
3) In this paper, S.Valarmathy, R.Ramani, Fahim Akhtar, and S.Selvaraju, G.Ramachandran proposed an Automatic Ration Materials Distribution based on GSM and RFID technology as an alternative to ration cards. Present the RFID tag into the RFID reader to purchase items from ration stores. The controller will then verify the customer codes and quantity information on the card. After verification, these devices display the quantity information.

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The information will then be entered by the customer using a keyboard and transferred via GSM technology by the controller to the government office and the customer.

4) Elshaama V W, Vidya B, Rahul K, and Trupti M4 recommended in A Survey On Advanced Ration Distribution System to have access to stock information and data that can be accessed by both common consumers and government officials in the head office. Thus, physical labour is replaced with a completely automated electronic equipment controlled by controllers that properly measuresthe items and updates transaction information in a digital format.

5) A review paper on the deep learning-based public ration distribution system was written by Dr. Ravindra Jogekar, Kalyan Dahake, Yash Banode, Sankalp Selokar, Rutuja Chikhale, and Yash Banode. The public distribution system's main objective is to guarantee that Indian citizens receive an adequate amount of food in accordance with theirfinancial situation. Only government employees working at the headquarters have access to data on the stock that is now on hand and that is arriving. To precisely measure items and update data about ration distribution, transactions, and ration card users in a digital format on a central database, fully automated electronic techniques using Arduinocontrollers should completely replace manual labour.

6) The Automated Ration Material Distribution System was developed by Srinivas Hebbar, Sanjana Srinivasan, and Shravan Kumar. They developed and implemented an Automatic Ration Material Distribution System based on RFID and Biometric technology in place of conventional ration cards.

7) The prior system, called the Automatic Ration Dispensing System (ARDS) by Sateesh Kumar H C, relied on human distribution, which led to inaccurate material quantity estimation. This method is susceptible to human mistake, corruption, and illegal commodity smuggling. They have employed the MASTER KEY method along with finger print authentication to avoid this problem. The user must input a One Time Password that is only valid fora short period of time as part of the finger print authentication process.

8) Presenting Biometric Authentication Based AutomatedRation Disbursal for Public Distribution System are Shripad

9) Deshpande, Harikrishnan.R., and Siddarth S. Biraj. The Smart Automated Ration Disbursal System (SARDS), a novel application for automating the Public Distribution System that employs the Internet of Things to replace manual PDS processes, is presented in this paper. Thecomponents of this system include embedded controllers foronline biometric customer verification, smart measuring forprecise commodities distribution, and real-time data updating on the server.

10) By Swapnil Kurkute, Damini Bhoye, Kishori Kavare, and Priyanka Musale, "E-Rationing System: A New Approach" The government has provided clients with various types of cards for the Ration Material Distribution System (RMDS) based on their destitute queue. GSM technology, which stands for Global System for Mobile Communication, will be used for distant information transmission, together with a biometric machine for authentication, an RFID card for recognizable evidence and exchange, and an advanced processor to operate the system.

11) Automated Ration Material Distribution System by Rohan Pinto, Shibani Shetty, S. Shravya, Thrupthi, and Sushmitha. This approach is straightforward and substitutes the ration card with the Aadhar card for customer identification. The system distributes ration items like wheat, rice, and sugar using an automated procedure with no assistance from people. Thesystem's benefits include overcoming problems including data accuracy, unauthorized data entry, and inaccurate weighing of items owing to human mistake.

III. METHODOLOGY

The system is created using different technologieslike IoT, Firebase which are the helpful in automationprocess of any system.
Hardware components used in the project are Node MCU ESP8266, 4X4 Keypad, Liquid crystal display with I2C Module, 5kg Load cell with amplifier moduleHX711, Servo motor. The Node MCU is used as the main processing unit of the system and performs all thelogical computations in the PDS. The process start with consumer authentication, where the credentials like user id and password that the consumer enters willbe matched with stored credentials of the consumer recorded while registration. In the system we are considering the ration card number as the main authenticity factor. The input is taken from the 4x4 keypad where the process is being displayed through the LCD. After validation the messages of ration quantity and price will be displayed where the consumer have the choice to select the needed ration item and in the desired quantity where the cost will beshown according to the quantity of ration item the consumer has selected. For payment process we are using RFID and QR Scanning technique. After the payment completion, the dispenser mechanism starts working in which the container outlet is opened by the servo motor the servo motor return to the initial position closing the outlet of the dispensing container.

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The servo motor is regulated using the reading collected from the Load cell as the quantity of ration entered by the consumer will be taken as an stop valuefor the servo motor so that the receiving container to not overflow. All he data collected from the PDS will be stored in the database in the cloud. This records canbe used for prediction in ration storage strategies and future prediction about the PDS.

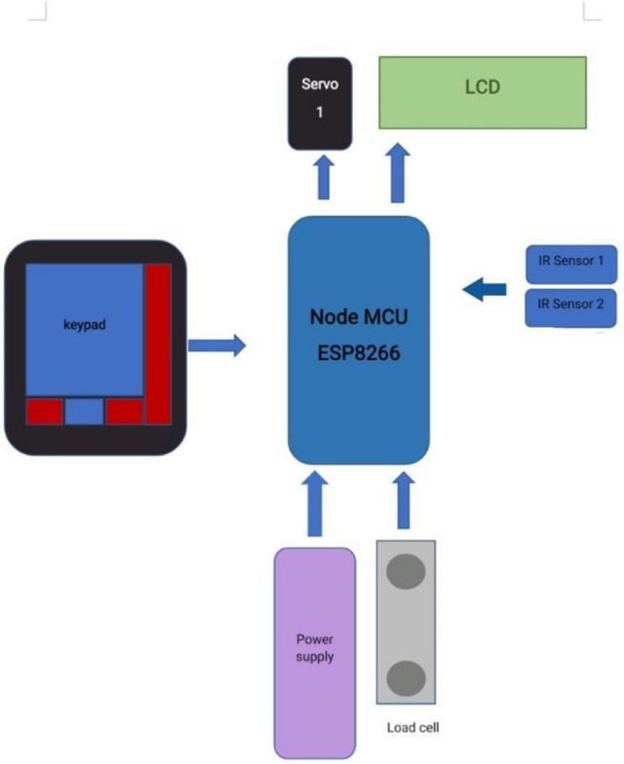


Fig.1 Block diagram of the system

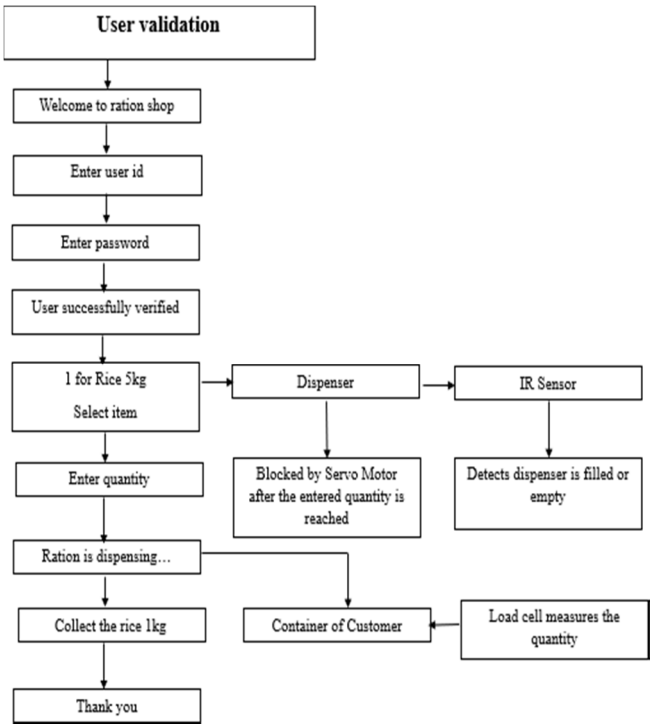


Fig.2 Architecture of the system design

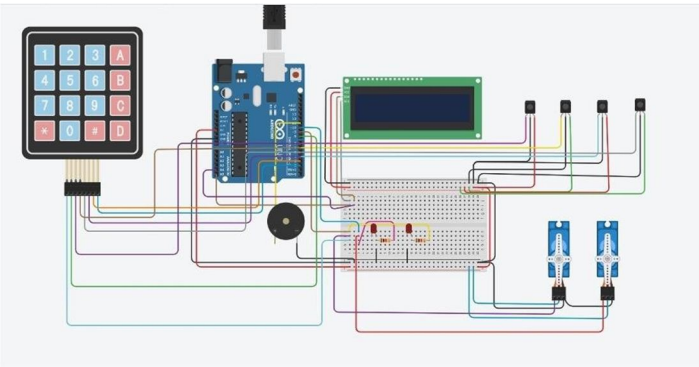


Fig.3 Simulation (Circuit diagram) of ARDS

No.	Components	Price
1	4x4 Member Keypad	42
2	Weighing Load Cell Sensor 5k	157
3	X711 Load cell Amplifier Module	42
4	NodeMCU ESP8266	159
5	Arduino Nano	219
6	Jumper Ribbon Wire	142
7	Electronic Spices 1800mA Rechargeable Battery Lithium-ion	132
8	TowerPro M995 Servo Motor	295
9	16x2 LCD Blue with 12C Module	331
	Total	1519 Rupees

Fig.4 Total Cost of ARDS

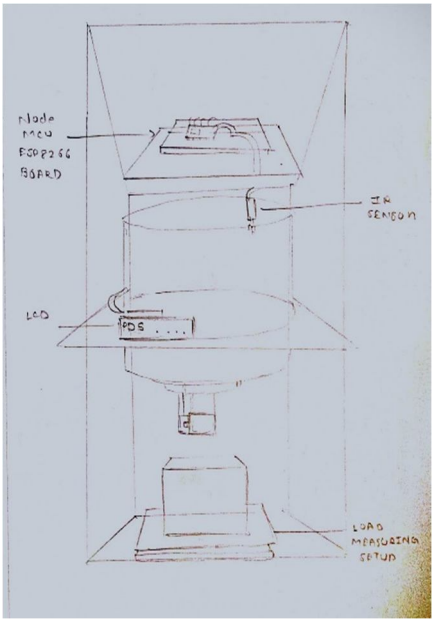


Fig.5 Front view of project

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Fig.6 ARDS actual implementation

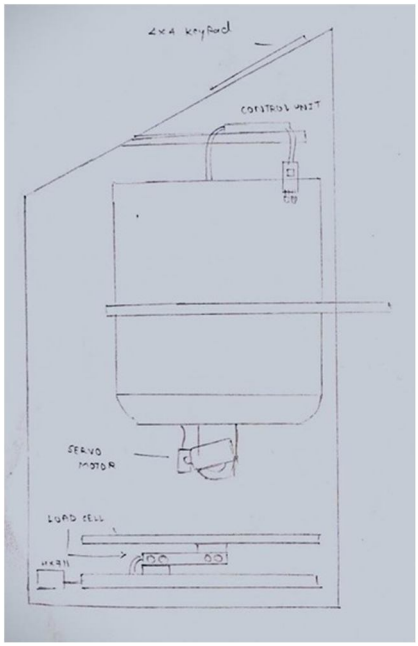


Fig.7 Side view of Project

IV. RESULTS AND DISCUSSIONS

The accuracy of the system depends on factors like the weight measuring mechanism. For constructing the measuring mechanism we have included the components like load cell and the amplifier module HX711. As the major part of the distribution system depends on the precise measuring of the ration quantity in the system. The calibration of the load cell helps in achieving the exactness in the weight measures. In the process calibration factor is used to get precise readings from the load cell. calibration factor = (reading)/(known weight)

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For example, if the consumer selects the quantity as 5kg of rice than the rice quantity is measured by the load cell, here we have to divide the known weight of the rice that is 5kg and divide the actual reading we aregoing to get while recording the measuring of the loadcell.

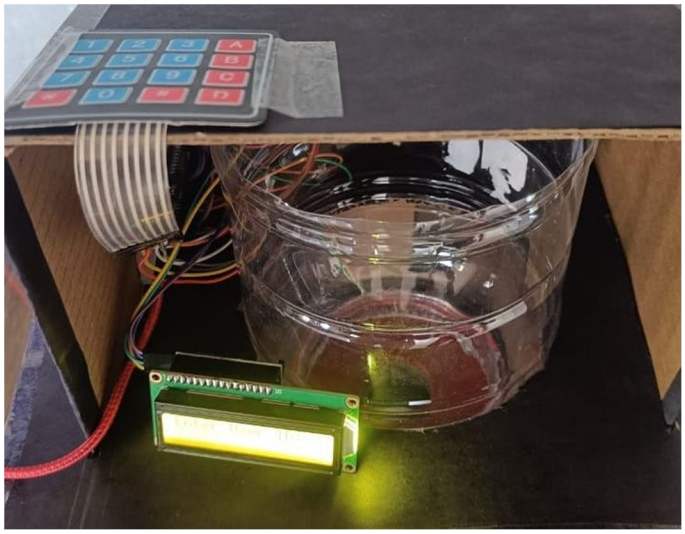


Fig.8 keypad system



Fig.9 Enter user id and password



Fig.10 user id successful



Fig.11 Enter quantity



Fig.12 Ration dispensing



Fig.13 Collect your ration


Fig.14 Dispensing of ration

V. CONCLUSION

The Automated Ration Distribution System (ARDS) provides an appealing solution to the problems that traditional ration distribution systems encounter. The ARDS improves efficiency, transparency, and equal access to crucial food supplies by integrating sophisticated technologies such as artificial intelligence, machine learning, and data analytics. The ARDS's user-friendly interfaces make it accessible to people of all technological literacy levels, guaranteeing that recipients may readily participate in the distribution process and stay informed about their entitlements.

VI. FUTURE SCOPE

The use of a biometric lock, the integration ofIoT devices to enable real-time monitoring of inventory levels, storage conditions, and distribution logistics, the implementation of block chain technology in the ARDS, which can increase transparency, and the incorporation of mobile paymentsystems into the ARDS can all improve the device. Implementing a QR scanner, a GSM module, anddeveloping an Android application will enable users toget information on the availability of food in various PDS centers.

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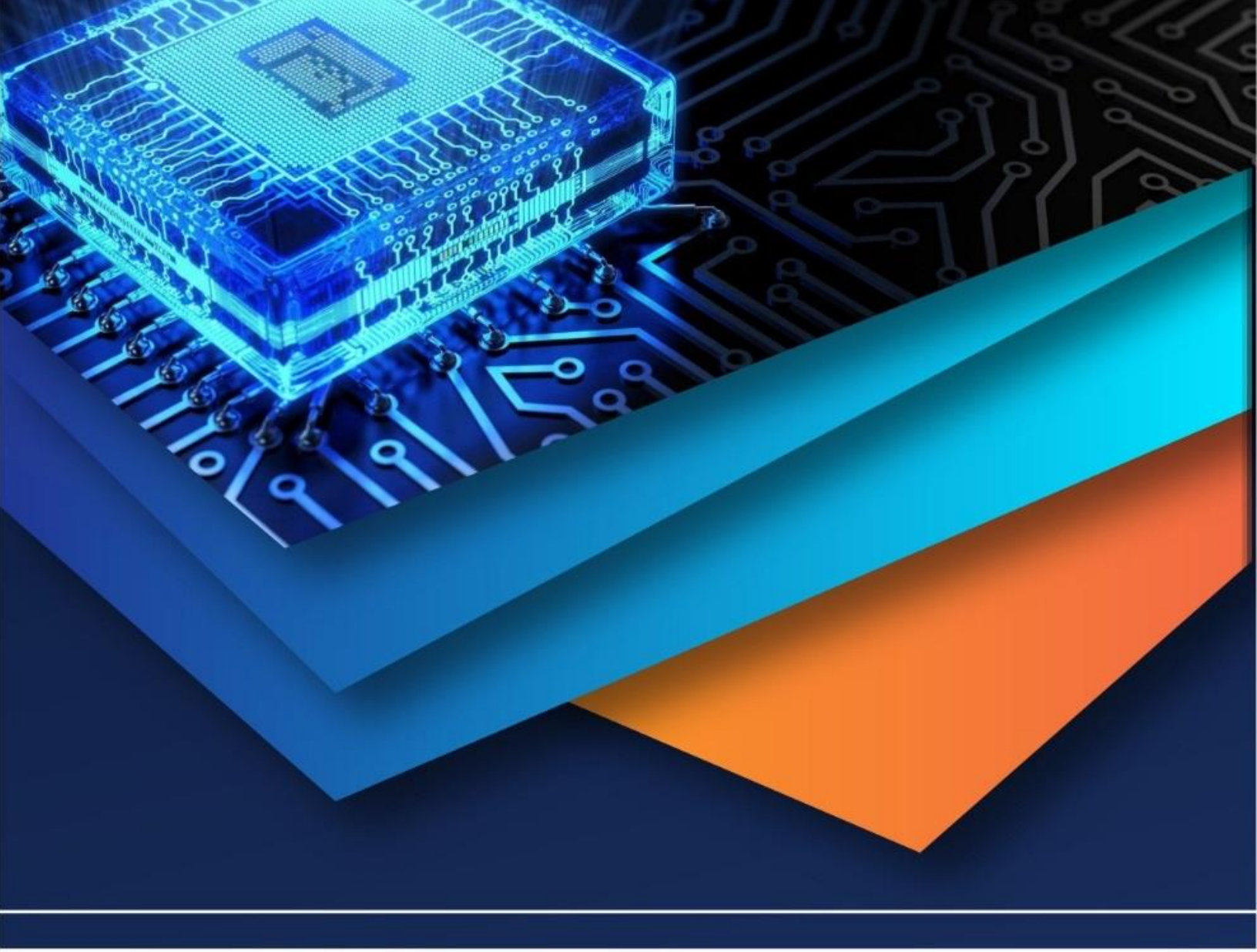
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