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Three Level Authentication based Automatic Ration Distribution System

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Abstract: **The Public Distribution Technique (PDS) is a system for reducing shortages by distributing food grains. It is an important aspect of the government's plans for managing the country's food economy. It is a government-sponsored retail chain that is in charge of food distribution. Due to flaws in the public distribution system, the government has lost hundreds of millions of rupees over the years. In ration shops, the Smart Automatic Ration**

Distribution System allows for real-time authentication and automatic material distribution. The goal of this system is to provide an automated and user-friendly system to protect the public's interests by preventing malpractice. The system's primary goal is to build a fingerprint matching algorithm for user identification, which will eliminate widespread corruption, card misuse, and the time complexity of human data entry. In black markets, the technique is utilised to defend the products of fair-priced stores[1,3].

Keywords- IOT, Arduino, Node MCU, RFID Tag, Fingerprint Scanner, Dispensing System, Firebase, Kodular

I. INTRODUCTION

The distribution of vital items to a large number of people is referred to as a ration distribution system. The government is in charge of this. The public distribution system is one of the most contentious departments, as it is rife with corruption and unlawful smuggling as mentioned in many research papers. All of this occurs because every task in the ration shop entails manual labour, and there are no high-tech innovations available to automate the process. The major goal here is to automate the distribution process[2]. In developing countries like India, the system of distributing essential domestic items on a subsidy basis to poor families is an important part of meeting people's basic needs. The current ration distribution mechanism in ration stores necessitates manual amount measurement and transaction record keeping. It has been proposed creating a smart rationing system that uses a smart ration card for verification and replaces the current paper-based ration card.

II. LITERATURE REVIEW

The goal of the study is to prevent the black-market distribution of ration materials. As it is known that, the government provides numerous services to those living in poverty, but these services do not reach poor people owing to corruption in the chain of all the services offered by the Indian government as mentioned in many researchers. Users can buy ration supplies in the ration shop for a fair price set by the Indian government in such systems. The shopkeeper might benefit more by unlawfully selling the ration material in the market at a high price, which leads to corruption[3]. To address this problem, a simple verification system has been devised, which will be linked to government offices, apportion wholesalers, and proportion cardholders[4,7].

Different types of systems implemented for similar tasks were detailed in these publications, along with their benefits, drawbacks, and applications. In line with this, a new strategy to automatic ration distribution is proposed in order to address all of the old system's fundamental flaws[5,8]. The flaws are:

- Some of them were using only one-step of authentication..
- Some were using GSM module but including it was too costly for the system..instead of the GSM module we have used node mcu as it has inbuilt wifi/hotspot.
- Some systems were using 2-step authentication i.e, finger print and smart card...but we are using 3-step authentication i.e, finger print, smart card and password.
- Their database was not real time.

III. MATERIALS AND METHODS

The goal of this system is to provide an automated and user-friendly system to defend the public's interests by combating malpractices. The system's primary goal is to build a fingerprint matching algorithm for user identification, which will eliminate widespread corruption, card misuse, and the time complexity of human data entry[4]. The technique is used to protect fair-priced shop products in black market places.

- This system was created with the following features in mind:
- The system is secure since it uses a fingerprint authentication technique to identify a specific user.
- Using an Android application, pick the commodity and its amount.
- Information concerning the amount of ration to be provided that has been predetermined.
- Mechanism for distributing rations automatically.
- Overcome the shortcomings of the current rationing system.

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A. *Hardware Description*: The entire project has been separated into four components, each of which has its own set of hardware. These four components are Input part, Controller, Authentication part and Dispensing part, details are mention in implementation.

1) Arduino UNO: Arduino is an open-source electronics platform that uses simple hardware and software to make it easy to use[6]. Arduino boards can take inputs - such as light from a sensor, a finger on a button, or a Twitter message - and convert them to outputs - such as turning on an LED, triggering a motor, or publishing anything online as shown in Fig. 1.

2) Node MCU: Node MCU is an open source platform based on the ESP8266 that allows things to be connected and data to be transferred using the Wi-Fi protocol as shown in Fig.2. Furthermore, it may solve many of the project's demands on its own by providing some of the most important functionalities of microcontrollers such as GPIO, PWM, ADC, and so on.

3) Motor Driver: To correctly operate the motor, a motor driver amplifies the low-current signal from the controller circuit into a high-current signal[9,10]. Because a microcontroller can only produce around 0.1 amps of current, most actuators (DC motors, DC gear motors, servo motors, and so forth) require several amps, a motor controller is required as shown in Fig. 3.

Fig. 1. Arduino UNO

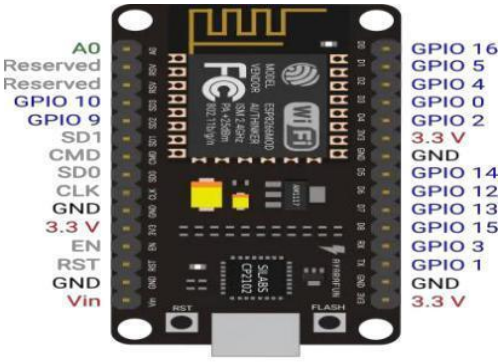

Fig. 2. Node MCU

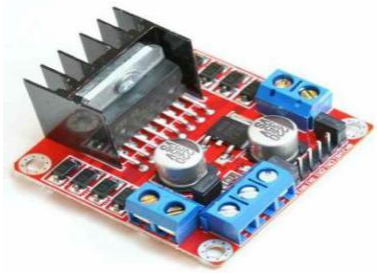

Fig. 3. Motor Driver

RFID Tag & Reader: A radio frequency identification (RFID) reader is a device that collects data from RFID tags, which are used to track particular things as shown in Fig 4. Data is transferred from the tag to the reader through radio waves. RFID is a technology that, in theory, is analogous to bar codes. Unlike barcodes, RFID does not require line of sight. RFID tags have a higher read rate than barcodes. This means that an RFID reader may read up to 40 tags simultaneously. RFID readers, writers, and updater can read, write, and update data.

4) Finger Print Sensor: Fingerprint scanners capture the ridges and valleys on a finger's pattern as shown in Fig.5. The information is then compared to a list of registered fingerprints on file by the device's pattern analysis/matching software[15].

5) Control Panel: The Control Panel has four buttons as shown in Fig 6. button 1 is used to "Register" the user, button 2 is used to "OK/Delete" as needed, button 3 is used to "Back/Forward" as needed, and button 4 is used to "Next."

Fig. 4. RFID Tag & Reader

Fig. 5. Finger Print Sensor

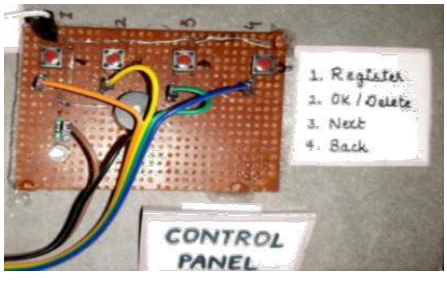

Fig. 6. Control Panel

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7) Dispensing System:

a) DC Motor: Any rotary electrical motor that converts direct current electrical energy into mechanical energy is referred to as a DC motor as shown in Fig. 7. The most common varieties rely on magnetic fields to produce forces. Almost all DC motors contain an internal mechanism, either electromechanical or electronic, that changes the direction of current in a section of the motor on a regular basis[8].

b) Water Pump: A water pump's primary concept is to use a motor to convert rotational or kinetic energy into energy for moving fluid or for fluid flow (hydrodynamic energy). A water pumping system's primary function is to transport water from one location to another as shown in Fig 8.

8) Power Supply: Power connections are devices that allow an electrical current to pass through them solely for the purpose of supplying electricity to a device (not a data stream, for example, or anything more complex). These plugs are designed to be used on a cable that connects to an external AC adapter (power supply) as shown in Fig 9. The matching jack or socket is permanently installed on the powered equipment.

Fig. 7. DC Motor

Fig. 8. Water pump

Fig. 9. Power Supply

Power Regulator: A voltage regulator is a part of the power supply unit that maintains a consistent voltage under all operating conditions. It maintains voltage during power fluctuations and load changes. It can control both AC and DC voltages. Any electrical or electronic device that keeps the voltage of a power source within acceptable limits is known as a voltage regulator. The voltage regulator is required to keep voltages within the acceptable range for electrical equipment that uses that voltage.

B. Software Description:

1)Arduino IDE: The Arduino IDE (Integrated Development Environment) is a software tool for writing code that may be downloaded from the Arduino website. The Arduino board is the actual device that stores and executes the code that has been uploaded to it. Arduino is the name given to both the software and the board. The Arduino code is written in C++, with a few extra methods and functions that we'll go through later. C++ is a computer language that is easy to understand as mentioned in many references [11,12].

2)Firebase Database: The Firebase Realtime Database is a NoSQL database hosted in the cloud that allows you to store and sync data in real time amongst your users. It's a Backend-as-a-Service solution (Baas). It offers a number of tools and services to assist developers create high-quality apps, expand their user base, and make money. It is based on Google's technology.

3)Kodular (for app development): Kodular (previously Makeroid) is an open-source web development platform for mobile apps. It offers an innovative component and block architecture that allows you to create an Android app without coding for free. With a blocks-type editor, you can quickly design Android apps as mentioned in many references. Blocks are used to describe how to complete a task. The Blocks are used to design how the Components respond to various actions and events in the programme. App logo is shown in Fig.10.

Fig. 10. App Logo

IV. PROCEDURE METHODOLOGY

The overall technique for this project, as well as the updates made to current technologies that serve the aim of trash removal without human cleaning, are shown in the form of a flow chart in Fig.11 below. The flowchart below depicts the project's entire operation as well as its step-by-step procedure:

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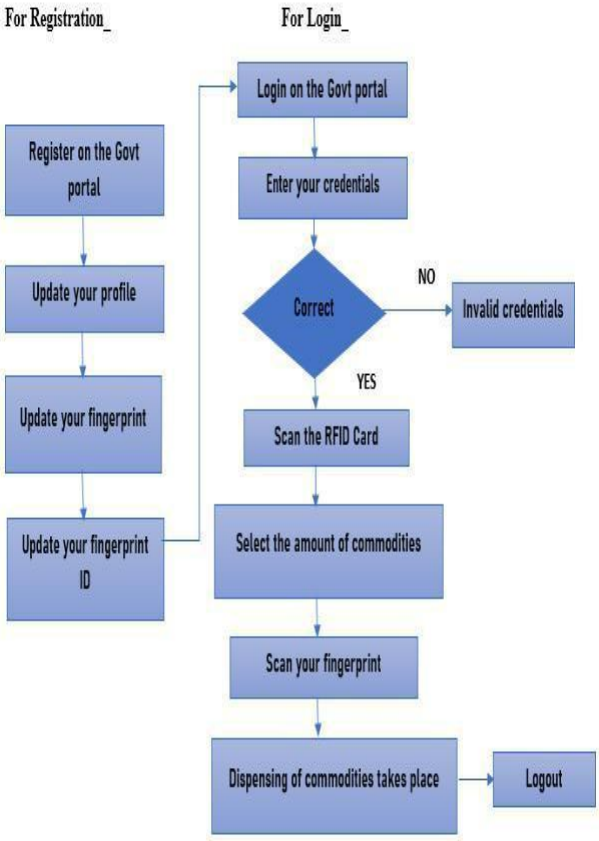

Figure 11. Flow Chart of Project

V. IMPLEMENTATION

Below in Fig.12 block diagram of project implementation is drawn:

Project is divided into four parts namely:

- Input Part: It includes 12V 1A power supply, DC to DC Buck converter and 5V power supply. It provides input supply to the controller.
- Controller: It includes Arduino Uno and Node MCU which controls authentication part and dispensing part by taking power from input part.
- Authentication Part: It includes three level authentication that are Fingerprint, password and RFID, Fingerprint Module uses LCD Display to display the data. Buzzer is being provided to detect any false practices.
- Dispensing Part: It is divided into two parts i.e., Solid dispensing system and Liquid dispensing system. Solid Dispensing System consists of Servo Motor and Solid Commodity Dispenser. Liquid Dispensing System consists of Motor Driver, Electric Pump and Liquid Commodity Dispenser.

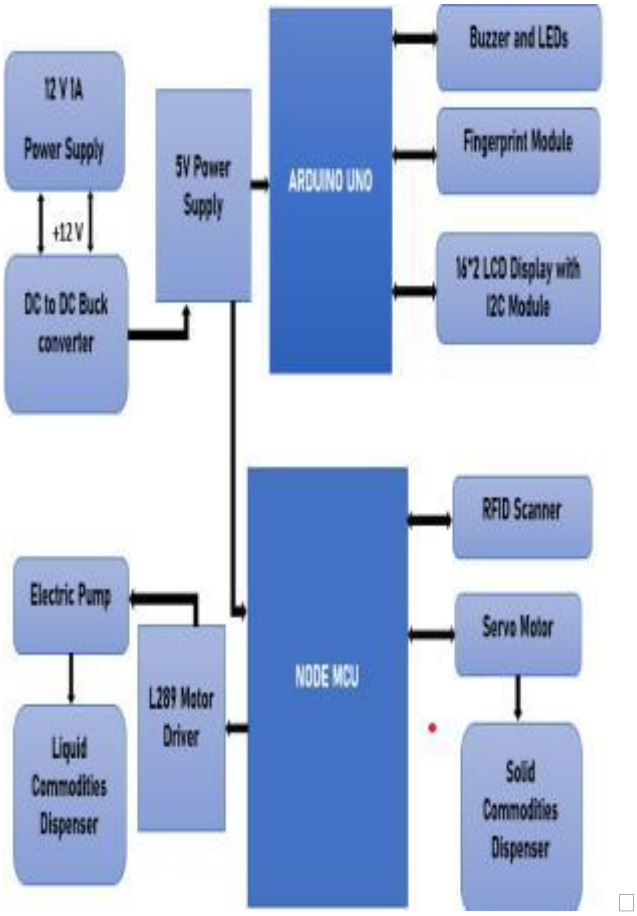

Fig. 12. Block Diagram of Project Implementation

VI. ACTUAL PROJECT MODEL

Below is the picture of how the actual model looks like after implementing everything in Figure 13 and Figure 14.

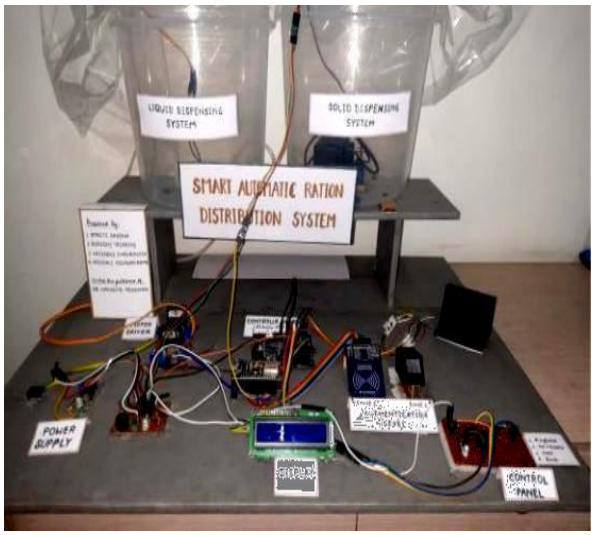

Fig. 13. Front View

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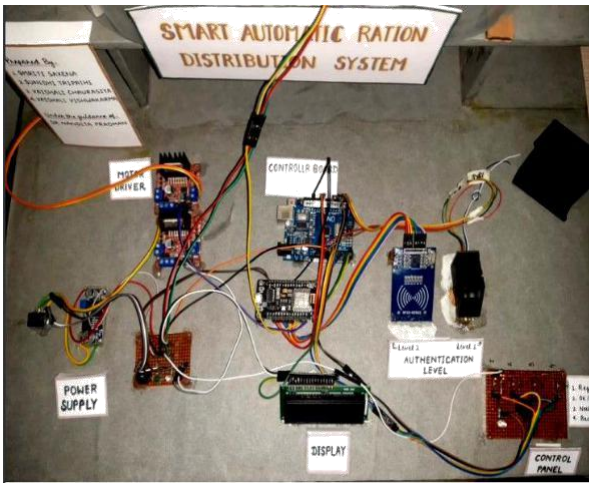

Fig.14. Top View

VII. RESULT

The result for Smart Automatic Ration Distribution System is described in the observation tables below.

Table 1: For Solid Commodity_

S. No	Time (in Seconds)	Quantity Dispensed (in grams)
1	4 s	150 g
2	8 s	300 g
3	12 s	450 g
4	16 s	600 g

Table 2: For Liquid Commodity_

S. No	Time (in Seconds)	Quantity Dispensed (in ml)
1	10 s	150 ml
2	20 s	300 ml
3	30 s	450 ml
4	40 s	600 ml

VIII. CONCLUSION AND FUTURE SCOPE

Through this model, we hope to introduce a new technology that helps to rectify problems in the existing system while simultaneously giving benefits that may be used to other applications. It functions as an anti-corruption instrument since it reduces material theft in ration stores as well as corruption and malpractices throughout the system, which was one of the primary factors we addressed while developing the concept[12,14].

1) Future scope:

To improve the effectiveness of this system, the following methods can be used in the near future[13]:

- High-quality sensors and hardware can be employed for efficient implementations;
- certain organisations may find this helpful and elect to deploy such a system.
- Payment Gateways can also help make the payment process go more smoothly.
- This automatic rationing system can be translated into a variety of languages.
- It can also be utilised in automatic medicine dispensing, grocery stores, and food storage sensors.
- It can remove the time constraint for many types of applications due to the simplicity of access, allowing users to be available 24 hours a day, seven days a week.

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