

Design and Fabrication of Single Window Automatic Vending Machine for APL/BPL Ration Card Holders

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Abstract -A monthly allocation of goods from the ration shop is all that nearly 1.21 billion (29.8%) Indians depend on to get by in poverty. But the present ration distribution system has a lot of irregularities and many fraudulent activities are taking place in this sector. The commodities that the government provides to the ration shops are not reaching the people who deserve it and are falling into the wrong hands.

To solve all these problems, automatic ration vending machines came into the picture. While building these vending machines researchers have carefully combined all the recent technologies and made sure that the system is convenient, systematic and corruption free. The most common technologies used here are RFID, biometrics and GSM technologies.

Key Words: RFID, biometrics, ration vending machines, and GSM

1. INTRODUCTION

The public distribution system is another name for the rationing system. The public distribution and food ministry of the Indian government oversees and administers the public distribution system, or PDS. Food Corporation of India (FCI), founded in 1951, purchases goods from farmers, warehouses them, and delivers a predetermined allotment each month to the PDS network. Civil Supplies Corporation, a significant public sector organization, oversees and provides all citizens with needed goods. The PDS System was first set up by the British Government in 1933 as a wartime rationing measure. In 1944 the government of India started distributing subsidized food and non-subsidized food to the Indian poor during the second world war and later in 1947 it was launched in the current form. Subsequently, in 1997 the Indian government introduced targeted PDS, which aimed at improving the living standards of the poor by providing them subsidized food through a network of ration shops.

To purchase goods from the ration shops, every family needs a ration card. A family is given a ration card, an official document, by the Indian government. This card serves as a means of identification and proof of address for a person who is authorized to obtain a monthly ration of food grain from the ration shop. Each family member's name and identity are listed on this card. The proportionate distribution of rations is decided by the government. The commodities are collected once in every month at a ration shop distributed by the ration shop keeper. The ration keeper checks the person's ration card, validates it, then weighs the monthly share of his commodities and delivers the commodity to the ration card holder. This process has a lot of drawbacks: the weight that is measured can be inaccurate due to human errors. The ration card holder has to wait in long queues until the person ahead of him is checked for his ration card and commodities are delivered to him. If the beneficiary misses his ration for that month the ration keeper can sell the commodities at higher prices in the open market [4]. The ration keeper can also produce fake ration cards and acquire the commodities and sell at higher prices and tell the people that the ration is empty. So the people who deserve the ration may not get it without even the slightest knowledge of what's happening inside the ration shop.

In further sections we will see different authentication methods, input/output methods and other features which can be used to avoid all these ill-practices and to make this system efficient and transparent.

1.1 Background of Invention

The Public Distribution System (PDS) was started long ago during the inter-war period in the 1960's. Since then the system has been working through shops where people come to the shop, give their credentials and take the ration home at lowest prices. This scheme was initially started to nourish the economically backward classes in India.

But as the system grew and expanded to reach out to as many people as possible throughout India, people started

to exploit the loopholes of the system. People started stealing commodities by making fake entries without the knowledge of the ration card holder. Since entries are made in a book and the offline documentation is not accurate the government loses a lot of money due to these methods.

To overcome these flaws, automation is necessary. Prior work had been done on this problem and a RFID (Radio Frequency Identification) based ration vending machine was designed. In the RFID based vending machine most of the above mentioned problems are solved but the problem with that invention is that the beneficiary have to always keep his RFID tag with him and cannot interact with the vending machine without it.

Our invention aims at solving all the above mentioned problems and also make the process easy and convenient to the beneficiary.

1.2 OBJECTIVE OF THE INVENTION

- The current public distribution system is run in ration shops where at least two people are required to do all the work. But with our invention the public distribution system will become fully automatic and online.
- With our invention the beneficiary need not bring a ration card, Aadhar card or give fingerprint to avail his ration and he will only need his phone.
- Our invention will save a lot time of the beneficiary as he need not wait in long queues and wait to give all his credentials before getting his ration. Our invention can work 24/7 and does not require any human laborers.
- This invention will help the government avoid any sort of corruption and thus save a lot of money.

2. METHODOLOGY

In this section we have divided every working part of a ration vending machine, and we have looked further into them to see how recent technologies can be implemented to get an efficient and systematic system.

The major working parts of a ration vending machine is Input, authentication and output of the machine . Let's look into each of these parts.

2.1 INPUT METHODS

1. LCD DISPLAY

The LCD screen, often known as a liquid crystal display, is a relatively basic display module. The 16*2 LCD display is the most commonly used screen for the ration vending machine as it is more convenient.

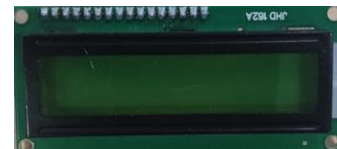


Fig. LCD Display

2. KEYPAD

To access menus, enter passwords, and operate numbers, a keypad is typically used. For the vending machine the keypad which is used to enter user details, amount of commodities , enter OTP, etc..

A 4*3 and 4*4 keypad is the commonly used input method.



Fig. Keypad

3. AUTHENTICATION

RFID

Automatic material or item identification using radio waves is made possible by radio frequency identification (RFID).

When the RFID card is scanned against the RFID reader module, the individual data from each user's RFID tag is collected (i.e combination of digits and characters), Which is matched with the database . If the tag matches with the database then the vending machine proceeds.

FINGERPRINT SCANNER

Biometric authentication is done to identify the persons intrinsic physical and behavioral traits. When a finger is placed on a fingerprint scanner, The fingerprint is checked

with the existing database and if it matches then it returns the person's appropriate information.

Fingerprint scanner R305 and R307 are the most commonly used fingerprint scanners.

GSM

Global system for mobile communication is used for sending OTP and messages about the ration to the consumer and the government. GSM module sim 300 is most commonly use.

4.WEBPAGE

A webpage can be created wherein the consumer who needs goods from the PDS system can enter a valid serial number and password. After logging in, the page will show the details about the consumer and then the consumer can order the commodities.

5.MICROCONTROLLER

The system's brain is a microcontroller. It is the primary element responsible for delegating and managing all of the tasks carried out by the various modules.

Arduino is a tool for creating a variety of electronic projects that is open source and free.This allows for two different sorts of access: physical programmable circuit boards, often known as microcontrollers, and software, or integrated development environments.

Arduino Uno and arduino mega are two suitable arduino boards for ration vending machines.

PIC microcontrollers like the PIC 16F377 and PIC 18F4520 are also used.

Raspberry Pi microcontroller which are similar to arduino are also used



2.2OUTPUT METHOD

1.LOAD CELL

A transducer that converts force into electrical signals is a load cell. The weight of the ration gathered is measured by the load cell. The Arduino is connected to a load cell and HX711 to function as a weight sensor. For weight scales, the HX711 is a precision 24-bit analogue to digital converter.



Fig. LoadCell

2. SOLID FLOW SYSTEM



Fig. ServoMotor

An electrical device known as a servomotor transforms electrical energy into mechanical energy. Once the authentication process is done and the dispensing of the commodities is initiated a motor starts rotating and opens the container lid.Following the load cell's signal, the motor spins counterclockwise and closes the lid. A typical motor driver or motor driver IC is L293D, which enables DC motors to run on either length H-bridges perform similarly to L293D. The linear position, velocity, and acceleration can be precisely controlled by a servo motor, which is a rotating actuator or linear actuator.

A MG90 servo motor can be used to control the flow of commodities by openings and closing the lid.

3. CONCLUSIONS

In India since many people come from financially backward classes and a system like the Public Distribution System (PDS) is very beneficial for them as it will relieve them of some financial costs and help them lead a good life.

The current system comes with lot of drawbacks which not only affects the common people but also the Government of India. In the current system the Government of India's Ministry of Public Distribution and Food is not able to keep track of the commodities reaching the poor and how much is falling into the wrong hands.

Therefore a system has to be framed which not only benefits the people to avail ration but also the Government to keep track of the commodities.

Such a system needs to have good authentication methods and also keep updated records of the database. A two-factor authentication can be done with the help of RFID/Biometric authentication for the first level of security. The second level of authentication can be done with the help of GSM technology by sending OTP.

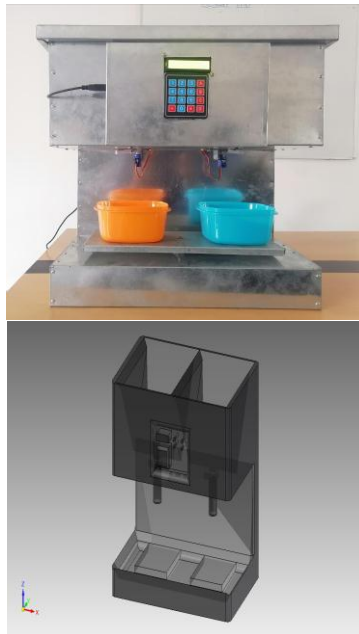


Fig. Fabricated Model & 3D Model

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