Automated Ration Distribution System Using RFID/UID and IoT

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Abstract—An efficient, accurate and automated technique of ration distribution using RFID (Radio Frequency Identification) based technology/using of AADHAR number, which is an innovative approach in PDS (Public Distribution system). Public distribution system is also named as rationing distribution system, which is one of the widely disputable issues that involve malpractices. The existing ration distribution system has high level of corruption like inaccurate measurement of goods, large waiting time, and material theft in ration shop and manual distribution is not easy to handle crowd. In this paper, the proposed system replaces the manual work in public distribution system. The main objective of the designed system is the automation of ration shop to provide transparency by using, RFID/UID number & networking which is similar to the ATM. This automated ration system replaces the conventional ration card system by RFID tag/AADHAR number, the government Authority provides the customer’s database stored in microcontroller. Customer needs to scan tag to RFID reader or enter the AADHAR number, along with the PIN assigned to it, and then microcontroller checks customer’s details with stored database to dispense the material in ration shop. After successful authorization, customer needs to enter type of material as well as quantity of material using keypad. After delivering proper material to consumer, proposed ration shop system is connected to the IoT database via Ethernet module to provide information to customer as well as PDS authorities. The Digital India Initiative marks the use of internet for accessing information even in most remote areas. The use of AADHAR number in the system eases the management of distribution for the government.

Index Terms—Arduino, Ethernet, IoT, Microcontroller, RFID, Solenoid.

I. INTRODUCTION

The PDS is recognized by the Government of India, with a network of 5.05 Lakh Fair Price Shops (FPS) is perhaps the largest retail system in the world [1]. This scheme was launched in India on June 1997. Public distribution system provides a ration card issued by the State Government for the purchase of essential consumer materials like rice, wheat, kerosene and oil. The fair price shops are mainly used to distribute the goods at a subsidized price to the poor.

Public Distribution System is one of the widely controversial issues that involve inefficiency in the targeting of beneficiaries and the resulting leakage of subsidies. The Indian ration card is the authority of the Indian people. It is an important livelihood tool for providing proof of personal identity [2]. Public Distribution System is one of the widely controversial issues that involve malpractice. The manual interference in weighing of the materials leads to inaccurate measurement and it may happen, the ration shop owner illegally uses consumer materials without prior knowledge of ration card holders [1]. In this paper, the proposed automated ration distributed system aids to control Malpractices by replacing manual work with automatic system based on RFID/UID number & Internet Databases.

II. LITERATURE SURVEY

This automated ration system replaces the conventional ration card system by RFID tag, the government Authority provides the customer’s database stored in Internet through ThingSpeak Database. The main objective of the designed system is the automation of ration shop to provide transparency by using, RFID &IOT technology.

The RFID systems basically consist of three elements: a tag or transponder, a reader and a middleware deployed at a host computer. The RFID tag is a data carrier part of the RFID system which is placed on the objects to be uniquely identified. The RFID reader is a device that transmits and receives data through radio waves using the connected antennas. Its functions include powering the tag, and reading or writing data to the tag. Consumers are provided with RFID card which acts as ration card. The PDS system today supports over 40 crore Indians below the poverty line with monthly supply of subsidized food grains [2]. This large crowd can be handled by using UID (Unique Identification) number system called AADHAR number through which government databases could be accessed providing necessary Details. ThingSpeak™ is an open source IoT(Internet of Things) platform that lets one collect sensor data in the cloud and develop IoT applications. The ThingSpeak™ IoT platform provides apps that let one analyse and visualize data in MATLAB®, and then act on the data. Sensor data can be sent to ThingSpeak from Arduino®, Raspberry Pi™, BeagleBone Black, and other hardware.

In this paper we have designed and implemented an automated ration distribution system using RFID and IOT. In this system every consumer is provided with a
RFID card which acts as ration card. The RFID card has unique identification number; the consumer scans the card on RFID reader which is interfaced with microcontroller. Consumer can also enter her/his AADHAR Card number instead of RFID Scan. After successful authorization, customer needs to enter type of material as well as quantity of material using keypad [3]. After delivering proper material to consumer, proposed ration shop system is connected to the government database via INTERNET which updates the database and thereby provide information to customer as well as PDS authorities. By implementing the automated ration distribution system each user is assured to get a correct amount of ration at the Correct Price. The project can be implemented in large scale by using UID (Unique Identification) number system called AADHAR number which can be linked with government databases [4].

III. PROPOSED METHODOLOGY

A. Block Diagram

The basic setup of the complete project consists of Arduino Board (Arduino Mega 2560 used), Servo, DC Pump, RFID Tag, RFID Reader, Ethernet Module, keypad, LCD display, Power Supply, Buzzer.

Fig. 1: Block Diagram

The proposed system demonstrates distribution of solid as well as liquid consumer materials that is grains (wheat/rice) and kerosene [1]. RFID reader and keypad acts as inputs to system and LCD is used for displaying ration stock and related activities. The microcontroller outputs are used to drive servos and DC Pump. The Ethernet module is used to transmit the data to the ThingSpeak open source Internet Database.

B. Algorithm

Algorithm of proposed system is:

1. Every consumer is provided with a RFID card which is registered and linked to the PDS and Government database[5].

2. At the time of ration distribution at ration shop, either consumer scans the RFID card or enters the 12-digit AADHAR NUMBER.

3. User is prompted to enter the unique 4-digit [IN for validation.

4. Password of consumer is verified with the database provided by the Government authority which is stored in the microcontroller.

5. Once verification is successful, User ID is displayed on LCD, consumer is asked for a Select type of material (Here, 1.Rice and 2. Oil) through keypad.

6. Based on type of material chosen, the consumer is asked for the amount or quantity to be entered through keyboard.

7. Meanwhile, Database is updated with the current transaction. If the asked quantity is not within Allowable Amount, Transaction fails.

8. Otherwise, the Servo or Solenoid valve is activated based on the material chosen.

9. After dispensing exact quantity of material motor or solenoid is disabled.

10. Database is Updated.

C. Flowchart

Fig. 2: Flowchart

IV. CIRCUIT OPERATION

Microcontroller Atmel 2560 is the heart of the Automatic Public Distribution System. The circuit diagram is shown in the Fig. 3.
A. Microcontroller

The 16 MHz crystal oscillator is used to provide the required clock signals to the microcontroller. The Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button [4].

B. LCD display and Keypad interfacing

A liquid-crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. The LCD is used in a wide range of applications including computer monitors, televisions, instrument, aircraft cockpit displays.

Hex key pad is simply an arrangement of 16 push button switches in a 4X4 matrix form. Typically, a hex keypad will have keys for number 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 and letters A, B, C, D, *, # [4]. The keypad has 8 control lines, 4 for rows and 4 for the columns.

C. Relay and Solenoid Valve

A solenoid valve is an electromechanically operated valve. The valve is normally closed. It is controlled by current through it. The solenoid valve is interfaced with Arduino using relay circuitry. Solenoid valve is used in system for controlling the flow of Oil. As soon as consumer selects Oil and its quantity, solenoid valve switched on by relay circuitry. The ON time of Solenoid valve depends on selected quantity of kerosene. Solenoids offer fast and safe switching, high reliability, long service life, good medium compatibility of the material used, low control power and compact design.

D. SERVO

Servomechanism is employed to check on the opening and closing of the outlets of the grains. A tiny and high torque servo is used which can rotate almost 180 degrees in all. Using the arms provided with the servo, a solenoid mechanism is made.

E. ETHERNET MODULE

ENC28J60 is used, which is a standalone ethernet controller with an industry standard Serial Peripheral Interface and is designed to serve as an Ethernet Network Interface for a controller. It meets all of the IEEE 802.3 specifications. It also provides an internal DMA for fast data throughput.

F. THINGSPEAK

ThingSpeak™ is an open source IoT (Internet of Things) platform that lets one collect sensor data in the cloud and develop IoT applications [6]. The ThingSpeak™ IoT platform provides apps that let one analyze and visualize data in MATLAB®, and then act on the data. Sensor data can be sent to ThingSpeak from Arduino®, Raspberry Pi™, BeagleBone Black, and other hardware.
A software has been developed, to enable the users to access their transaction logs just like an ATM. An Android based app is also available to view the ThingSpeak™ cloud database. The Keypad is used for entering different choices. The advantage of using a web based server is that the Government can also access the data remotely, as desired.

The mechanical part of the automated ration distributed is shown Fig. 5. It contains an RFID module interfaced with Arduino with an Ethernet module. A LCD is also interfaced. A Servo and a solenoid with relay is also interfaced which is used to dispense the ration. The alarm is also interfaced to detect the wrong card. The full working is shown below in different figures [4].
VI. CONCLUSIONS AND PERSPECTIVE

Automated Ration Distribution System Using RFID/Aadhar and Internet System has been successfully implemented. This system is secure and user friendly. The record of each user is maintained in a cloud based database which can be accessed by people around the globe. This model reduces the need of ration shops. The methodology can be adopted by the government and be implemented in large scale using silo. The future ration shops can include these modules to run in an effective manner so that the malpractice rate is reduced and the poor can get their share. Human interaction with the functioning of the machine is minimized to a great extent, thereby reducing the opportunities of malpractice. For future research the proposed methodology can be modified to include biometrics and image processing technologies for authentication instead of RFID tags to give more security.

REFERENCES


