Automatic Ration Material Distributions and Payment System Based on GSM and RFID Technology

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Abstract— **RFID based automatic fair price shop is novel approach in public distribution system (PDS) useful for more efficient, accurate, and automated technique of ration distribution. Public distribution system also called rationing distribution system is one of the wide controversial issues that involve malpractices. The present ration distribution system has drawbacks like inaccurate quantity of goods, low processing speed, large waiting time, material theft in fair price shops. The proposed system replaces the manual work in fair price shops. The main objective of the designed system is the automation of fair price shops to provide transparency. The proposed automatic ration shop for public distribution system is based on Radio Frequency Identification (RFID) technology that ration replaces conventional cards. The RFID tags are provided instead of conventional ration cards. Customer's database is stored in microcontroller which is provided by Government Authority. Customer needs to scan tag to RFID reader, and then microcontroller checks customer's details with stored to distribute material in ration shop. After successful verification, customer needs to enter type of material as well as quantity of material using keypad. After delivering proper material to consumer, the microcontroller sends the information to customer as well as PDS authorities using Global System for Mobile (GSM) technology. Till date, only the distribution system was automated. In the proposed system, payment is also automated**

Index Terms: GSM, Microcontroller, Public Distribution System, RFID

I. INTRODUCTION

India's Public Distribution System (PDS) is the largest retail system in the world [7]. Public distribution system provides a ration card [6] issued under an order or authority of the State Government for the purchase of essential consumer materials like rice, wheat, kerosene and oil. State Government issues distinctive ration cards like yellow ration card, saffron ration card, and white ration card depending on family annual income. The consumer material is supplied to ration card holders in the first week of every month by ration shopkeeper. Public Distribution System is one of the widely controversial issues that involve malpractice. The manual intervention in weighing of the materials leads to inaccurate measurements and/or it may happen, the ration shop owner illegally uses consumer materials without prior knowledge of ration card holders. The proposed system aids to control malpractices which are present in ration shop by replacing manual work with automatic system based on RFID and GSM. Every consumer i.e. family head provided 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 kept at ration shop. Once consumer is validated by password, the system asks the consumer to select appropriate material and quantity of material through keypad. Based on material chosen by consumer, appropriate circuitry will be activated and consumer gets material. GSM interfaced with microcontroller sends information in the form of SMS to related people. The proposed RFID based automatic ration shop system would bring transparency in public distribution system and become helpful to prevent malpractices.

II. BLOCK DIAGRAM

Fig. 1 shows the system block diagram based on RFID technology. This system consists of various parts such as RFID, GSM, microcontroller, motor driver, solenoid control circuits and keyboard.
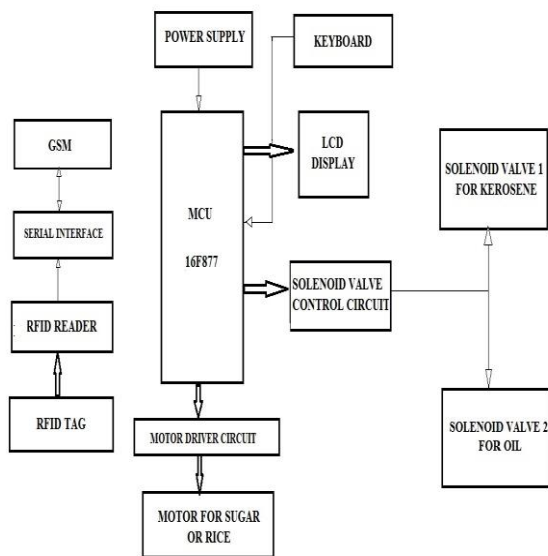
Fig 1: Block diagram of the proposed system

II. WORK DONE

A. MICROPROCESSOR

The proposed system uses PIC 16F877A IC as the main microcontroller. In the existing system, an ARM microcontroller is used. Though the use of ARM has advantages, it had some disadvantages such as:

- Programming is quite difficult.
- ARM comes under CISC type of microprocessor, which is not as quick as other RISC processors in operation.
- Clock speed is low.
- We can't have a large memory to be stored inside, which will lead to slow operations.

So, in order to improve the performance of the existing system, the PIC microcontroller is used here. PIC microcontroller has the following advantages:

- It is a RISC processor.
- It is compatible in all modes of operation
- The three modes of operation in the PIC microcontroller helps to improve its performances.
- Clock speed is higher.
- Storage can be massively made.

B. LCD AND KEYPAD INTERFACING

LCD is electronic visual display that uses the light modulating properties of liquid crystal. System uses 16x2 LCD module which is easily programmable and economical. Interfacing of 16x2 LCD module with LPC2148 which operates on +3.3V is not same as interfacing with microcontrollers like AVR which operates on +5V. LCD module is interfaced successfully with LPC2148 using CD4050 IC. Both the terminals of the switches of 4x3 matrix keypad are connected to the port pin i.e. four rows and three columns. Each row and column section pulled by high or low to scan particular key press.

C. SOLENOID CIRCUITRY

A solenoid valve is an electromechanically operated valve. The valve is normally closed; it is controlled by current passing through it. The solenoid valve is interfaced with LPC2148 using relay circuitry. Solenoid valve is used in system for controlling the flow of kerosene. As soon as consumer selects kerosene 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.

Fig.2: A Solenoid valve

D. DC MOTOR INTERFACING

Here, IC L293D is used for interfacing the microcontroller with DC motor. Fig.3 shows the interfacing method
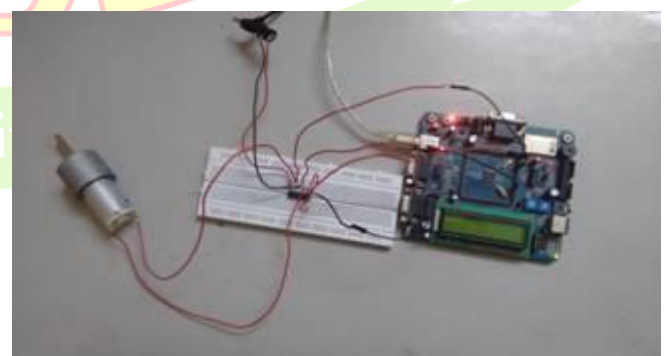

Fig.3: DC motor interfacing

E. SERIAL INTERFACING

RS 232 is the common serial interfacing module for most of the serial communication systems. In the proposed

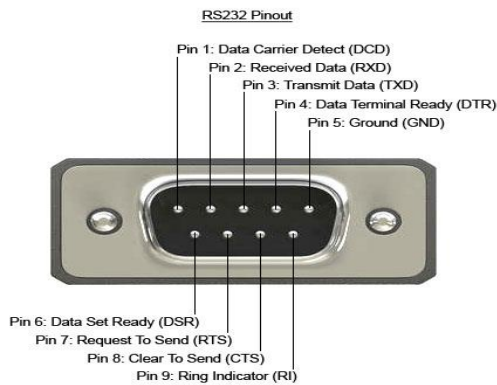system also, we are using RS 232 cable for serial communications.

Fig.4: RS 232 pin diagram

III. ALGORITHM

Algorithm of proposed system is:

1. Every consumer is provided with a RFID card which is registered by the Government authority.
2. Each unique RFID contains details such as name and address of the consumer, amount of stock allotted, amount available in the ID, etc.
3. Each consumer is asked to have a password.
4. At the time of ration distribution at ration shop, first password of consumer is verified.
5. User ID is verified with the database provided by the Government authority which is stored in the microcontroller.
6. Once verification is successful, the consumer details are displayed on the LCD screen.
7. Consumer is asked to select the type of material and quantity required through push buttons and keypad respectively.
8. Based on type of material chosen, the motor or solenoid valve is activated.
9. For solid materials, motor is activated and for liquid materials, solenoid valve is activated.
10. The load cell or level indicator is checked for proper quantity.
11. After collecting proper quantity of materials, motor or solenoid is disabled.
12. After the process is completed, the payment system, similar to mobile recharging system will deduct the amount to which we have bought the materials and remaining amount is displayed on the LCD
13. GSM module will send the information in form of SMS to the user
14. Current stock in the ration shop is displayed using LCD.
15. At the end of each day, the PDS authorities will receive a message from the fair price shop, regarding the stock availability.

IV. FLOWCHART

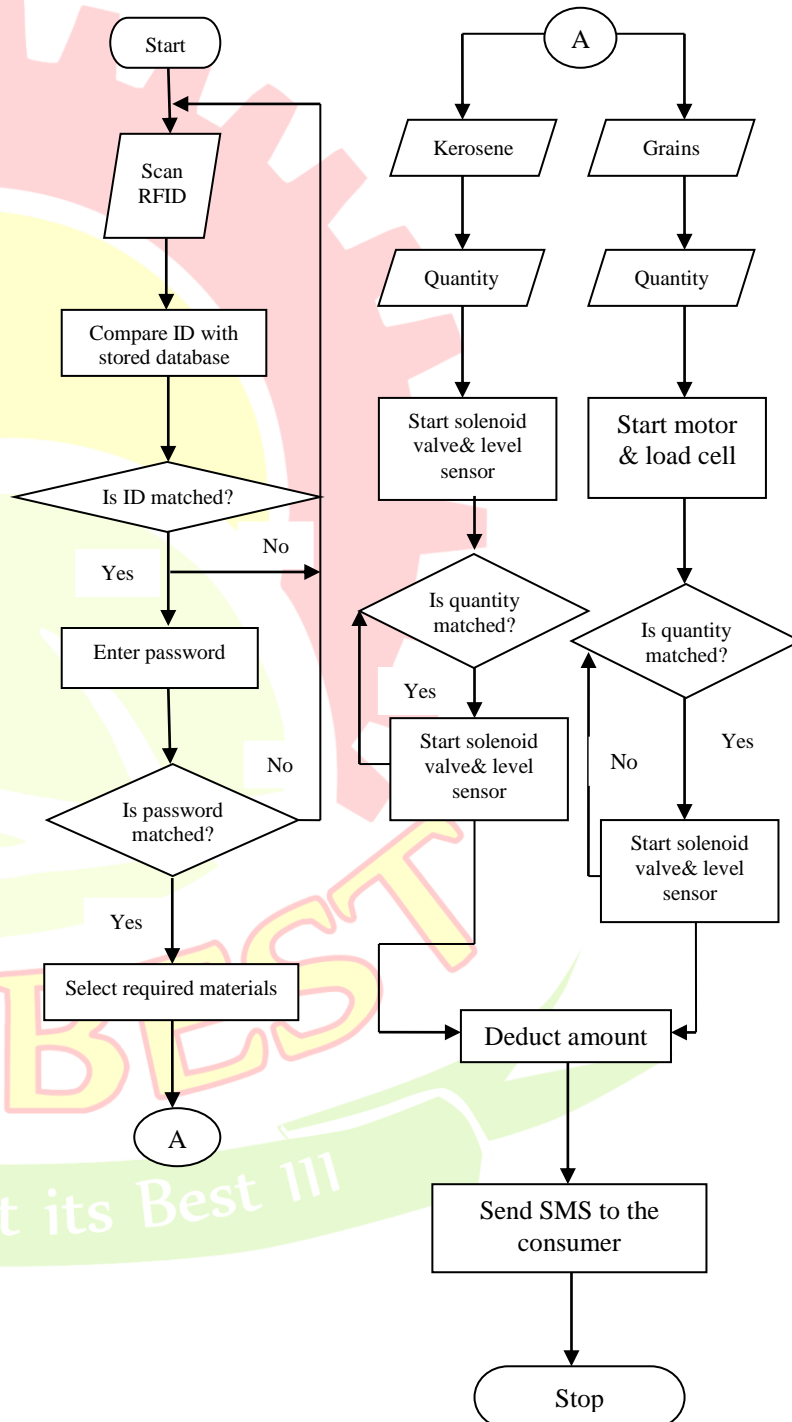Fig. 2 shows flow chart of the proposed public distribution system

Fig. 4 System Flowchart

V.   RESULTS

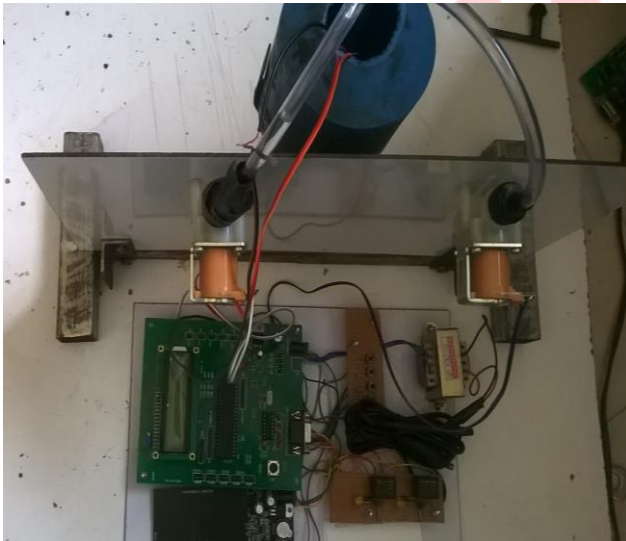Fig: 5 shows the final setup of the proposed system

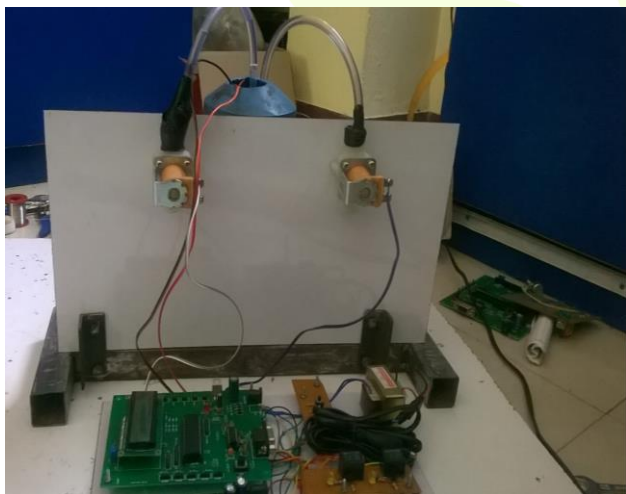*Fig.5(a): Final setup of the proposed system*

Fig.5(b): Final setup of the proposed system

The main objective of the system is to reduce the man made errors in the public distribution system. At the end of the research, the following inferences were made as the result of the proposed system:
- ✓ Distribution of the materials is automated
- ✓ Occurrence of manual errors is not possible in this system

- ✓ Programming is made simple compared to that of existing system
- ✓ Payment is also automated
- ✓ Message traffic does not occur, as the PDS authorities get the stock availability message only at the end of the day
- ✓ Illegality does not exist

VI.   CONCLUSION

The conventional system has drawbacks like malpractices, low processing speed, long waiting time at the fair price shops to get materials, and without any acknowledgement to Government and consumer, materials may be sold illegally. To overcome above problems, automatic ration shop played important role. The automatic ration shop involved RFID as well as GSM technology to distribute the materials. Ration card is replaced by RFID and information is sent to consumer using GSM module. The proposed system creates the transparency in public distribution system as the work becomes automatic. With the help of this system, it is possible to make public distribution system efficient and free from malpractices. The proposed system has advantages like it is helpful to prevent malpractices at ration shop, maintain data properly, reduces paper work, time saving approach and cost effective. Many attempts have been done by research people to get this one to be effective. But, due to various flaws, they have been considered impractical. In the proposed system, the payment is also made automated. This reduces the work of authorities. Since at the end of the day, stock availability of each fair price shop is sent to the civil supplies office, theft of the materials can also be averted.

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