RFID and GSM based Automatic Rationing System using LPC2148

Vinayak T. Shelar, Mahadev S. Patil

Abstract— RFID based automatic ration 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 widely 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 ration shop. The proposed system replaces the manual work in ration shop. The main objective of the designed system is the automation of ration shop to provide transparency. The proposed automatic ration shop for public distribution system is based on Radio Frequency Identification (RFID) technology that replaces conventional ration 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.

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

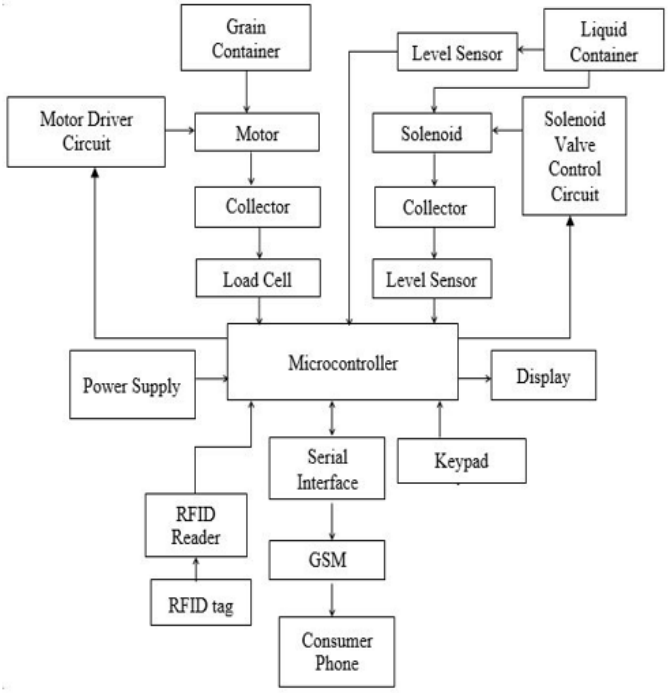

Fig. 1 System Block Diagram

Fig. 1 shows the system block diagram based on RFID technology. System consists of microcontroller-LPC2148, RFID, GSM, motor driver, solenoid valve circuitry, LCD and keypad. The proposed system demonstrates distribution of solid as well as liquid consumer materials that is grains (wheat/rice) and kerosene. RFID reader, ultrasonic sensor, load cell 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 motor and solenoid valve.

ISSN: 2278 – 1323

III. ALGORITHM

Algorithm of proposed system is:

1. Every consumer is provided with a RFID card which is registered by the Government authority.
2. At the time of ration distribution at ration shop, first password of consumer is verified.
3. User ID verified with the database provided by the Government authority which is stored in the microcontroller.
4. Once verification is successful, consumer is asked for a select type of material and quantity required through push buttons and keypad respectively.
5. Based on type of material chosen, the motor or solenoid valve is activated.
6. The load cell or level indicator is checked for proper quantity.
7. After collecting proper quantity material motor or solenoid is disabled.
8. GSM module will send the information in form of SMS to the user as well as PDS authority.
9. Current stock in the ration shop is displayed using LCD.

IV. FLOWCHART

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

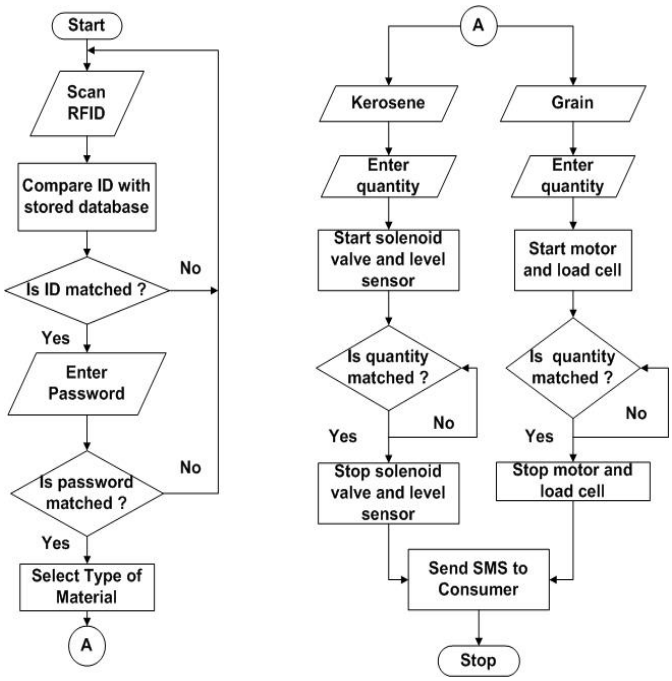

Fig. 4 System Flowchart

V. WORK DONE

A. Microcontroller-LPC2148

It is the heart of automatic ration shop. The LPC2148 has following features,

- One or two 10-bit ADCs provide a total of 6/14 analog inputs, with conversion times as low as 2.44 micro sec per channel
- Two 32-bit timers
- Multiple serial interfaces including two UARTs
- Power saving modes include Idle and Power-down
- USB 2.0 Full-speed compliant device controller

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.

System uses 4x3 matrix keypad. 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. Ultrasonic sensor

It is non-contact sensor having following characteristics:

- Does not require physical contact
- Requires less maintenance
- Faster operation
- Flexibility in application

Module Working Principle

1) First to start ranging, 10 µs high level input signal is given to trigger pin of the ultrasonic sensor.
2) As soon as module is triggered, it automatically sends eight 40 kHz and detect whether there is pulse signal reflected back.
3) If signal returns, echo pin will rise i.e. it will become high to certain duration which is equal to the time taken by wave to reach the object and to coming back.
4) Test distance = (high level time × velocity of sound(340m/s)/ 2

Practically, timing diagram of HC-SR04 module is shown in fig. 3 (a) and fig. 3 (b).

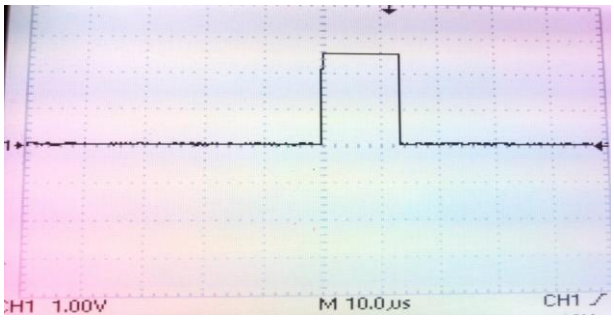

Fig.3 (a) Triggering pulse

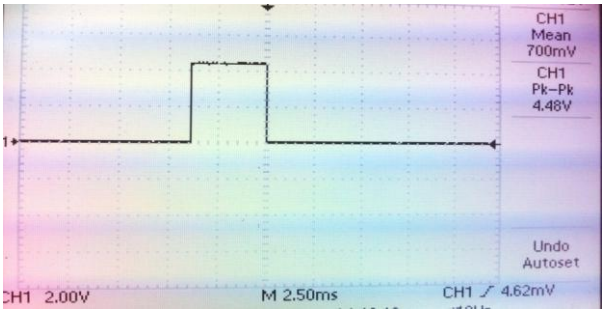

Fig. 3 (b) Echo pulse

ISSN: 2278 – 1323

D.Relay and solenoid circuitry

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 LPC2148 using relay circuitry. Solenoid valve is used in sytsem for controlling the flow of kerosene. As soon as consumer selects kerosene and its quantity, solenoid valve swithched 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.

E. Amplifier circuitry design

INA 128P is a 8 pin instrumentation amplifier IC. This IC is used to amplify the voltage of load cell which is in millivolt. Wide range of gain can be slected by using single resistor which is connected between pin number 1 and 8. The amplifier gain is set to 178 for grain distribution sub system.

Table 1. Load cell sensor outputs

Weight (in Kg)	**Load cell output Voltage**	**Amplifier Output**
No Load	0.59 mV	0.17 V
1 Kg	2.8 mV	0.70 V
2 Kg	5 mV	1.31 V
3 Kg	7.3 mV	1.80 V
4 Kg	9.59 mV	2.22 V
5 Kg	11.8 mV	2.80 V

F. DC motor with driver circuitry

Fig. 5 shows interfacing of DC motor and LPC248 usign L293D IC, IC L293D provides proper matching between motor and LPC2148.

Features of high torque 12V DC geared motor 10 RPM

a) High torque DC motor with Metal Gear box and off centered shaft.
b) 6mm diameter shaft with M3 thread hole.
c) Shaft length 15mm.
d) No load current 800mA, load current up to 7.5A.

VI. RESULTS

Fig. 4 Final Working Setup

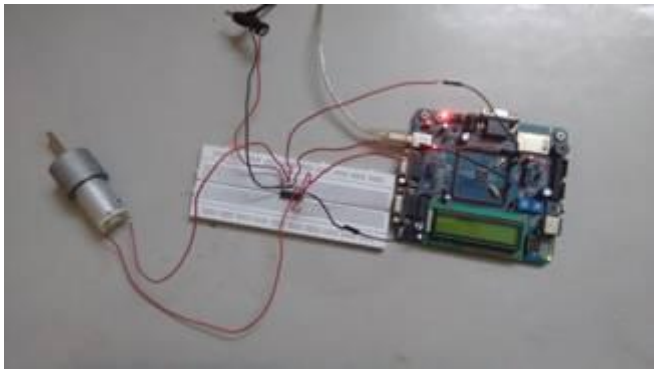

Fig. 5 DC motor interfaing using L293D

Fig. 6 Grain Drwan from System

Fig. 7 Quantity verification using digital weighing machine

ISSN: 2278 – 1323

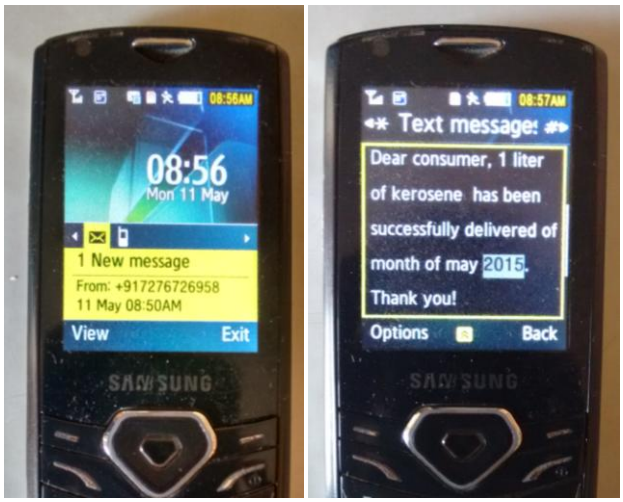

Fig. 8 Consumer received message from ration shop after material delivered from system

VII. CONCLUSION

The conventional system has drawbacks like malpractices, low processing speed, long waiting time at ration shop to get material and material theft in ration shop without any acknowledgement to Government and consumer. To overcome above problems, automatic ration shop played important role. The automatic ration shop involved RFID as well as GSM technology to distribute the kerosene or grain material. 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.

ACKNOWLEDGMENT

The authors thank to the workshop staff of mechanical department, Rajarambapu Institute of Technology, Rajaramnagar for helping in carrying out fabrication work.

REFERENCES

[1] Dhanoj Mohan, Rathikarani, Gopakumar, "Automation of Ration Shop Using PLC" International Journal of Modern Engineering Research, 2013, Vol. 3, Issue. 5, pp. 2971-2977.
[2] S.Valarmathy, R.Ramani, "Automatic Ration Material Distributions Based on GSM and RFID Technology" International Journal Intelligent Systems and Applications, 2013, Vol. 11, pp. 47-54.
[3] Rajesh C. Pingle and P. B. Boroley, "Automatic Rationing for Public Distribution System (PDS) using RFID and GSM Module to Prevent Irregularities" HCTL Open International Journal of Technology Innovations and Research, 2013, Vol. 2, pp. 102-111.
[4] S. Sukhumar, K. Gopinathan, "Automatic Rationing System Using Embedded System Technology" International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering, 2013, Vol. 1, Issue 8, pp. 339-342.
[5] Yogesh Kumar Sharma, K. B. ShivaKumar, "Multi-Modality Biometric Assisted Smart Card Based Ration Distribution System" International Journal of Application or Innovation in Engineering & Management, 2014, Vol. 3, Issue 6, pp. 382-392.
[6] http://en.wikipedia.org/wiki/Ration_card_(India)
[7] http://www.indiaenviornmentportal.org.in

BIOGRAPHIES

Vinayak T. Shelar has born in Ahmednagar district, Maharashtra, India in 1991. He has received the B.E. degree in the Electronics and Telecommunication Engineering from Pad. Dr. D. Y. Patil Institute of Engineering and Technology, Pimpri, Pune, Maharashtra, India. He is currently pursuing M. Tech. in the Electronics Engineering from Rajarambapu Institute of Technology, Islampur, Maharashtra, India. His main areas of interests are embedded systems, mechatronics and automation. He is member and student co-ordinator of IET.

Mahadev S. Patil born in Belgaum district, Karnataka, India in 1973. He has received B.E. degree in Electronics and Communication Engineering from Karnataka University Dharwar in 1995, M. Tech. degree in Power Electronics from Indian Institute of Technology, Bombay Powai, Mumbai in 2001 and Ph.D. degree in E and Tc Engineering from Shivaji University, Kolhapur in 2014. He has 19 years of teaching experience. He has published more than 50 research papers and filed a patent. Currently he is working as Professor and Head of Program M. Tech-Electronics in Rajarambapu Institute of Technology, Islampur, Sangli, Maharashtra. His field of interest includes power electronics, industrial control and instrumentation and telecommunication engineering. He is a member of Institution of Engineers (India), member of IETE New Delhi, Member of IET and life member of ISTE New Delhi.

ISSN: 2278 – 1323