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DEVELOPMENT OF E-PUBLIC DISTRIBUTION SYSTEM (E-PDS) USING SMART CARD

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ABSTRACT

Smart card 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 Smart Card technology that replaces conventional ration cards. The RFID tags are provided instead of conventional ration cards.

Keywords: Arm-7 Controller, Rfid, Gsm, Public Distribution System, Weighing Machine.

I. INTRODUCTION

India's Public Distribution System (PDS) is the largest retail system in the world. Public distribution system [7] provides a ration card 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 [6] 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 controller 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 controller sends information in the form of SMS to related people. The proposed automatic ration shop system would bring transparency in public distribution system and become helpful to prevent malpractices.

Dhanoj Mohan, Rathikarani, Gopakumar[1] has developed system on automation of ration shop using PLC. They have designed hardware for two commodities sugar and kerosene. These two commodities are stored in tanks. User has to enter the required quantity and product using a keypad. For the measuring, it uses load cell for sugar and level sensor for kerosene. The problems in this system are no security provided to consumer, smart card, information exchange between authorities and data storage.

Mohit Agrawal, Bhupendra Singh and Manish Sharma[2] have developed system on smart ration card using RFID and GSM technique. Here paper work of ration shop is replaced by RFID card. Through RFID consumer access their account. GSM is used to send confirmation message to consumer. Limitation of this system is security not provided and for quantity measurement weighing machine is not used. Data storage is also not considered.

S.Valarmathy, R.Ramani[3] have developed system on automatic ration material distributions based on GSM and RFID technology. Consumer must show RFID tag to access the account. After accessing, controller checks the consumer details. Then consumer needs to enter the required materials by using keypad. Controller will send the message through GSM after receiving the materials. This system has limitation like no password protection, no visual display and no data storage available.

Rajesh C., Pingleand P. B. Boroley[4] have developed system on automatic rationing for public distribution system (PDS) using RFID and GSM module to prevent irregularities. They use smart card reader (RFID Based), GSM module, microcontroller (AT89C51) and PC via RS232 to develop such a system. It has limitations like more total material display, password protection and no data storage on web portal.

S.Kalpanadevi, S.Sukhumar, K.Gopinathan, P.Naveenkumar[5] have developed system on automatic rationing system using embedded system technology. In this system they provided finger print detection for security. PIC microcontroller and PLC modules are used. To provide eco-friendly machine, they use solar. After transaction, confirmation message is delivered to each consumer. It has limitations like more costly and no data storage is available.

Public Distribution System[10] provided three types of ration card as yellow, saffron and white cards based on family income. This is issued under authority of the state Government for purchase of commodities like Wheat, Rice, Kerosene and Oil. The ration shop owner keeps record of all consumer materials. It has limitation like material theft, processing speed is low, unable to get materials at any time.

II. SYSTEM DIAGRAM

Fig. 1 shows the system block diagram based on RFID technology [2]. System consists of controller-LPC2148, RFID, GSM [1], weighing machine, solenoid valve circuitry, LCD, keypad and internet connection. The proposed system demonstrates distribution of two solid materials (wheat and rice) and two liquid materials (kerosene and edible oil). RFID reader, weighing machine, and keypad acts as inputs to system and LCD, seven segment displays are used for displaying ration stock and related activities.

The microcontroller outputs are used to drive motor and flow sensor, solenoid valve. GSM is used to sends message to costumer after completion of transaction. All transactions are stored in PC and uploaded on web portal.

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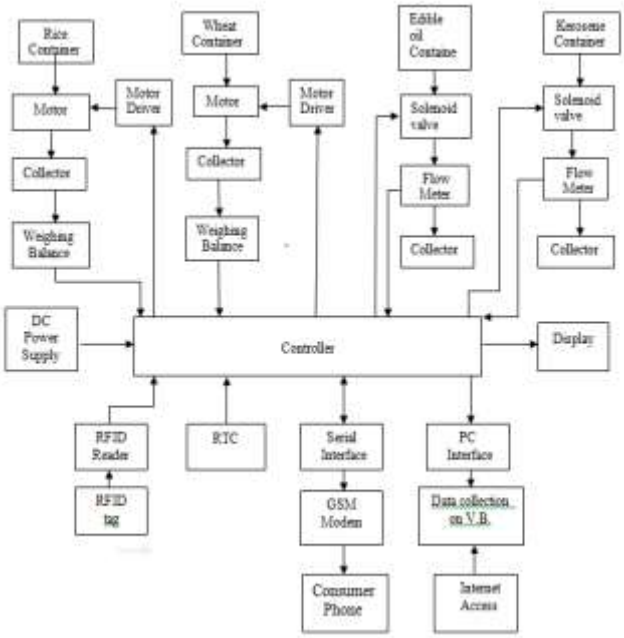

Fig.1 Block Diagram of System

III. ALGORITHM

Every user is provided with a RFID card which is registered by the Government authority.

1) At the time of ration distribution, first password of user is verified
2) System will check type of the card & then display quantity of material
3) Based on type of material chosen, the motor or flow meter valve is activated
4) The weight balancing machine or flow meter will check proper quantity
5) After collecting proper quantity material motor or flow meter is disabled
6) Exchange the information in the form of SMS between controller assembly and user
7) Display of current stock in the ration shop
8) Store the data on computer
9) Upload data to web portal

IV. DESCRIPTION

4.1 Controller LPC-2148

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

4.2 LCD and Keypad interfacing

System uses 16x2 LCD modules which is easily programmable and economical. Interfacing of 16x2 LCD modules 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.

4.3 RFID and GSM Modem

Each RFID Card consist different tag. This RFID cards are provided to each consumer. Different password is provided to each smart card. On RFID reader magnetic fields are generated. When this card is come in contact with RFID reader then signal is generated and this signal is given to controller.

GSM modem is used to send the message to each consumer after completion of each transaction.

4.4 Liquid quantity measuring subsystem

Fig. 3 Flow sensor & Solenoid valve

Flow sensor and solenoid valve are used to measure the quantity of edible oil and kerosene. At the output of flow sensor we get pulses using those pulses we are controller flow of liquid. Solenoid valve is used to ON and OFF the flow of oil or kerosene. Both are operated on 12V DC supply.

V. Grain quantity measuring subsystem

Fig. 4 mounting of load cell

Load cell is used to measure the weight of grains. Fig. 4 shows arrangement of load cell. It consist two ends, one end is for mounting and another is for calculating. Output of load cell is in micro volts. It is amplified and converted into digital form and displayed on seven segment display.

V. RESULTS

5.1 Interfacing of RFID and GSM to Controller

When card is placed in front of RFID module then generated signal is given to controller. Controller will identify the costumer as shown in fig 5 and it will display the name of costumer. After completion of each transaction SMS is delivered to each consumer using GSM [4].

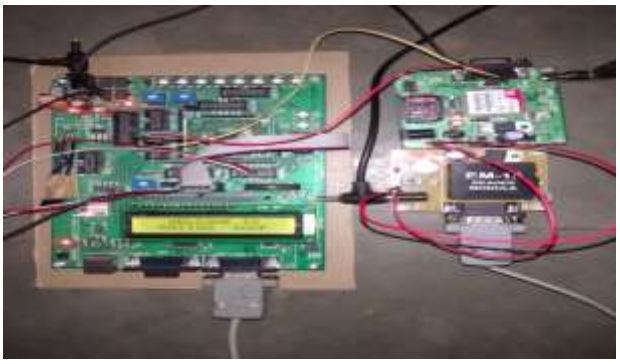

Fig. 5 Interfacing of RFID and GSM

5.2 Interfacing of motor and load cell

Fig. 6 Grain drawn from system

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 are

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

Table.1 Load Cell Calibration Table

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

One circular plastic is attached to shaft of motor across the cylindrical pipe. If costumer enters 1kg then motor will turn vertically that is turns in 90˚. When the weight on weighing machine will reach to 900gm then motor will turn to 45˚ clockwise then the speed of grain will slow down and when reached to 1000gm then motor goes horizontal across the cylinder.

Flow sensor and solenoid valve is used to measure the accurate amount of liquid materials (edible oil and kerosene). Flow sensor is used to measure the flow of liquid. It consist three pins namely supply, ground and output. Output pulses are used to measure flow of liquid. Water flow sensor consists of a plastic valve body, a water rotor, and a hall-effect sensor. When water flows through the rotor, rotor rolls. Its speed changes with different rate of flow. The hall-effect sensor outputs the corresponding pulse Signal. Flow rate range is about 1 to 10 lit. per minute. Solenoid valve is used only to turn ON and OFF the flow of liquid.

After completion of each transaction SMS is delivered to each costumer as shown in fig. 5 and also record of each costumer is stored in computer using visual basic software. Data stored in computer are uploaded on internet to web portal of Public Distribution System. District level officers can access and can check the data of any costumer.

Fig. 7 Delivered message on consumer mobile

VI. CONCLUSIONS

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 rice, wheat, kerosene, editable oil. 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 saves time and cost effective.

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