



RFID Based Intelligent Shopping Cart Using 2.4 GHZ Open Band Transmission

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Abstract- While purchasing in super market, we collect the required items and deposit them in a trolley. The total bill is known only at the instant of billing. The customer might have a particular cumulative budget in mind. This makes it difficult for a customer to assume the cost of the goods he needs because the ones which is printed is not the exact price. It then becomes difficult for him to keep in mind the total cost of the things he buys. As a result, a lot of commotion may arise, disrupting the essence of shopping. Also we need to stand in a queue for billing those items. To overcome this here we can design an Intelligent Shopping Cart to make the purchase more easily and comfortable. When we reach at a shopping center, first of all we need to grab a trolley. An RFID Reader with electronics hardware system is fitted with the trolley to make the purchase comfortable. All the items are fitted with an RFID card whose price is fixed into the card. The amount at which we are going to purchase has to be entered in to the system. When an item is shown in front of the reader (fitted in the trolley) the amount for the item is added to the purchase bill and is shown on the LCD Display. The system will alert the person when the budget limit is reached. It also has the provision for removing the items from the trolley where the cost is removed from the total cost. Then the cart should be moved to the billing counter and the RF communication module will transfer the amount information that should be paid and that will be displayed on the PC display in the billing counter. So the customer can easily pay the amount without any delay or staying in long queue. 2.4 GHz open band wireless transceiver modules are used on receiver and transmitter which have range of 30m in indoor.

*Keywords-Radio Frequency Identifier (RFID), Radio Frequency Transceiver, Microcontroller, RFID Tags, 16*2 Alpha Numeric Display.*

I. INTRODUCTION

Automation plays an increasingly important role in the world economy and in daily experience. Automatic systems are being preferred over manual system. Through this project we have tried to show an RFID based trolley for supermarket. RFID is one the fast growing technology all over the world for identifying and tracing goods. Radio-frequency identification (RFID) is the use of an object (typically referred to as an RFID tag) applied to or incorporated into a product, animal, or person for the purpose of identification and tracking using radio waves. Some tags can be read from several meters away and beyond the line of sight of the reader.

The RFID is a technology that uses communication through the use of radio waves to transfer data between a reader and an electronic tag attached to an object for the purpose of identification and tracking. It is possible in the near future, RFID technology will continue to multiply in our daily lives the way that bar code technology did over the forty years leading up to the turn of the 21st century bringing inconspicuous but remarkable changes when it was new. In every RFID system the transponder Tags contain information. This information can be as little as a single binary bit, or be a large array of bits representing such things as an identity code, personal medical information, or literally any type of information that can be stored in digital binary format.

II. SYSTEM DESIGN

Our proposed project RFID based INTELLIGENT SHOPPING CART consists of mainly two sections. One is the transmitter section (trolley section) and the second one is the receiver section at the billing counter. The transmitter section consists of RFID reader, PIC16F877A microcontroller, 16*2 alpha numeric LCD display, RF transceiver, selection keys and an audio indication. Receiver section includes an RF transceiver, RS232 serial communication and the billing computer.

Transmitter Section:

1. RFID Tags

RFID tags are attached to each product. The tag would include unique ID of the product. When the tag is brought near to the RFID reader, the data is received by the receiver.

2. RFID Reader

An RFID reader is a device that is used to interrogate an RFID tag. The reader has an antenna that emits radio waves, the tag responds by sending back its data. Here the RFID card emits an RF wave, the emitted wave contains the details of the product, which is received by the RF reader and the reader is directly interfaced to the microcontroller.

3. Control Keys

The details of each product can be entered into the system memory through this control keys. The limit of the purchase can also be entered with the help of this.

4. Microcontroller Unit(PIC16F877A)

It controls all the functions of other blocks in this system. MCU takes or read data from the RFID reader and controls all the functions of the whole system by manipulating these data. Initially with the help of control keys we can store the details of products. The RFID reader receives data from RF card and given to the MCU. The micro controller will check the received data with the code saved in the memory. If both matches MCU will display the product and its price .When the total price goes above the set limit, the microcontroller initiates to ring the alarm. An LCD is interfaced with the MCU to display the details.MCU gives the data input to the RF transmitter through encoder circuit. RF transmitter transmits the amount information to the billing section.

5. RF Encoder

Any digital data is first converted to a coded form before sending wirelessly to get ensure data integrity from noises and offers security from other faulty messages. The encoded data is decoded in the receiver side and the original data is recovered. Here encoder receives data input from the MCU and convert it into a coded output signal. This coded output is corresponds to the amount information.

6. RF Transmitter

RF transmitter is used to transmit the purchase information. The RF module, as the name suggests, operates at Radio Frequency. The corresponding frequency range varies between 30 kHz & 300 GHz.

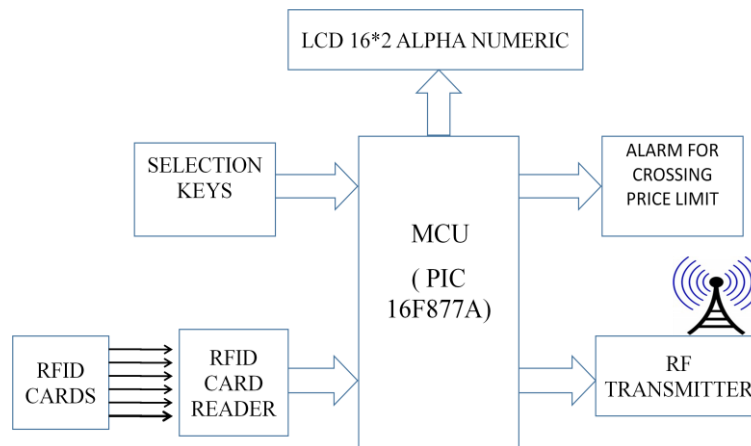
7. LCD Section

LCD display is used for displaying the status of the system. Here it shows the details regarding the purchase. LCD module is a dot matrix liquid crystal display that displays alphanumeric, kana (Japanese character) and symbols.

8. Audio Indications

A buzzer is used to indicate if the total price of the products consumed goes above the limit set.

Block Diagram:



Receiver at the Billing Counter:

1. RF Receiver

The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter. Transmission through RF is better than IR (infrared) because of many reasons. Firstly, signals through RF can travel through larger distances making it suitable for long range applications. Also, while IR mostly operates in line-of-sight mode, RF signals can travel even when there is an obstruction between transmitter & receiver.

2. RF Decoder

A decoder is a device which does the reverse of an encoder, undoing the encoding so that the original information can be retrieved. It accepts data from RF receiver and compares received address with its own address. If it matches, the decoder recovers the original data and given to the PC, this data corresponds to the total purchased amount.

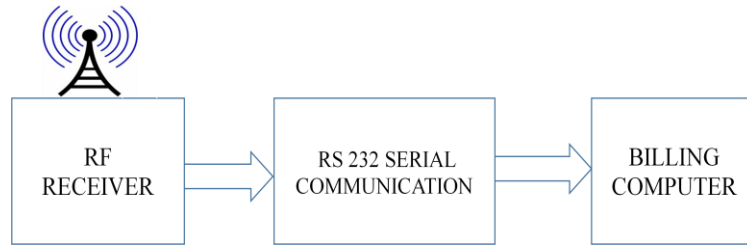
3. RS 232 Serial Communication

Here RS- 232 is used to interface the RF transceiver with PC display. RS-232 (Recommended Standard 232) is a standard for serial binary single-ended data and control signals connecting between a DTE (Data Terminal Equipment) and a DCE (Data Circuit-terminating Equipment). It is commonly used in computer serial ports. The serial interface connected to PC is RS232. MAX232 is the IC used.

4. PC Display

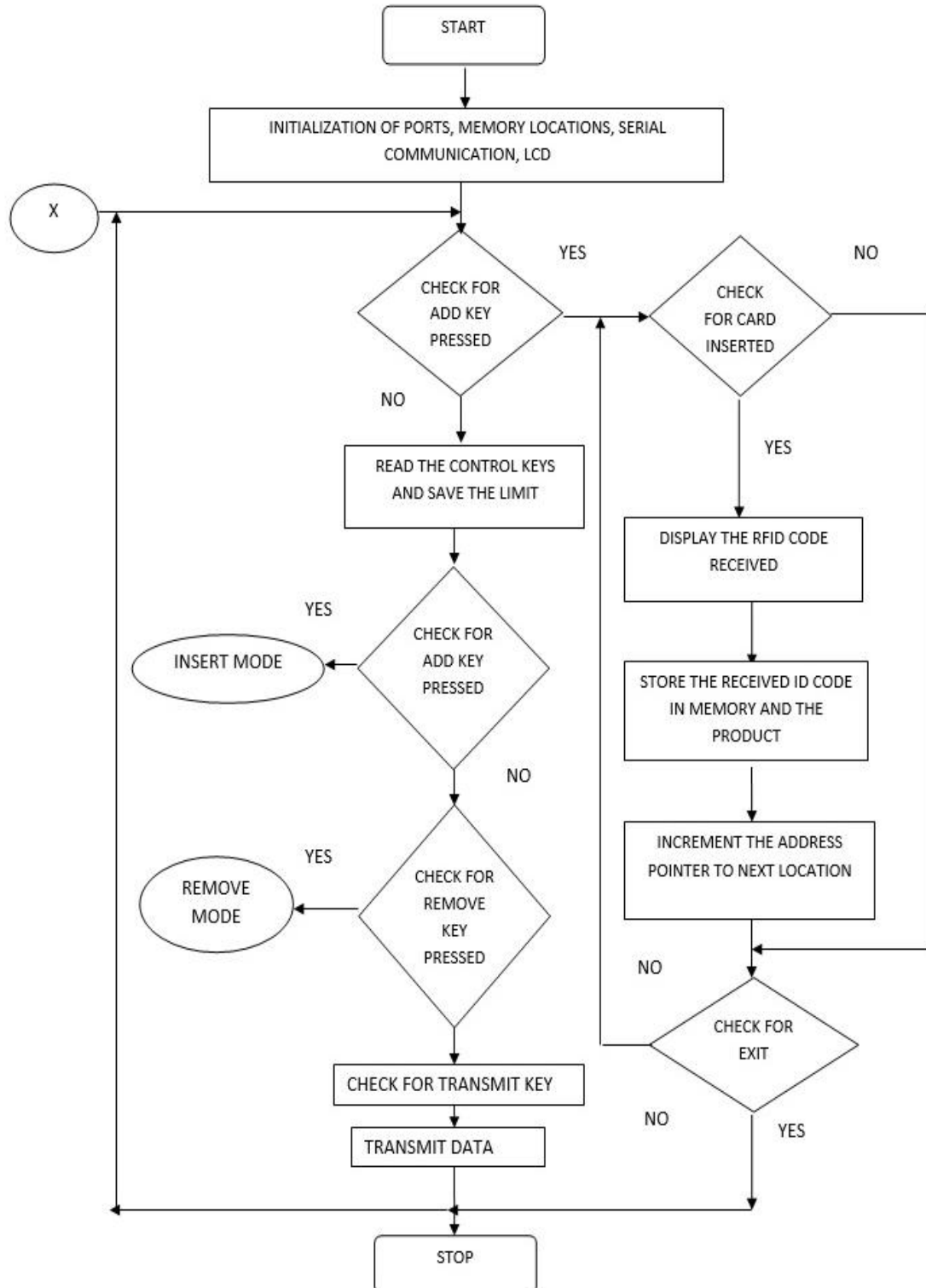
The received purchased amount from the trolley is displayed on PC through a serial interface. These displayed details are stored in the PC. Software is installed inside the system for the display and storing of received data.

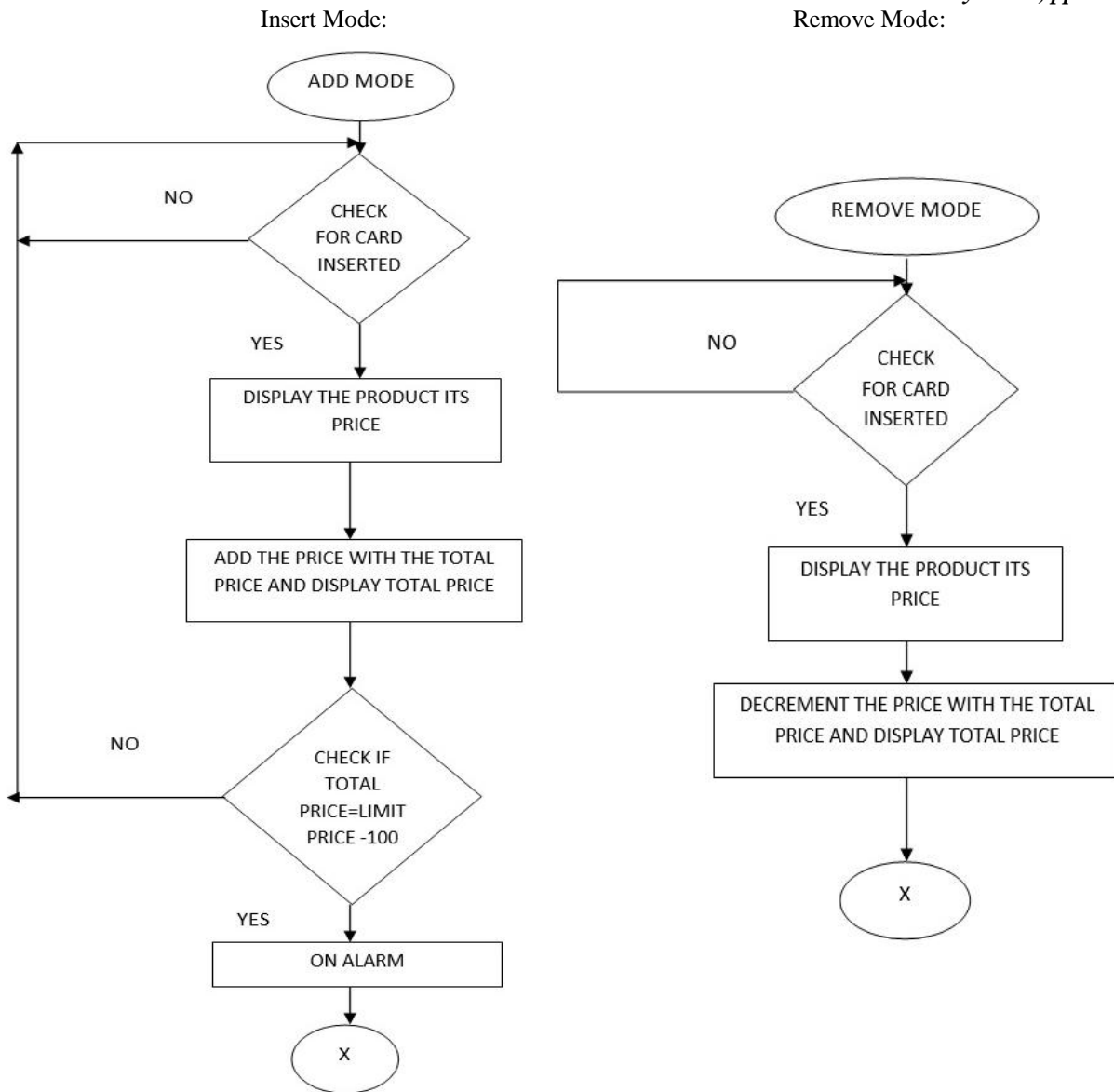
Block Diagram:



III. SOFTWARE DESIGN

Flow Chart





IV. WORKING DESCRIPTION

Transmitter Section:

A radio frequency tag or card and an RF reader are the main part of the system. Radio frequency identification system is most popular method in the field of wireless identification system. It involves radio frequency tag or card and an RF reader, the card is attached with each product, it contains the details of the product. Initially, the information about the card is stored in the microcontroller with the help of control keys connected with the MCU. Here we can set a limit value for purchasing. This limit value can also be entered with the help of control key.

The RFID reader system is attached with the trolley. While purchasing, the items should be shown to the reader. When the tag is brought near to the RFID reader, the RFID card emits an RF wave, the emitted wave contains the details of that product, which is received by the RFID reader and the reader is directly interfaced to the microcontroller. MCU calculates the total amount by adding that product price with the purchase bill. If the total purchased amount goes above the set limit, the microcontroller activates the alarm circuit to ring. We can also remove the items from the cart by using remove key option. A liquid crystal display is used for displaying the entire status of the system. A 16X2 character LCD is used in this project. The module has the capability to display 32 characters as total in 2 lines, 16 characters in each line. Here it displays the product price and total purchased amount. MCU gives a digital data corresponding to the information to be transmitted to the RF encoder. RF transmitter transmits this coded binary output from the encoder. The total purchased amount information is transmitted to the billing section by using 2.4GHz band.

Receiver Section:

The receiver section is placed in the billing section it consists of an RF receiver, RF decoder and a PC display. RF receiver receives the coded binary data transmitted by the RF transmitter and given to the RF decoder. RF decoder decodes the input and gives four bit digital data to the PC display only if the address bit of encoder and decoder matches. PC receives and displays the data correspond to the purchased amount information. The communication between PC and RF receiver is through an RS 232 serial communication.

V. CONCLUSION

RFID Based Intelligent Shopping Cart can serve as an alternative to the traditional trolleys and can save a lot of customer time by reducing the time in front of the queue. It also makes the shopping an easy and comfortable experience for the customers as well as the shopkeeper. It can be considered as an ideal technology for the future shopping strategy or accomplishment. The main areas of its application are in super markets, textiles and electronic gadgets shop.

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