A SMART SHOPPING CART

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Abstract : *Nowadays, people are getting too busy in their schedule but still they need to spend time on their basic need like purchasing commodities from shopping market. In metro cities, we can see a huge rush at shopping malls on holidays and weekends. Consumer buy the commodities and put them in the trolley. After purchasing, one should approach counter for billing purpose. By using barcode reader, the cashier prepares the bill, which is a time consuming process .This results in long queues at the billing counters. This project presents an idea to develop a system in shopping malls to overcome the above problem. To overcome the problem, all products in the mall should be equipped with RFID tags and all trolleys should be equipped with a RFID reader and LCD screen. When one puts any product in the trolley its code will be detected automatically, the item name and cost will be displayed on the LCD; thereby the cost is added to the total bill. If we wish to remove the product from the trolley, you can take away the product, the amount of that specific product is deducted from total amount, and the same information passes to the central billing unit via X-bee module. Hence, the billing can be done in the trolley itself thereby saving a lot of time to the customers. Customers only pay the bill at central counter.*

IndexTerms - *RFID tag, LCD, RFID reader, Arduino Uno, Cart, X-bee Module, Central Billing Unit.*

I. INTRODUCTION

With the recent advancements in the fields such as machine learning, artificial intelligence, internet of things and so on, there is an increase in the expectations of the consumer. With the fast moving lives, the consumers absolutely have no time to stand in long queues for buying commodities.

In the present era, each grocery store and supermarkets utilize shopping trolleys with a specific end goal to help clients to choose and store the items which they expect to buy. Customers usually purchase the products required and place them in their carts and thereafter wait at the counters for payments of bills. The payment of bills at the counters is really troublesome and time consuming process which thereby results in an increased crowd at the counters.

As indicated by a study directed by US Department agency, on a normal, people spend through 1.4 hours consistently on shopping. A considerable number of clients will tend to leave a line if the line is too long.

So, we are presenting a smart shopping system using RFID, X-bee and Arduino controller. The trolleys in the shopping malls are protocol so as to automatically bill the products put into them and the final bill is sent to a central pc through X-bee module.

The system is also subjected to anti-theft management where the system doesn't let any customer take non-billed items.

II. METHODS AND MATERIAL

The proposed design primarily consists of two sections: Transmitter and Receiver.

A.Transmitter

In the transmitter side, all products placed in the cart are read by RFID reader and the details of each product is shown on LCD display. The data is further send to the receiver side through X-bee module.

Block diagram of Transmitter end

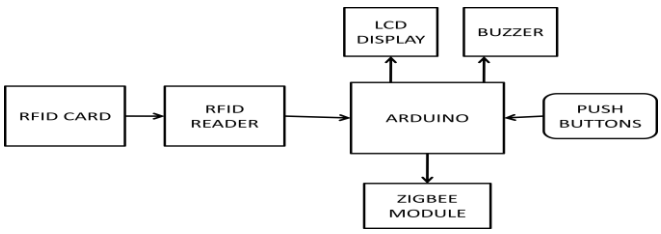

Figure 1 Transmitter Side Block Diagram

B.Receiver

The data sent by the transmitter is received and sent serially to the computer screen available at the billing counter for generating the bill.

Block diagram of Receiver end

Figure 2 Receiver Side Block Diagram

A. Software Description

The proposed system makes use of Arduino Integrated Development Environment (IDE) and X-CTU platform.

1. Arduino IDE

ArduinoIntegrated Development Environment (IDE) connects to the Arduino hardware to upload programs and communicate with the outside world The programming for the proposed system is done in Arduino IDE so as to interface RFID, LCD, X-Bee etc.

2. X – CTU

X-CTU is a free multi-platform application. The application includes embedded tools that make it easy to set up, configure and test Digi RF modules. This platform allows testing the X-Bees in the actual environment . Whenever we connect two X-Bees (transmitter side and receiver side), they begin to works as transceiver. It is to be noted that the two connected X-Bees should have same baud rate and RF standard.

B. Hardware Descriptions

1. Arduino UNO R3

The heart of Arduino UNO is a 8-bit ATmega328P microcontroller. It has 14 digital input/output pins, 6 analog input pins, a USB port, a power barrel jack, an ICSP header pins and a reset button. It also features a serial data (SDA) line and a serial clock (SCL) line. These two lines are required to support I2C communication protocol. The board also allows digital ports to be configured to act as Rx or Tx lines and these lines are required to support SPI communication protocol. The Arduino is responsible for transferring RFID module readings to the other necessary components..

Figure 3 Arduino UNO R3

2. MFRC522 RFID Reader

Mifare RC522 works on non-contact 13.56 MHz communication and is the high integrated RFID card reader. It is low cost and compact size ,read and write chip. Its duplex communication speed up to 424 kb/s. Module use 3.3V power supply and can communicate directly with any CPU board by connecting through SPI protocol. It has a good reading distance (3-6 cm). It is used as both active or passive RFID cards to read the data. The product information is stored in RFID card through programming.

Figure 4 MFRC522 RFID Reader

3. Liquid Crystal Display with I2C Module

16X2 LCD is used to display information about the commodities ,mentioning the name of the product and the total cost, when RFID card is read by the card reader.

Figure 5 LCD with I2C Module

4. X-Bee S2C Module

X-Bee S2C is a RF module designed for wireless communication or data exchange and it works on ZigBee mesh communication protocols that sit on top of IEEE 802.15.4 RF Standard. In this system, Its operating voltage is usually 3.3V DC and current is 33mA and frequency is 2.4-2.5 GHz. Its reading range in indoor is 60-100 m and outdoor range is 1200m. This module is using UART communication interface. It transmits power around 3.2mW. Two X-bees,work together to send and receive data. One X-bee act as a transmitter and another X-bee act as a receiver. In this system, Transmitter unit of X-Bee is known as coordinator and receivers unit is known as router. They are compatible with both computer and microcontrollers. They are configured with X-CTU platform and programmed with Arduino IDE platform.

Figure 6 X-bee S2C Module

C.Flowchart

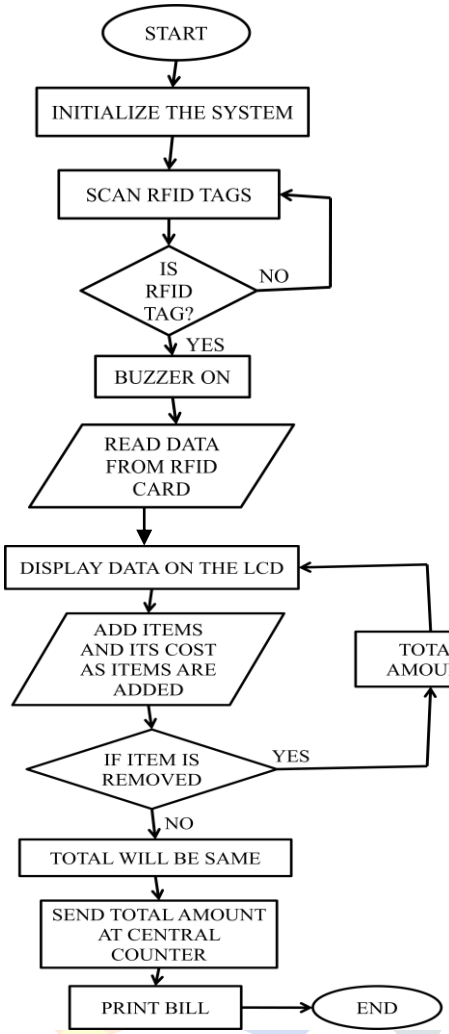

Figure 7 Flowchart of Proposed Model

III. Working of the Proposed Model

When customer enters the shop or mall he/she takes a trolley and start shopping. Each trolley has been assigned a unique identification number. Transmitter side circuit is inbuilt in trolley. Customer takes a product and its RFID tag is read through RFID reader which is given with each product. With this, all product information with cost is shown on LCD.
However, when any product is removed from the trolley, it is also shown on LCD indicating the name and cost of the product deleted.
When customer's shopping is finished, the finish button is pressed and the total bill is send to central billing counter through X-bee. At the receiver side, data is received with trolley number and is displayed on the computer screen of central counter. The customer has to pay the bill to the central counter without any delay.
This proposed model is user friendly for customer and has anti theft management.

IV. Results and Discussion

Figure 8 When item is added

Figure 9 When item is removed

Figure 10 Total item and bill

Figure 11 When middle button is pushed Total bill is displayed

Figure 12 Complete Project

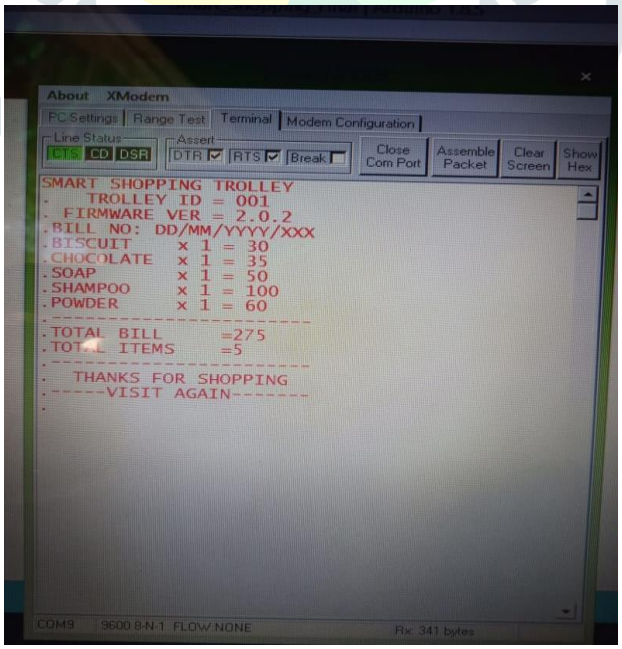

Figure 13 When shopping is finished Total bill generated at central billing counter

V. Conclusion

The proposed system is easy to use, low-priced and does not require any special training. The system involves radio frequency identification and detection technology, which are used for item recognition and billing. This results in a smart shopping system with reduced man-power.Theft in the mall can also be controlled using this system, which further adds to the cost efficiency. The time efficiency will increase because this system will also eliminate the waiting queues and more customers can be served in same time .

VI. References

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