SMART BILLING SYSTEM

Kuldeep Singh[1], Neeraj Kumar[1], Abhishek Patel[1], Mukul Singh Sisodia[1]

[1]Department of Electronics and Communication Engineering
IMS Engineering College, Ghaziabad

Abstract:
Smart Billing System with Innovative RFID is proposed to facilitate users while shopping. It provides several benefits such as to facilitate users to search for things in a shopping mall quickly without someone's help and allow customers to control their budget. The main components used in the proposed implementation are Arduino, RFID (MFRC522), Bluetooth (HC05), LCD. The main features of the proposed systems include- time saving, budget control, display the purchased product and reduce thefting of products.

Keywords- Smart trolley, RFID, Arduino, Counter, Security.

1. Introduction

Continuous improvement is a compulsion in the common billing system. In this regard, this paper presents an innovative SMART Billing system by Arduino, RFID reader and Bluetooth. The proposed system makes the shopping easy and also increse the security. The proposed system consists of two parts. The first part include the trolley side and second part include the counter side. The trolley side and the counter side are connected to each other by the help of Bluetooth. İn the counter side we connect another RFID on Gateway of a shopping mall which catch and display the unpaid products on LCD connected to the counter. According to [1], a cart is supplied to the customer by the shops or supermarkets to purchase the items. Radio-Frequency Identification (RFID) tag are attached to the products to identify and tracking the products with the help of RFID reader. The benefit of using RFID technology in the trolley is to know the price of goods so that the customer can able to control his budget while shopping. The main disadvantage of the system proposed in [1] is that the customer has to queue for billing of scanned products at the counter. This drawback of [1] is removed in the system proposed in [2]. In the presented system of [1,2], there is no provision to stop product thefting. Therefore, an attempt is made in this research paper to proposed a smart billing system which has the features of [1] and [2] and also include the security of products from thefting. The proposed system is also very helpful to reduce the rush at billing counter of malls which is very important in this pandemic time.

2. Proposed Smart Billing System

In the proposed Smart Billing System which has the features of [1] and [2] and also include the security of products. The system is divided into two parts, first one is cart and second is counter. Now we talking about cart and counter in which Arduino is connected with LCD, Bluetooth, buzzer and RFID (MFRC522). We program the Arduino to configure it with sensor and display. As we start the cart it shows some instruction on LCD display of cart and we simply follow the instruction to buy the products. There is a red colour LED attached in cart which indicate when the RFID reader at cart side iş ready to scan the product. In cart we give an option of smart card by which we simply make payment via that

smart card from cart without reaching the counter. The data shared between cart and counter is by Bluetooth (HC-05). If there is any product which is unscanned and unpaid it must be detected by RFID which is connected at counter and that unscanned and unpaid product is display on the LCD screen of counter.

The working of cart and counter is explained here with the help of flow chart shown in Fig.1 and Fig.2 respectively. From the flow chart of cart (Fig.1) as we start, we take the product and scan to add product in your cart. After that a decision making is done If you don't want that product than re-scan it, otherwise go on and another decision making is takes part. If we want more product then repeat these steps. The last step is to make payment. There are many existing modes of payment, here we also add a new mode which is via smart card. The smart card is similar to Metro card and will be provided by shopping mall. To make payment via that card we simply scan that card on cart after collecting all stuff we want.
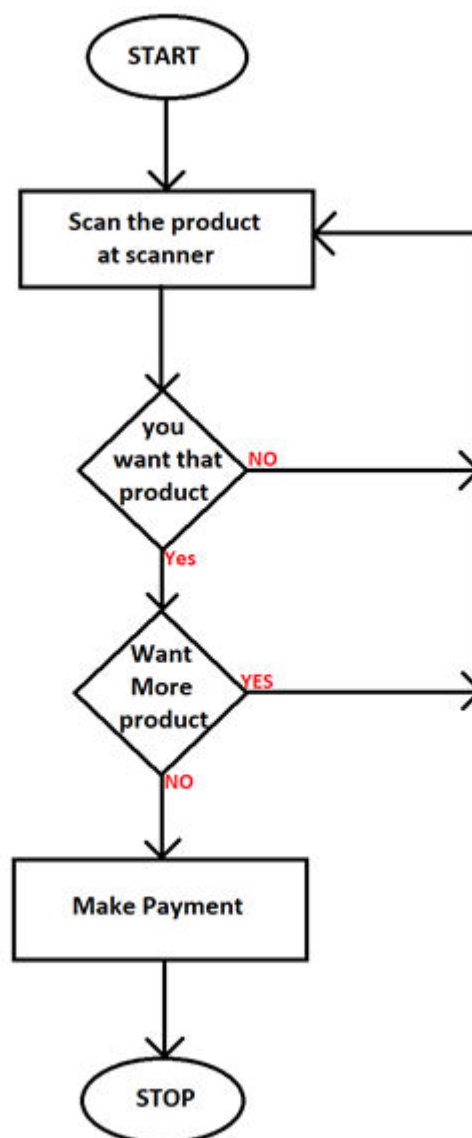

Fig.1 The flow chart at cart side

The flow chat of counter/gate is presented in Fig.2. This flow chart shows that a security checking is introduced at exit point to prevent product thefting. Purchased goods easily exit the gate without any alarm, while unscanned goods which was taken by any customers mistakenly or by any other intention an alarm rings and display the product name.
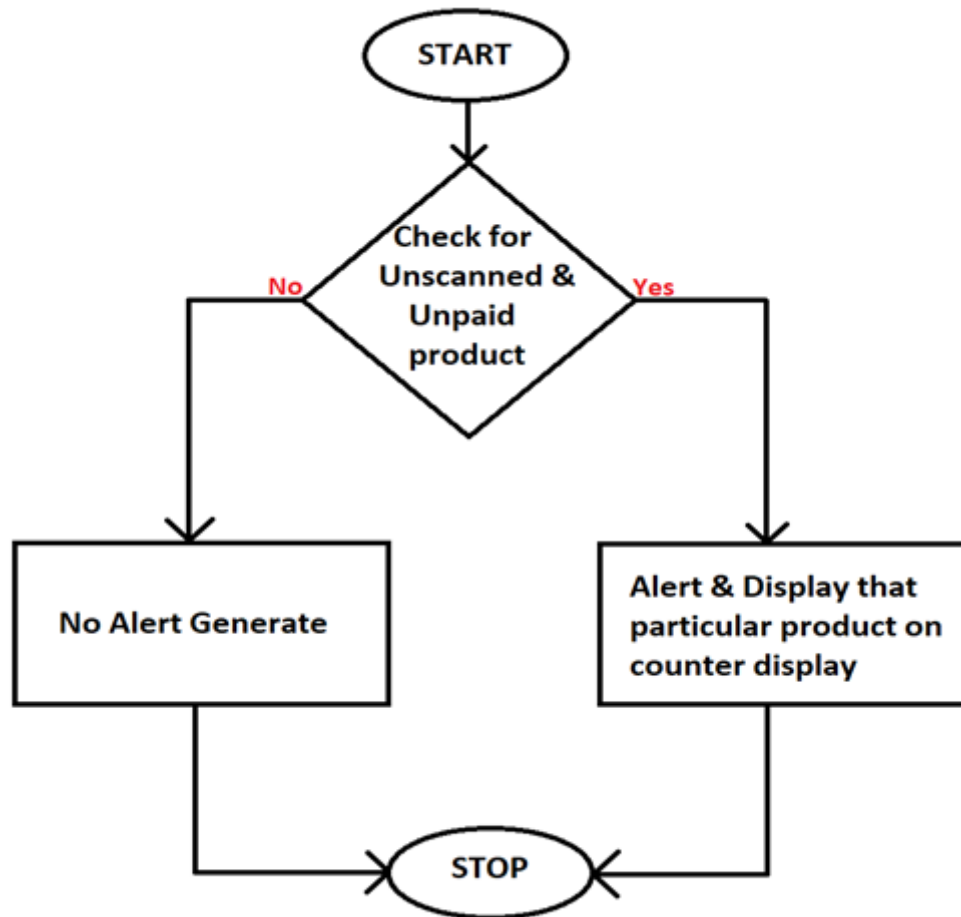

Fig.2 the flow chart of counter/gate

3. Components used in Proposed Billing System

The main components used in the proposed Smart Billing are listed below-

- ARDUINO UNO, MEGA (2560).
- BLUETOOTH (HC-05).
- LCD (20x4), (16x2).
- MFRC522 RFID READER.
- RFID TAGS.
- BUZZER.

3.1 Arduino

Arduino [3] is an open-source hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices. The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc.[4] The board is equipped with sets of digital and analog input/output pins that may be interfaced to various expansion boards and other circuits. The Arduino MEGA 2560 shown in Fig.3 is designed for projects that require more I/O lines, more sketch memory and more RAM. With 54 digital I/O pins, 16 analog inputs and a larger space for your sketch it is the recommended board for 3D printers and robotics projects.
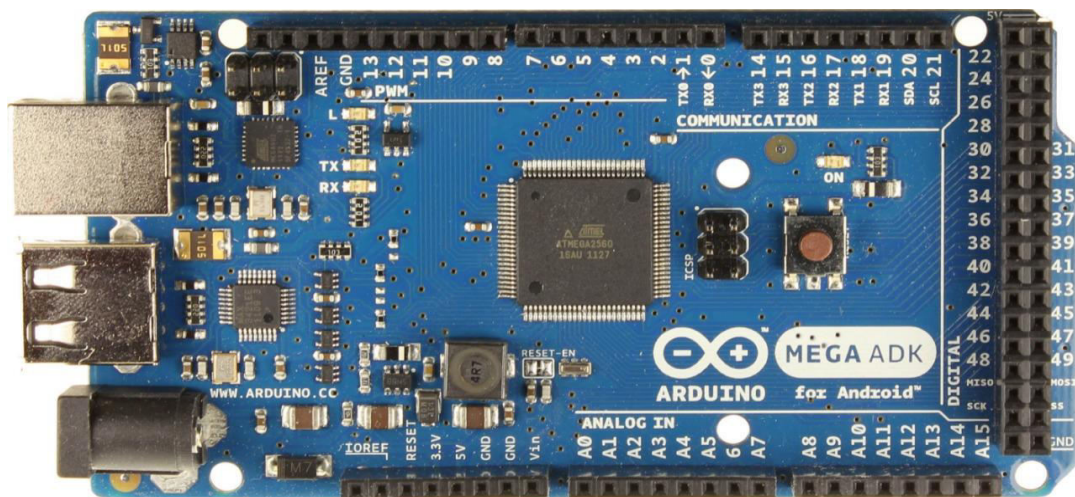

Fig.3 the picture of Arduino mega2560

3.2 RFID (Radio-frequency identification) READER

The RFID reader [5] is a circuit which generates 125KHZ magnetic signal. This magnetic signal is transmitted by the loop antenna connected along with this circuit which is used to read the RFID card number. In the proposed smart billing system, RFID card is used as a security access card. So each product has the individual RFID card which represents the product name and price of the product. Radio-frequency identification (RFID) shown in Fig.4 uses electromagnetic fields to automatically identify and track tags attached to objects. An RFID system consists of a tiny radio transponder, a radio receiver and transmitter. When triggered by an electromagnetic interrogation pulse from a nearby RFID reader device, the tag transmits digital data, usually an identifying inventory number, back to the reader. This number can be used to track inventory goods. There are two types of RFID tags- positive tags and active tags. Passive tags are powered by energy from the RFID reader's interrogating radio waves. Active tags are powered by a battery and thus can be read at a greater range from the RFID reader, up to hundreds of meters.

The RC522 RFID module based on MFRC522 IC from NXP is one of the most inexpensive RFID options that you can get online for less than four dollars. It usually comes with a RFID card tag and key fob tag having 1KB memory. And best of all, it can write a tag, so you can store some sort of secret message in it.
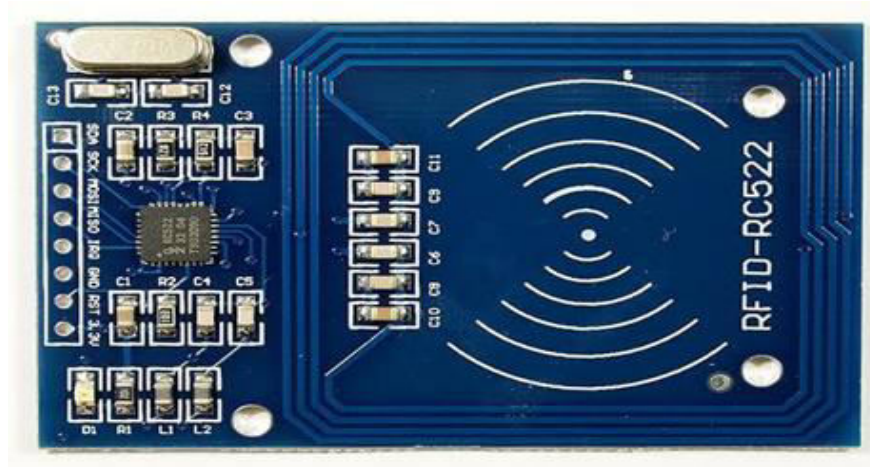
Fig.4 the image of RFID MFRC522 sensor

3.3 LCD

A liquid-crystal display (LCD) shown in Fig. 5 is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in colour or monochrome. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden [6-7].
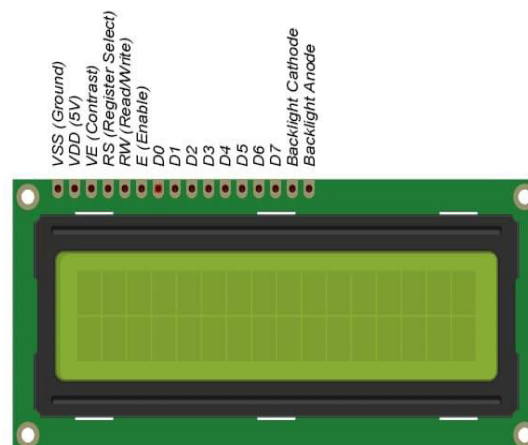

Fig.5 LCD (16X2)

3.4 RFID TAG

An RFID tag presented in Fig.5 can be affixed to an object and used to track and manage inventory, assets, people, etc. For example, they can be affixed to cars, computer equipment, books, mobile phones, etc. RFID offers advantages over manual systems or use of barcodes [5].

Fig.6 RFID Tags

4. Key Features of Proposed Smart Billing System

- This proposed system helps in achieving a faster billing system.

- The innovation payment method avoid the long waiting time.

- Helps the buyer to know the bill details in advance so that he can plan an affordable purchase.

- Helps in to maintain social distancing during pandemic (like COVID-19)

- Helps in business promotions for the supermarkets by gaining more customers providing quick service,

- Easy to use and does not need any special training.

5. Conclusion

The purposed Smart Billing System has the features of faster bill payments without going on the billing counter. This feature is very useful in reducing the rush on the billing counter, which is very important in this pandemic situation. This smart billing system is also helpfull for customers to control or manage their budget. The proposed smart billing also provides security of products from theft.

Reference

[1] Ismila Che Ishak, Muhammad Munawwir Muslim, Shaiful Bakri Ismail, Muhammad Abdul Mun'aim Mohd Idrus, and Maziah Mat Ali, A Smart Trolley with RFID Implementation: A Survey Among Customers, ARPN Journal of Engineering and Applied, vol. 12, no. 4, 2017

[2] Dennis Boamah, Amadu Ben Jalloh, Sarmad Ali, Ibanda Tex Tembi, Mahreen Riaz, Mingzhi Sun, Hugo Fernando, Technology Evaluation and Commercialization Report on Smart Trolley, London South Bank University.

[3] https://www.arduino.cc/

[4] https://www.arduino.cc/en/software

[5] https://create.arduino.cc/projecthub/Aritro/security-access-using-rfid-reader-f7c746

[6] https://www.arduino.cc/en/Reference/LiquidCrystal