A NOVEL RFID BASED SELFMOVING CASTER AND AUTOMATIC BILLING SYSTEM

By

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ABSTRACT

In this new-fangled era, social acceptance outcome is the main achievement of an industry. Purchasing is one of the main activities in everyone's life. During discount and special seasons, there would be a large rush in the malls. So vast amount of time is being wasted by the purchaser. In this research work, a Selfmoving caster is being utilized, which is being implemented with the help of Radio Frequency Identification (RFID) reader, RFID tag, IR sensor, Wi-Fi, Bluetooth, Liquid Crystal Display (LCD) display, Alarm, and Global System for Mobile (GSM). Each product is being read by the RFID reader. The product details like cost and ingredients will be displayed in the LCD display. In early days, the purchaser has to push the caster, but in this work, Bluetooth is being used so that the purchasers need not pull the caster instead it follows them. If the purchaser moves away from the caster, an alarm sound will be heard. By using GSM, a purchaser can get the bill in mobile itself. With the Wi-Fi technology, the bill is automatically transferred from caster to the billing section computer. So by this advancement in technology, a new generation people will enjoy purchasing the product and will be comfortable.

Keywords: RFID Reader, RFID Tag, Bluetooth, IR Sensor, Liquid Crystal Display (LCD), Alarm.

INTRODUCTION

The lifestyle of people are being changed in today's generation. People find comfortable shopping in malls rather than going to market for each product. In a single shop, all the needed items can be purchased. Nowadays, number of large as well as small shopping malls has increased throughout the global due to increasing public demand (Jayshree et al., 2014). Customers buy different items during shopping and put it in the trolley, which will be read by the RFID tag (Lekshmy et al., 2015). LCD display was been attached to the trolley which shows the price and discount of the item (Wani et al., 2015). During billing process, the customers have to wait in large queues to pay the bill (Shraddha et al., 2016). At the billing section, the Wi-Fi receiver is used which is connected to the main computer (Padmapriya et al., 2016). Using the microprocessor, the process of shopping

becomes easy and it avoids confusion to the customers (Suganya et al., 2016). Thus the billing will be done in the trolley itself and the whole information will be passed to the main personal computer by the wireless transmitter (Ruchi et al., 2016). This will save the customer's time and reduce the manpower (Palve et al., 2017). The RFID allows quick scan of the product, which would be a benefit to the customer (Doshi et al., 2017). In RFID, information cannot be overwritten or changed (Peradath et al., 2017).

1. Components

1.1 LCD Display

It is a flat panel display, which is used in TVs and other computer monitors. The light modulating properties are being used. It may be available in various shapes and sizes. The LCD display is shown in Figure 1.

1.2 Wi-Fi Module

It is a Wireless Fidelity. It is basic wireless adapter. It adds

Figure 1. LCD Display

connection to laptops and desktop computers. It provides high speed internet connection to the user.

1.3 Relay

They are type of switches with one or more holes. It can be operated by a small electric current. It can open and close a circuit electronically. The relay switch is shown in Figure 2.

1.4 GSM

It stands for Global System for Mobile Communication. In today's world it is used as a cellular technology. It is one of the leading digital cellular systems. The GSM diagram is shown in Figure 3.

Figure 2. Relay Switch

Figure 3. GSM

1.5 Bluetooth

It is a wireless technology for transferring data from caster to the computer. The range of Bluetooth is less than 10 to 100 m. The range of bluetooth 5.00 is from 40 to 400 m.

1.6 Android Device

It is a device that works on Android operating system. It contains an array of software for many core applications. It may be available in smartphones, laptops, and personal computers.

1.7 IR Sensor

It is a type of sensor that is capable of measuring infrared light that radiates from an object. It is capable of measuring the heat which is emitted by the object. It may be available in everyday products. The IR Sensor is shown in Figure 4.

1.8 Alarm Device

It is a system that gives an audible, visual, or some other form of signal. It may be used in the cases of risk or for the person's awarenesss. An alarm device is shown in Figure 5.

1.9 RFID Reader

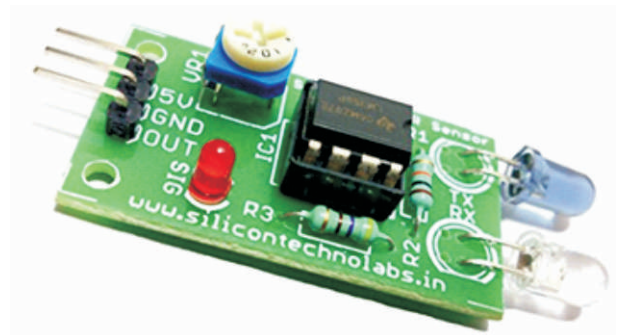Radio Frequency Identification uses some tags that are

Figure 4. IR Proximity Sensor

Figure 5. Alarm Devices

being put on the items. It uses radio frequency to identify the product. It is an integrated circuit, where an antenna is used to transmit the data. An RFID reader is shown in Figure 6.

2. Proposed System

In this proposed system, RFID Reader, RFID Tag, Android devices, Bluetooth, LCD Display, Relay, GSM, Wi-Fi, Personal computer, Trolley, and an IR Sensor are being used. The RFID reader reads the value of the product. The product details like cost and ingredients are displayed in the LCD display. Relay is used to connect the Arduino board with the caster. Bluetooth technology is being used so that the purchaser need not pull the caster, but the caster will follow. The GSM module will transfer the bill details from the system to the purchaser's Android device. Wi-Fi is used to transfer the bill directly to the billing section computer. An alarm is being connected to the caster so that if the purchaser moves away from the caster, it will produce some Alarm sounds. IR Sensor is being connected to the caster to note if purchaser puts the product back without displaying it. The IR sensor will detect the product and a beep sound will be produced with the help of an alarm. The Wi-Fi module is being connected so that the final bill of the product is being directly sent to the billing section computer. By using this technology, the purchaser can save time and reduce the time of purchasing.

3. Algorithm

The proposed algorithm to implement this system is given below.
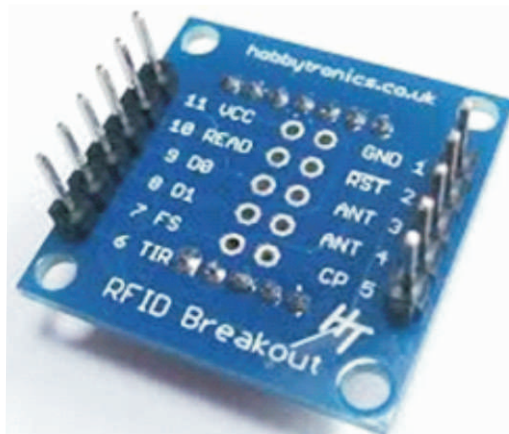

Figure 6. Block Diagram

Step 1: Start

Step 2: Initialize the system

Step3: Search for RFID

Step 4: Check RFID tag

Step 5: Read related data from memory

Step 6: Display data on LCD

Step 7: Add item cost as items are added

Step 8: If an item is removed, display a message "ADD OR REMOVE"

Step 9: Pair the Android Device with the caster

Step10: The product details will be displayed

Step 11: Stop

4. Block Diagram

The main platform of this research work is the Arduino board. This board is being connected to the IR Sensor, Relay, Wi-Fi, GSM, personal Computer, Caster, Alarm, Bluetooth, Android devices, and LCD display. The product is read by the RFID Reader, which is being connected with the LCD display. The product details like date of manufacturing, expiry date, and ingriedients will be displayed in the display provided. A Bluetooth device is also connected to the trolley which is connected with the Android Device. The block diagram of the system is shown in Figure 7.

5. Results

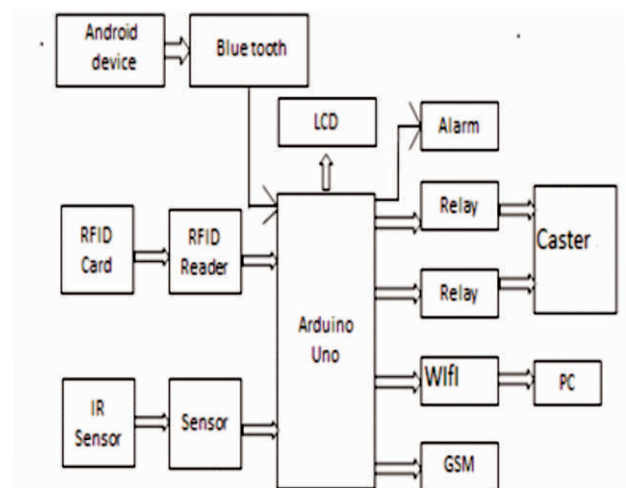By stimulating the blocks of this system, the IR Sensor reads

Figure 7. RFID Reader Breakout Board

and scans the product. The Bluetooth is capable of following the purchaser. The GSM (Global System for Mobile Communication) is able to transfer the bill from the system to the Android Device. The bill is directly passed to the billing section computer. The transmitter block diagram is shown in Figure 8, which is capable of supplying limited amount of power to the circuit. It also contains capacitors and resistors. The receiver block diagram is shown in Figure 9.

Conclusion

In this novel research work, the rush in the malls can be reduced. The workers get a less amount of work. The purchaser time is also reduced. All details of the product is being determined using the sensor. It is comfortable for all people. This technology does not need any type of spe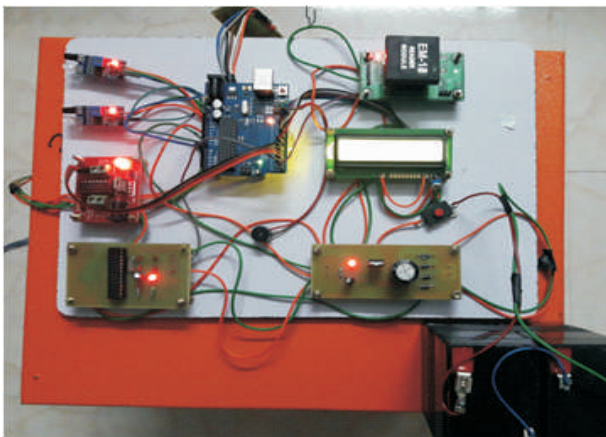cific training. The products in mall are displayed with more security. The items can be eas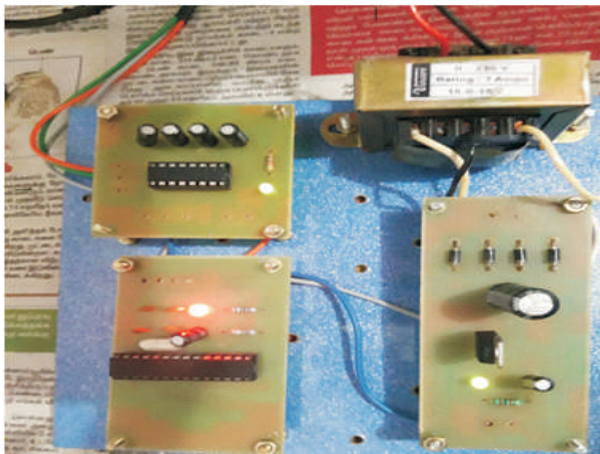ily searched and identified. With the help of an Android Device, the bill can be directly seen by the purchaser. The main advantage of this is the usage of Bluetooth technology, so the purchaser need not pull the caster but the caster will follow the purchaser automatically. So without physical help, the caster can come back. So it is a big advantage for the present generation user as the product reduces time and rush in shopping malls.

Figure 8. Transmitter Block Diagram

Figure 9. Receiver Block Diagram

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