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ADVANCED SHOPPING CART AND AUTO BILLING USING RFID TECHNIQUE

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Abstract

Despite the presence of E-commerce people tend to buy many products only in malls and supermarkets for the sake of their own satisfaction. Among the difficulties faced by the customers, one difficulty is to follow queue through the billing process. Though their intention is just to buy one or two products, waiting to bill products consumes time and also inconvenient these days as people live in a busy environment. As per our survey done, money and average time spent on each customer is high especially in over-crowded supermarkets. The shopkeepers are ready to welcome any smart machines that automate the billing process to reduce manpower and time consumed for that process. The main intension is to satisfy the customer and also reduce the time spent on the billing process which is to complete the billing process in the trolley rather than waiting in a queue even for one or two products. The customers just have to add the products after a short scan in trolley and when done the finalized amount will be displayed in the trolley. Customer could either pay their bill by their ATM cards or through cash. Our ultimate motto is to mitigate the time consumption in purchase by getting rid of queue ensuring customer's comfort and shrinking the tediousness of barcode scanning and eliminating waging of billers, thereby accomplishing both shopkeeper and customer demands.

Index Terms: RFID tags, RFID Reader, GSM, etc.

1.INTRODUCTION

Mall and market are a big corner for customer to purchasing the daily requirement like branded food item, snacks, cloth materials, electric and electronic devices etc. Nowadays, a maximum numbers of shopping mall are available large as well as small in the world. In holidays and weekend time we can see a huge rush at mall. The public was demand & spending more time in shopping mall. After purchasing a long time, the customers waste of unnecessary time at the billing counter for billing the purchased item. Continuously improvement was compulsion in the common billing system to increase the quality of shopping experience to the customers. To overcome these problems and to change and improve the existing system, we have designed a SMART SHOPPING TROLLEY. This can be done by simply attaching using RFID tags to the products and a RFID reader with a LCD display on the shopping trolley. In this system, customer will have to know the price of each and every item that is scanned in with help RFID and LCD, total price of the item will be displayed in LCD and also brief about the product. In this system will save time of customers and manpower required in mall. It is also used to reduce the employee work in the shopping mall.
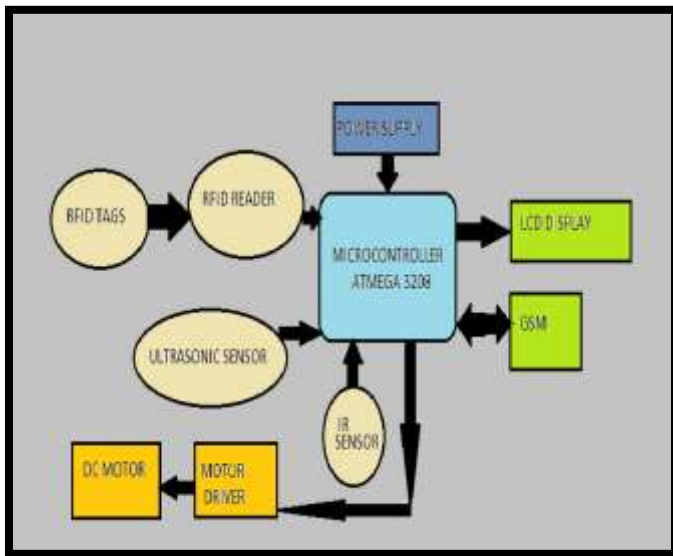
2.BLOCK DIAGRAM

Fig 1: Block Diagram

3. HARDWARE FOR SYSTEM DESIGN

3.1 Micro-controller

We are using here ATMEGA328 because of its some special features like, it gives high performance, low power consumption, on chip analog comparator, 32KB flash memory etc. Its input voltage is 7-12volts and it operates at 5volts. Processing speed ranges 0 to 16MHz.So it stores the instructions and process accordingly. Purpose of microcontroller is to control the whole process through the instructions stored.

3.2 RFID tags

These tags comprise of a microchip for storage of its unique number and a coil which acts as an antenna for radiating its stored data. It may or may not have a battery depending upon its type either active or passive respectively. Passive tags are used which doesn't have a battery. As soon as the tag comes in the RFID reader coverage range the Reader emits RF signals which gives power to passive tags and it re-emits the signal with data to the reader. Purpose of RFID tags is to uniquely identify products.

3.3 RFID reader

EM-18 is used which operates at 5volts DC and less than 50mA. The frequency at which it works in 125kHz. It can cover a distance of 10cm. It continuously emits RF signals throughout its range and whenever an RFID tag is inside its distance coverage it retrieves the information stored in the tag. Purpose of RFID reader is to retrieve the product information from their RFID tags.

3.4 DC motor

A DC geared motor is used which has an operating voltage of 12volts and 0.5A. The frequency of rotation will be around 150 to 200rpm (revolutions per minute). Geared motor

indicates the extra ring with teeth like projections attached to the shaft of the motor to ensure uniform speed throughout the rotation of the rotor. Purpose of DC geared motor is for proper opening and closing of the trolley door.

3.5 Motor driver

Motor driver is a setup which has two input supply and a ground. One supply for circuit and other to pass to the motor. We used driver circuit which is capable of controlling motor rated up to 12volts. Purpose of motor driver circuit is to control the motor.

3.6 GSM module

GSM – Global System for Mobile communication. GSM sim900A type module is used which has a supply voltage in the range of 3.4 to 4.4volts. It can operate in four bands of frequency (850/900/1800/1900 MHz). GSM mostly utilizes 850 and 900 MHz frequency. It has the ability to transmit information in the form of voice (call), text (Short Message Service) and data (GPRS – General Packet Radio Service). Purpose of GSM is for sending alert for unauthorized usage and invoice in the form of text as an SMS to corresponding user.

3.7 Power Adapter

The power adaptor is used for dc supply to the setup. It acts a rectifier where it takes input of about 240volts AC and 30 amps and gives output of 12volts DC and 1 amp which will be suitable to our setup. Purpose of power adapter is to provide a steady DC supply from an AC power source.

3.8 Ultrasonic sensor

Ultrasonic sensor detects the presence of a target object and measure the distance between the sensor and object by sending the beam of ultrasound. It is divided into three categories: Transmitter, receiver and transreceiver. Transmitter converts electrical signal into ultrasound. Receiver converts ultrasound into electrical signal. And transreceiver can both transmit and receive ultrasound. Range: 3cm to 3m (maximum range is 20m)
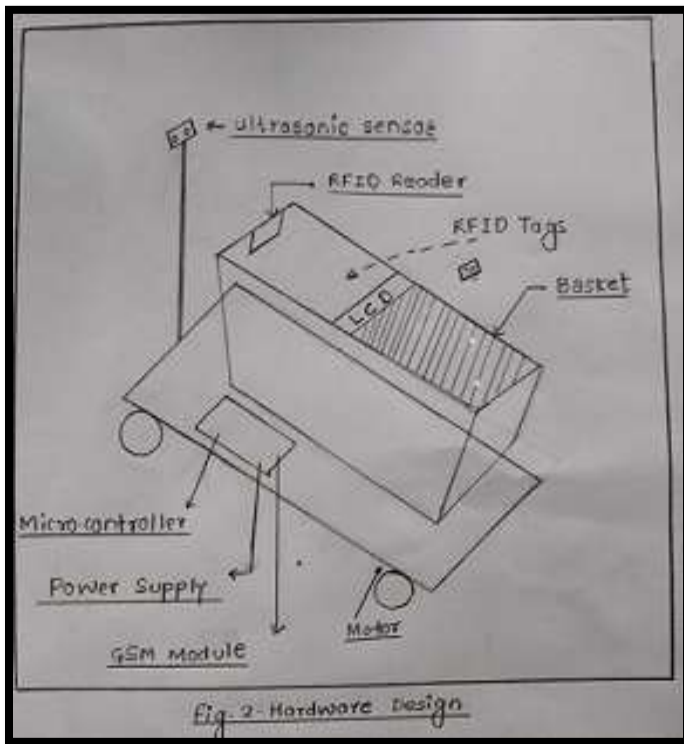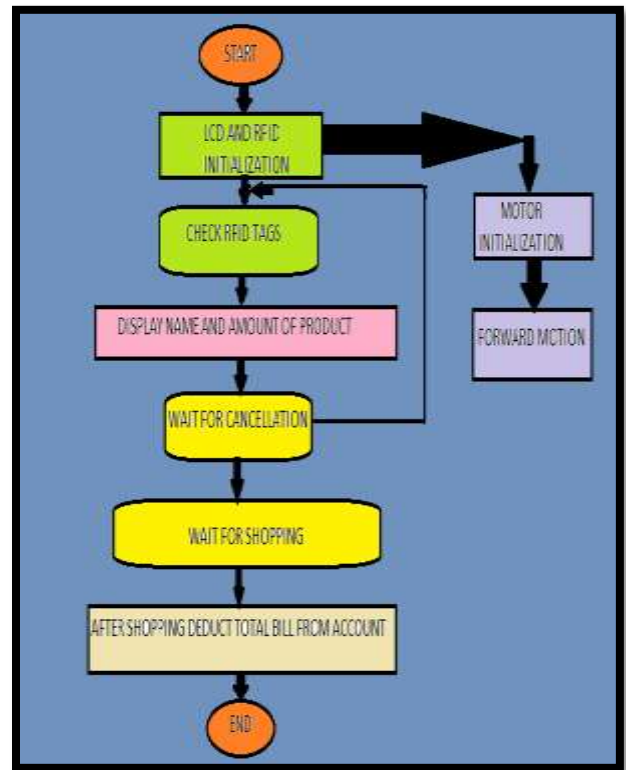
4.SMART TROLLEY DESIGN

Fig 2: Hardware Design

Fig 3: System Flow

5.METHODOLOGY

Start the process. Initialize the system. Scan an item in RFID tags. Check the RFID tags. If the tag is registered or scanned, RFID reader can read the data related from memory. Display the data and cost with help of LCD. The item is added automatically the item cost also add and produce the total cost. If any item is removed, the total cost is subtracted by the particular removed item and again the process will be continuing. Send the total amount in the billing system. Print the bill. Finally, the process is end. The system flow is shown in below Fig 3.

6.EXPECTED RESULTS

After implementing this smart cart in shopping malls we are expecting less amount of time requirement while billing as compared to Barcode system. After counting the items both by barcode and RFID technology, we are expecting that scanning of 10,000 items when done by RFID should take 2 hours whereas scanning the same number of items by barcode reader may take 53 hours. Thus expected result is 96% decrease in the item counting time. Also as we are using here ultrasonic sensor by which the smart cart will follow the customer, we are expecting that it will be maintaining a safe distance between the motor driven cart and the customer.

7.ADVANTAGES AND DISADVANTAGES

Advantages are like: It saves customers time. It also reduces the payoff given for workers. It is possible to rewrite the RFID tags. It doesn't need line of sight. It can scan multiple RFID tags at one time which is the drawback of Barcode. Tags are less sensitive to adverse condition (dust, chemicals, physical damage, etc.) RFID tags can store additional information like its name, price, etc. And the disadvantages are like: Initial time required for customer to get habituated to this new system will be more. Initial setup of this RFID system will be little costlier than Barcode system.

8.FUTURE SCOPE

We can include other data of products like expire date. We can make android mobile app for the mall where we can find the location of the products which we want to buy, instead of

searching it in the entire mall. We can use more DC motors to carry more and more stuff.

9.CONCLUSION

We are using sensors on our smart trolley which will track the customer and move at some maintained distance. It will stop when the customer will stop. There is RFID reader fixed on the trolley unit to keep the track on name of products, its individual price. After shopping, customer will not have to stand in the long queue for billing purpose as our system provides automatic billing.

The project is developed with low cost and low power consumption. With our project the customer can enjoy the shopping without pushing the trolley by themselves, and can have great experience.

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