International Journal of Applied Engineering Research ISSN 0973-4562 Volume 13, Number 23 (2018) pp. 16545-16547

Development of Automatic Shopping Trolley in Supermarkets

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Abstract

This paper presents the development of automatic shopping trolley for supermarkets. This automatic shopping trolley reduces the shopping time of customer and also effort required to move trolley. This project works on Arduino Mega microcontroller, RFID tag for scanning the products, Bluetooth module used on the trolley will give instructions to the trolley and DC Motors to move the trolley and trolley will move at the maintained distance and LCD to display the billing. Hence it works with low cost, low power consumption. So that customers can enjoy shopping without pushing trolley themselves.

Keywords: Arduino Mega microcontroller, RFID, Servo motor

1. INTRODUCTION

Now a day's human lifestyle has changed and has become more hectic. Time is money. As people don't have much time to spend for shopping which is an inevitable thing. Hence they prefer shopping in the malls so that they can get all the products at the same place. This saves them from going into different shops to purchase only a limited type of products. Though shopping in malls gives the benefit of saving time to people but they have only weekends to visit shopping malls.

This makes a problem at the cash counter because of increasing number of consumers. The customers have to stand in the billing lines for a lot more time than actual shopping time sometimes. Seeing the general Indian population and way of thinking, In the existing, in the mall every person takes product put into trolley. After the shopping is done that person have to stand in the queue for billing. In the billing process a sell person scan barcode of each and every product and gives final bill. This process is very time consuming and it becomes worst on holidays, special offers or weekends. And also it seems hectic to push the trolley till entire shopping is done. Moving a trolley is really difficult task to do in malls and shopping areas.

So, to overcome these problems we are introducing a idea called "Automatic Electronic Shopping Trolley using RFID, Sensors". Our trolley will move automatically using Bluetooth technology. We are using Bluetooth technology on trolley which is commanded by our mobile and for motion we are using DC motors. When a customer puts any product in a trolley its code will be detected using RFID reader attached with the trolley. Thus, Customer can keep the track of the total amount. It will be displayed on LCD. And finally we can do billing after finishing our shopping using employment card or Atm card by self.

2. BLOCK DIAGRAM:

The block diagram consists of two sections, one section is being trolley automatic billing section and the other section being the automatic movement of the trolley.

Fig 2.1 shows the functional block diagram of Automatic Billing of Trolley

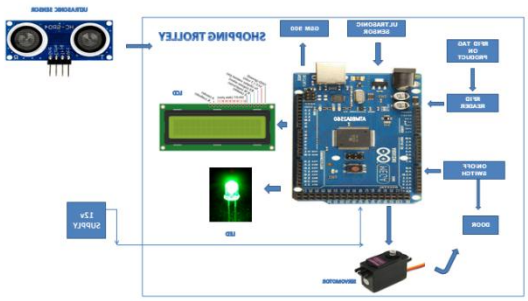

Fig.2.1 Functional Block diagram of Automatic Billing of Trolley

The billing section consists of Arduino Mega which has inbuilt microcontroller [1][2]. The microcontroller is the main component of the block diagram as shown above. It operates at 5V. So it stores the instructions and process accordingly and purpose of microcontroller is to control the whole process through the instructions stored. Shopping trolley installed with an RFID reader to scan each product and load it which is controlled by a microcontroller. In this paper we use RFID tags, that tag contains information like actual cost, discount, manufacturing date, expiry date of the product. Whenever the person keeps the products in the trolley, the products has individual tags, these tags are read by the RFID reader [3]which is attached to the trolley and it will be given to the microcontroller and the information will be displayed on the LCD screen. As a concern to security, the cart is provided with Sliding door which is run by a Servo motor and it opens for every scan to let products in. And a switch is placed to open the door, where it will remain open for 9 seconds and after 9secs the door will close automatically. An additional feature Ultrasonic sensor is included to warn the user if they accidentally drop products into cart without scanning. When the customer is done shopping he could pay his final bill

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themselves without bothering the presence of workers, for this we are using Ultrasonic sensor and GSM is used to send the message of bill payment to shopkeeper and customer [4]. And also if a customer put any material without scanning then the automatic billing function will not work and a message will be sent to the shopkeeper about the unscanned product.

Fig 2.2 shows the functional block diagram of Automatic Billing of Trolley

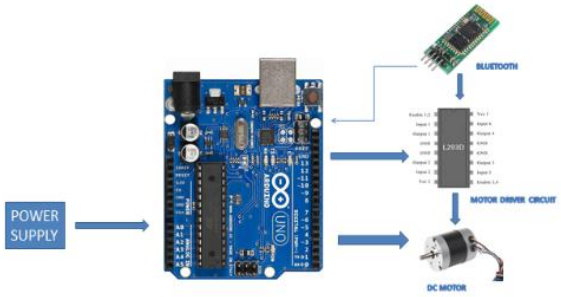

Fig2.2 Functional Block Diagram of Automatic Movement of Trolley

The moving section consists of Arduino Uno with inbuilt microcontroller. The microcontroller is the main component of the block diagram as shown above. It operates at 5V. So it stores the instructions and process accordingly and Purpose of microcontroller is to control the whole process through the instructions stored [5]. The down part of trolley consists of bluetooth device which is attached to the motor to run the trolley as per the given instruction by mobile. For the movement we have used four DC motor which is given direction and instruction. So as per the instruction it will move forward, backward, left, right and stop.L293D motor driver are used to make the interaction between motor and microcontroller.

3. RESULTS

Fig 3.1 shows the scanning of product in front of RFID reader. After that customer selects the product to know the detail of the product, RFID tag is used, that tag contains information like actual cost, discount, manufacturing date, expiry date of the product. And then RFID tag is brought near the RFID reader, these tags are read by the RFID reader which is attached to the trolley and it will be given to the microcontroller. Now the product information will be displayed on the LCD. Hence the customers come to know about product detail.

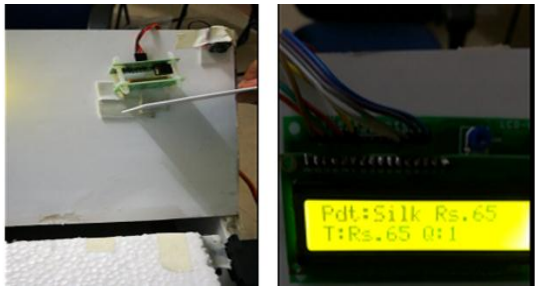

Fig 3.1 Scanning of the product (RFID TAG) in front of the RFID READER

Fig 3.2 shows the placing of product inside the trolley

After scanning the product detail, product will be placed inside the trolley. The trolley consists door locking system for the security purpose and it can be opened by using the servo motor. Here switch is used to open door. When we press the switch the will open automatically and it will close automatically after 10secs. So again after scanning the customer can open the door. Inside the trolley a ultrasonic sensor is kept to count the total product. So if a person keeps unscanned product accidentally then it will inform the shopkeeper about unscanned product through GSM.

Fig 3.2 Placing of product inside the trolley

Fig 3.3 shows the billing of products placed inside the trolley by the customers themselves once the shopping is completed using their employment card or Atm card. For this purpose a RFID card is again scanned with RFID Reader and the final price will be displayed on the trolley [6][7]. Hence the customer can use their employment card to pay the money and a message will be sent to both customer and shopkeeper about the final payment of the bill.

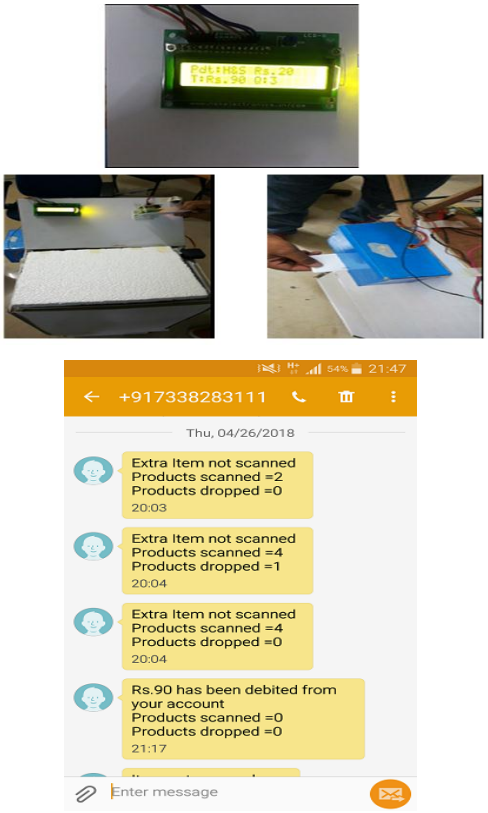

Fig 3.3 Billing of the product

In this paper as the trolley is designed to move automatically as shown in fig 3.5. For this purpose 4 dc motor and a Bluetooth module is used to control the movement of the trolley. The Bluetooth will be linked with the customer mobile. When the customer types command 1 then the trolley will move forward similarly for 3 left, for 4 right, for 5 reverse and for 2 the trolley will stop automatically. In this way customer can control the movement of trolley.

Fig 3.5 Movement of the trolley

4. CONCLUSION

Automatic shopping trolley developed in this paper works with low cost, low power consumption. So that customers can enjoy shopping without pushing trolley themselves. Bluetooth module used on the trolley will give instructions to the trolley and DC Motors to move the trolley and trolley will move at the maintained distance. It will stop when the customer will command stop and there is a RFID reader fixed on the trolley to keep the track for the total amount and customer can pay their bill automatically without waiting in the long queue.

FUTURE SCOPE

- In future we can use different sensor through which it can detect directly human and move after customer. Also, we can use more number of DC motors to carry more and more stuff. We can make a container type carrier so that small kids can sit and no mess will be there.
- Future advancement is to use enhanced RFID readers that operate in high frequency which can read multiple tags simultaneously. Mobile application can be developed to avoid smart card and GSM. Inventory management can be incorporated using IOT which in turn helps in automation of stock management.

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