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Self-directed smart shopping cart using near field communication

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ABSTRACT

Microcontroller based design, has acquired the status of most happening field in electronics. This is highly specialized field that has the power of integrating thousands of transistors on single silicon chip. Nowadays, in shopping malls for purchasing variety of items it requires a trolley. Every time customer has to pull the trolley from rack to rack collecting items and at the same time customer needs to calculate the amount that he will have to pay on checkout and needs to compare it with the budget in his pocket. Knowing all the details of the product (such as expiry date etc.) that the customer wants to buy is a very tedious task. The main objective of this project is to reduce the time spent in standing in long queues of the billing counter in shopping malls. Presently, manually pushing the heavy shopping carts causes strain and discomfort to the customers. This can be rectified to some extent by introducing a system in which the cart automatically follows the customer even if it encounters any obstacle. The cart displays the offers available in that particular mall and guides the customer to where the product is kept.

Keywords- Microcontroller ,shopping malls,Near Field Communication(NFC),Radio frequency identification(RFID) tag,obstacle detection

I.INTRODUCTION

There has been little progress in the design of shopping carts in the last decade. Recently researchers developed prototypes of computerized context aware shopping cart by attaching a Tablet MC to an ordinary cart. Initial field trials showed that the prototype and its context-awareness provide an opportunity for enhancing and affecting the shopping experience.

In the present scenario considering most of the things are atomized, on a daily basis customers face many problems like pushing the shopping cart manually, having to wait in long queues for the billing, budget problem, locating the particular product in the shopping mall etc.

In this project we propose to introduce a shopping cart which has a module in it which will scan the product and gives the details about the product like the cost, expiry date etc. Also, the shopping cart follows the customer. Once the customer completes his shopping and comes near to the billing counter, the total bill amount is automatically generated, which reduces.the waiting time (in long queues) of the customer. Along with this a module provided in the cart displays the offers available in the mall and enable the customer to find the exact location (row and column) of the product chosen by the customer.

The cart follows the customer using a line following robot, which is programmed to follow the customer in a predefined straight line. In case the cart encounters any obstacle in the path it is programmed to avoid it and take an alternative path and follow the line again

II.LITERATURE SURVEY

2.1 During survey we found that most of the people avoid going to shopping malls because of the time spent in waiting in long queues for billing. Customers find it difficult to locate the product that they want to buy. To overcome these problems, recent years have seen the appearance of several technological solutions for hyper market assistance.[1]

2.2 One system that has been designed in the past is a web shopping cart system as a typical client-server application on the web, this application is restricted to a single server only which created several problems in order to solve the problems, a new mechanism was proposed that can manage user sessions with high reliability and safety.[1]

2.3 The main drawback of the proposed system was the use of ZIGBEE technology for the wireless transmission of billing details to the billing counter. The use of ZIGBEE technology is not very efficient since it has low transmission rate and coverage area.[1]

2.4 In the existing model if the customer wants to remove an item from the cart, he needs to press the return key which is a tedious and confusing job for the customer. [2]

2.5 After completion of the shopping it is necessary to press the button to transfer the billing details through the ZIGBEE towards the billing counter.[3]

2.6 In the current model there is no alternative available to reduce the effort in pushing the heavy cart.[3]

III. DESIGN COMPONENTS

3.1 POWER SUPPLY UNIT: In most of our electronic products or projects we need a power supply for converting mains AC voltage to a regulated DC voltage. For making a power supply designing of each and every component is essential. The Components used are: Step down transformer, Voltage regulator, Capacitors , Diodes.As we require a 5V and 12V we need LM7805 and LM7812 Voltage Regulator IC's respectively.

3.2 CART UNIT:The cart unit will have an RFID scanner which scans the RFID code present in the product and displays the details in the RFID on a screen provided in the cart using microcontroller. The cart also has an ultrasonic sensor which helps the cart to follow the customer, ultrasonic sensor is preferred because it does not need line of sight(LOS) for detection, it has a wider angle of detection of about 180°(frequency used is about 40KHz). There is an NFC transmitter, the receiver of which is present in the counter unit, this helps in transferring the details required for generating the bill to the counter unit as soon as the customer comes in the vicinity of the billing counter.

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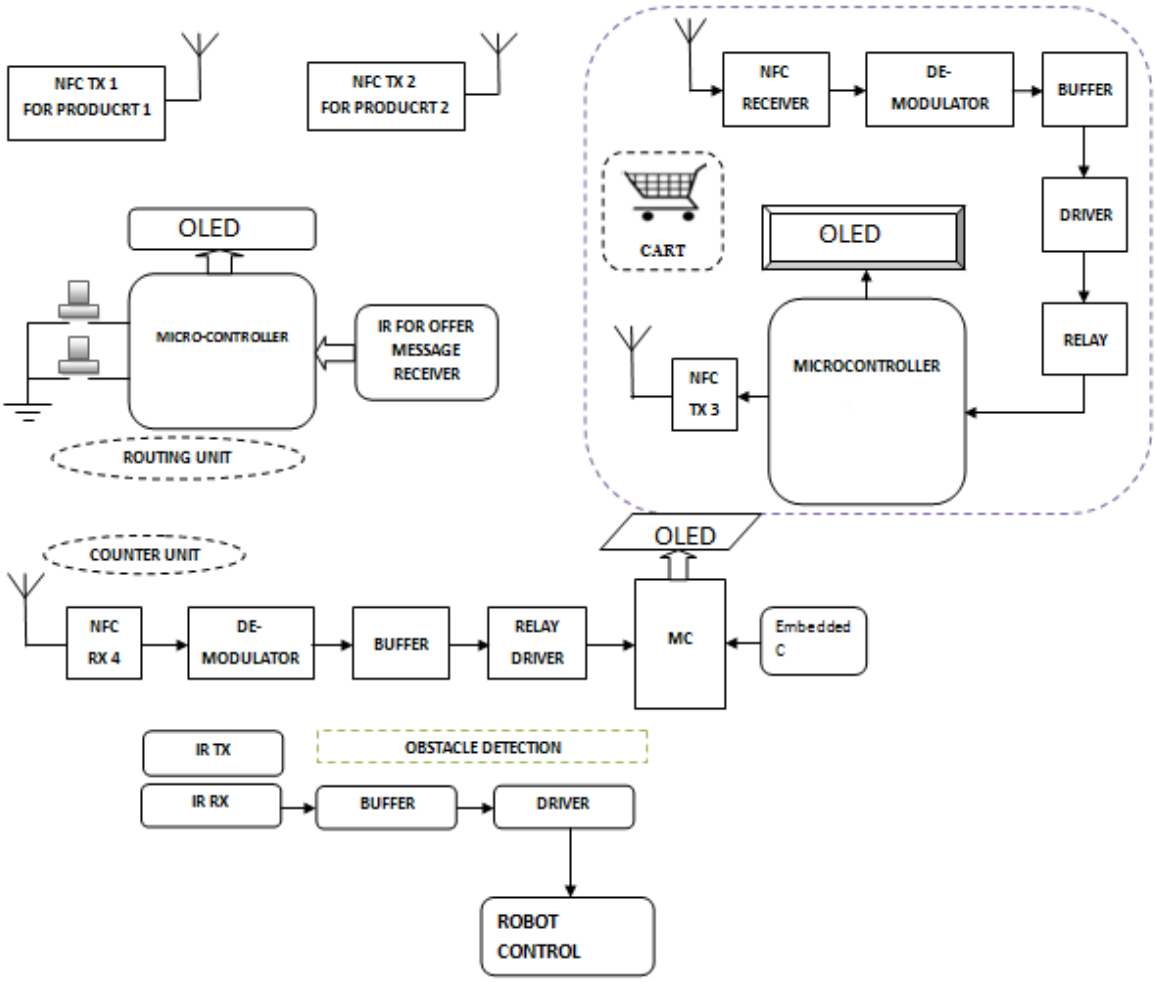
3.3 ROUTING UNIT:As soon as the customer enters the mall and picks up a cart the offers available in the mall are displayed on the screen of the module. If the customer faces difficulty in searching for the product he can select the particular product on the module which then guides him to where the product is kept. This entire module is embedded within the cart unit where it performs all the display functions.

3.4 COUNTER UNIT: In the counter unit, there is an NFC receiver (as mentioned above) which receives and demodulates the billing details which facilitates quick generation of bill. Also, the total amount will be displayed on a screen provided at the billing counter.

3.5 OBSTACLE DETECTION: In case the cart encounters an obstacle it is programmed to avoid it by taking an alternative path around the obstacle. For example if the cart is following a line on the left side and it encounters an obstacle in its path it follows the path right→ left→ right and then continues to follow the original path

IV.BLOCK DIAGRAM



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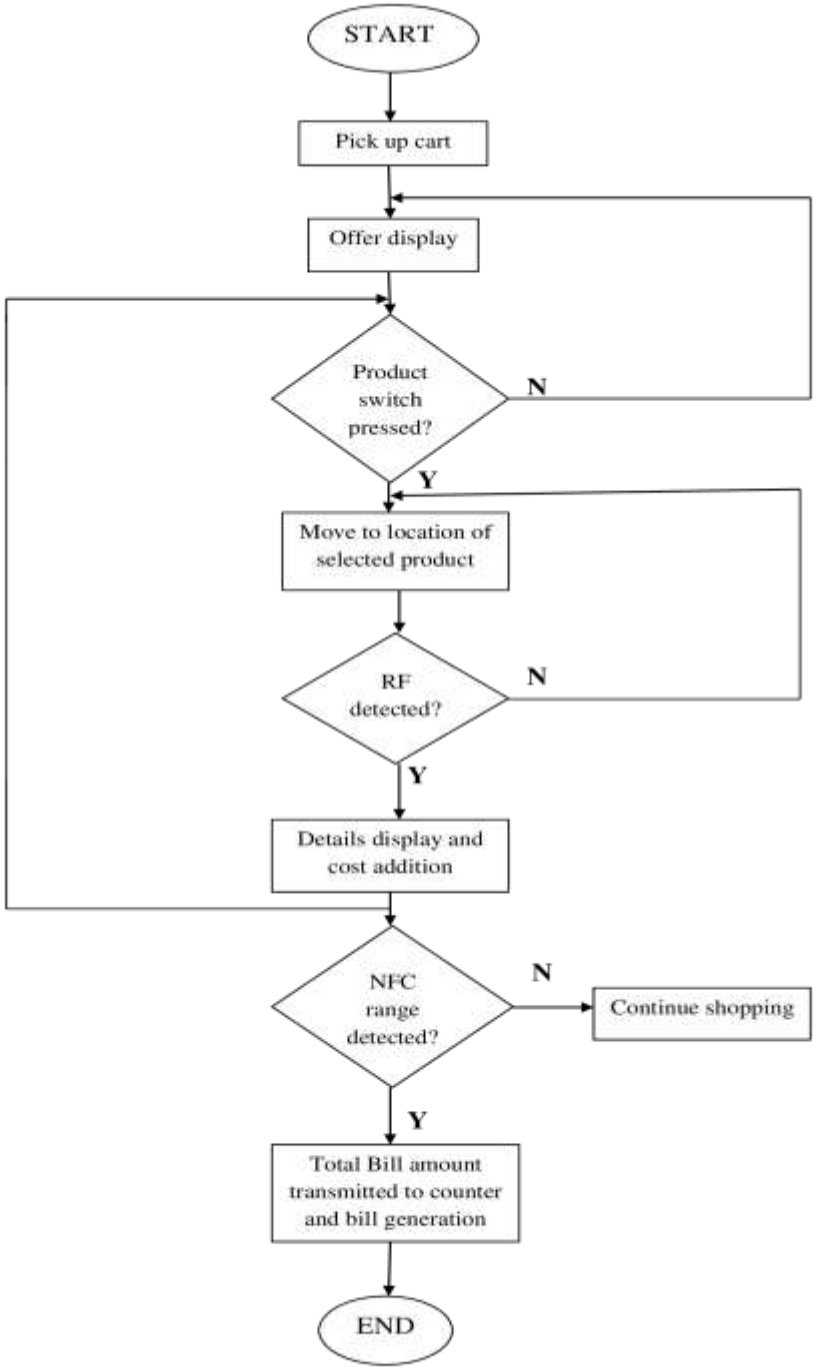
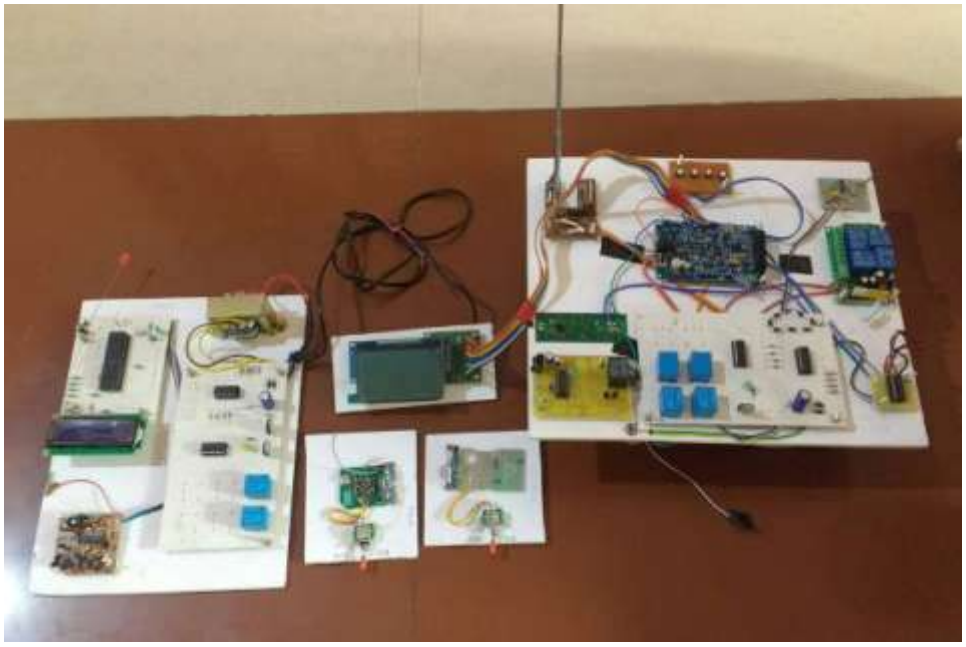
V.FLOWCHART



VI. OUTCOME



The system consists of two separate units one which is movable and acts as the cart unit and another which is fixed and acts as the billing or the counter unit. Two RFID modules are used to represent two products which when brought near the cart unit transmits its details to the RF receiver present on the cart. the movable cart unit has an NFC transmitter the receiver of which is placed in the billing unit, this facilitates the bill generation. OLED is used in the cart unit to display the details of the product, offers on them and the total bill amount

VII. CONCLUSION

In this paper, we presented the design and implementation of a self-directed, energy efficient, microcontroller based shopping cart. Compared with conventional shopping cart, our system is more advantageous in term of reduction of manpower, cost and providing details about the products purchased. Also it maintains safe distance between customer and itself. It gives the number of products in trolley and total cost of the products on the spot. Along with this the details of the product such as expiry date, vegetarian or non-vegetarian etc. After completion of the shopping the billing details from the cart directly gets transmitted to the billing counter where the bill will be automatically printed thus reducing the time spent in waiting in long queues. Our users are the people who want to adopt a easier way of shopping.

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