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# RFID Based Smart Shopping Cart and Its Automatic Navigation

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***Abstract: -*** **Today, shopping at malls and supermarkets have become a tedious and hectic activity especially when one of the major problems faced by consumers while shopping at a supermarket is the inability to locate items and also to carry goods to the billing counter. In this paper, we are proposing a very cost-effective method to overcome these issues by creating a smart trolley that moves automatically through the aisles of the supermarket, locating different departments by tracking RFID cards embedded on the aisle floors.**

***Keywords*- RFID: Radio frequency identification, UIDC: User interface display component**

## I. INTRODUCTION

A lot of research is also being carried out in the retail sector, to make shopping a more memorable experience. This would not only help consumers but also improvise the economic inflow of such shops as well. Subtle approaches such as ambient lighting or popular music have been sources of providing an enthralling experience to customers. A few shops have also adopted trolleys which are capable of playing music of the consumer's choice, with the handheld device attached to the trolley. This paper explains a novel methodology to overcome the problems faced by a customer at a shopping mall. This is achieved by developing a smart trolley system which is not only capable of carrying items pickedby the consumer but also guiding the consumer to prescribed locations in the mall based on his or her shopping list.

## II.LITERATURE SURVEY

According to recent survey today's shopping has been revolutionized with the help of internet shopping. The local market vendors have to put a spur of competition spirit to attract customers and retain their loyalty. For this motive an idea such as a smart trolley can be introduced. This smart trolley can curb the long queue for billing, in locating the needed product and also improvise the shopping experience of a customer. This technology [1] tells us how the smart trolleys work and also explains the importance and the uses of these smart trolleys in billing departments. It is based on a simple RFID technology that detects the product put in the trolley.

Developing multitasking smart trolley using RFID."International Journal of Emerging Technology and Advanced Engineering"[2] the paper explains advancement in the idea by using a smart card which is given to every customer it is rechargeable hence he need not to carry cash, he can just swipe the card. It also can be used as a access to a trolley and to maintain a personal account in the particular malls which has all the details of the customer.

"Smart Shopping Cart using a Product Navigation System"[3] this paper has an idea of using an IPS systems for a particular indoor location that helps the customer to analyze his location .if he needs a product there is a display mounted on a trolley on which he chooses the product, the IPS will show the route.

## IV.HARDWARE IMPLEMENTATION

The components required for this cart is shown if fig 1. The components requires for the cart are RFID reader, IR sensor, power supply, microcontroller, motors and motor driver, LCD display,etc

The display has an Android application that shows the products stocked in a store which is categorized in different categories. The LCD display is a liquid crystal display that is uses liquid crystals divided into blocks which can be made clear or solid, by changing the electric current to that block.

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***1. MICRO controller:***

The Arduino Mega 2560 is a microcontroller board based on the ATmega 2560. It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Arduino Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila**.**

***2. RFID Reader and Tags:***

Radio frequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically stored information. Passive tags collect energy from a nearby RFID reader's interrogating radio waves. Active tags have a local power source such as a battery and may operate at hundreds of meters from the RFID reader. Unlike a barcode, the tag need not be within the line of sight of the reader, so it may be embedded in the tracked object. RFID is one method for Automatic Identification and Data Capture.

***3. Motor drivers:***

Here the motor driver used is a L293D. L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. The L293D uses 5V for its own power and external power source is needed to drive the motors, which can be up to 36V and draw up to 600mA.

***4. DC motors:***

A DC motor is any motor of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

***5. IR Sensor***

IR Sensors work by using a specific light sensor to detect a select light wavelength in the Infra-Red (IR) spectrum. By using an LED which produces light at the same wavelength as what the sensor is looking for, the intensity of the received light can be found. When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor. This results in a large jump in the intensity, which we already know can be detected using a threshold.

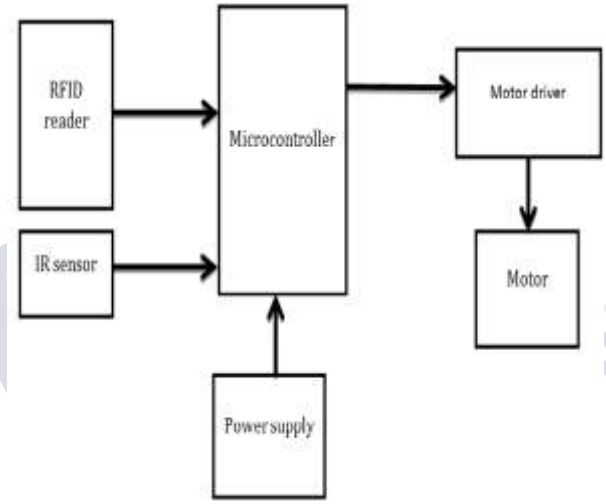


***Figure.1: Block Diagram***

**V.AUTOMATIC MOVEMENT OF CART**

Automatic movement of cart is accomplished by an embedded system containing of all the components mentioned above. Once the customer defines the product or the department using the app in the android display,the microcontroller looks for a predefined path. The path for any department can also be called asile.

Let us consider the below figure as an example in which A and B are departments, and 1,2,3,4,5,6 are routes to departments. As seen in the figure 2,predefined routes maps will have to be maintained to department A and department B. Primarily the customer will have to choose department A to B or vice versa. On starting the shopping process, the motors start running and the cart moves forward. When the RFID reader placed below the cart to read the tags on the aisle floor, reads tag1,it keeps moving forward according to the program until it reaches tag 2.Depending on the choice made in the beginning, the cart will have to move likewise to the chosen

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department. Here if chosen department was A, then at the tag 2,according to the program the cart turns left, moves forward for a delay time until it reaches tag 3.As programmed, the cart turns right at tag 3,moves forward for a delay time until it reaches tag 4 which is department A.
If the chosen department was B, then at the tag 2, according to the program the cart turns right, moves forward for a delay time until it reaches tag 6.As programmed, the cart turns left at tag 6,moves forward for a delay time until it reaches tag 5 which is department B.

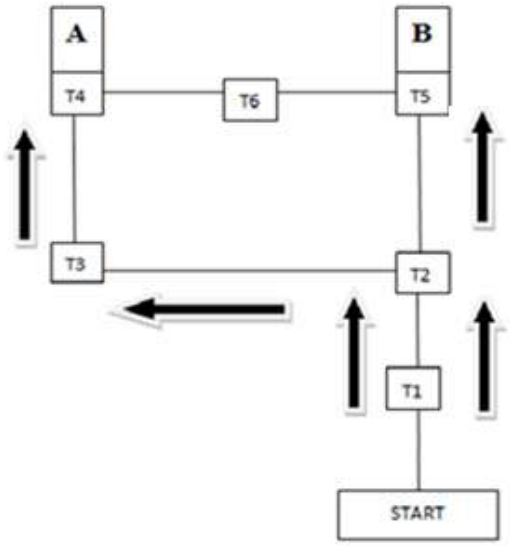


***Figure.2:*** Tag embedded routes of the smart cart(Here T1 to T6 are the RFID tags and A and B the departments).

Accordingly,the cart can be programmed to even come back to the starting point or move to any other location..

## VI. RESULT:

The prototype has been working efficiently with Arduino Mega micro-controller to handle the automatic movement of the cart. Figure shows the movement of cart Using RFID tracking technology in various directions and locations. The cart efficiently follows the algorithm and traces the path. Figure 4 shows the cart coming to halt when obstruction detected.

This setup is a prototype which has to be enhanced for a big building or location. The cart utilizes applications on android platform which could be replaced by any applications suitable.

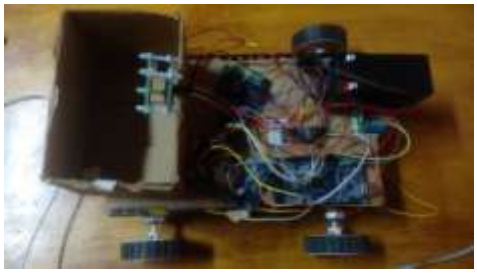

***Figure.3: Smart trolley.***

***Figure.4: Automatic navigation of trolley along RFID tagged path.***

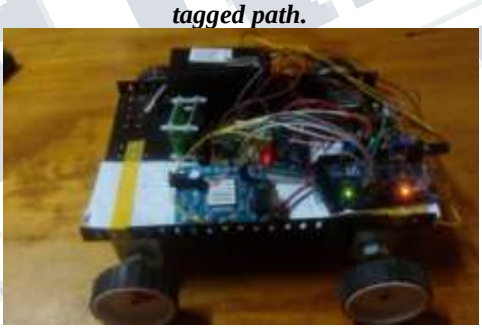

***Figure.5: Trolley with GSM turned on.***

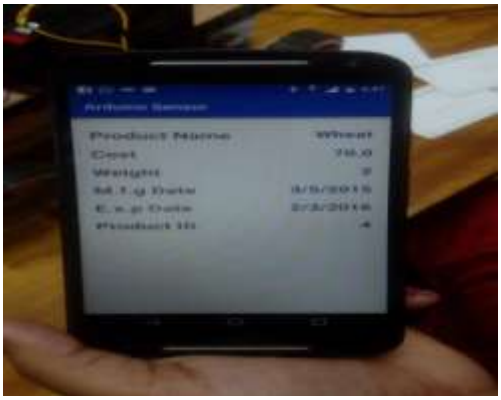

***Figure.5: Product details being displayed On app after picking item.***

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*Figure.6: RFID reader with item details and tags.*

## VII.FUTURE SCOPE:

- Wireless future trolleys can be integrated with Wi-Fi system or even the internet. In this way it would ensure a well built electronic global supply network chain management & also inventory management. By doing this the location of the trolley can be found out.
- The enhanced version of this technology can be used on the trolleys at the airports because of its wireless nature and its ability to ensure better security. It also proves to be an advantage to passengers handling heavy luggage's.
- This technology with certain modifications can be used to move and also track location and movement of containers on docks and ports.

## VIII. CONCLUSION

A shopping cart that reaches to a specific location in a retail outlet like mall, supermarkets, hyper markets automatically on its own with help of a click or a tap on an Android based display unit is something that proves to be an advancement in the history of retail shopping.The cart moves along aisles with help of RFID readers and tags as explained above without human aide i.e. the cart doesn't require to be pushed along. Communication is established between the RFID tags on the floor and the reader to enable this to occur.

The intended objectives were successfully achieved in the prototype model developed. The developed model has easy access, is economical and showcases an intelligent and easy shopping experience to reduce time, energy of the consumers. There are a few challenges/drawbacks to be resolved to make the proposed system more robust, but there is also no doubt that with the RFID having a wide scope in supply chain management, the proposed model has the potential to be enhanced to higher levels and hence the shopping experience be made easier and memorable.

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