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Smart Trolley System

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Abstract: ***In this modern twenty-first century mostly all families like to spend time shopping in malls, shopping complexes and retail stores. In all these shops people usually carry trolleys on their own in which they collect the desired items and then locomote the trolley to the billing counter where they have to wait in long queues, but nowadays there is a need to convert the old traditional trolley with a modern automatic trolley, which is exactly our project. The main idea of the project is to automate the process of shopping in such a manner that we will scan the products using RFID attached to the products and an RFID reader attached to the trolley as well as display the total amount on the LCD. We also have included a feature to send a message to the customer's registered mobile number. This process not only helps in reducing the waiting time in the long queues and moving the trolley automatically but also helps in managing and checking the budget while shopping which indeed provides a huge difference in their shopping experience as well.***
Keywords: Smart shopping trolley, RFID, Arduino project, Trolley billing system.

I. INTRODUCTION

Technology has been an enlightening path for innovative new ideas and connecting the world in which Modern world has brought us many possible ways of connecting people with technology such as IoT and industrial automation. Right from the start when innovations started in the world of technology the meaning was to reduce unnecessary hardship and increase the productivity of humans. One of the most important modern world leisure activities is spending time shopping in malls, shopping complexes etc. . Thus, an upbringing innovation in the field of shopping and retail stores can be the inclusion of smart shopping trolley systems in which the person has to just register with the help of his/her phone number and enjoy shopping with personalised billing system which helps the customer to view his total amount anytime while shopping which helps to maintain the budget, as well as automatic billing, helps in did you see the hardships required for waiting and standing in long queues in the shopping malls.

Our project consists of RFID tags which can be attached to the required products, an RFID reader which is used for scanning the products after putting them in the trolley while dropping them in the trolly the product will be scanned by EM-18, an LCD which will be used to show the items added in the trolley along with the total. Also, automated the movement of the trolley with the help of ultrasonic sensors, Arduino and motors. Using a GSM module which helps us in connecting the mobile phone of the registered customer with the trolley and after the billing is done a message will be sent to the registered customer's mobile number with the total description of the bill.

II. LITERATURE SURVEY

This [1] paper consists of Arduino and RFID, in which product weight and product quantity will display, with price detail. Smart Shopping Cart In this [2] paper, the model is attached to the trolley. It has an RFID reader which scans the product which has an RFID tag in it. The billing is done in shopping trolly only. Smart Cart using Arduino [3] consists of ultrasonic IR and RFID sensors. The RFID reader reads the tag in the product side by side amount is transferred to the billing desk. By which hardcopy is issued after the payment.

Smart trolleys for Shopping Malls[4] will generate the shopping bill in the shopping cart itself with the help of an RFID reader. Smart Cart with Automatic Billing In this [5] paper the author represents the system with the additional functionality, which will be calculating and updating the customer bill. The product and the price will get displayed on the LCD screen. Smart shopping cart with automatic billing system through RFID and transmitter and receiver In [7] malls, there can be a big rush on holidays, and weekends especially during special offers and discounts.

Due to purchasing in the shopping mall, nowadays customers prefer online shopping to get the required items like Amazon, Flipkart and Snapdeal etc. so to solve this problem this paper proposed the virtual cart, using which one can overcome the complications of online and offline shopping by ensuring a better experience.

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III. NOVELTY

There are many projects on smart trolly systems and the motive of all the projects is time efficiency (while shopping). But we have gone for more advanced and more time efficiency, in which we are scanning the product and displaying the price of the product and the quantity to LCD. After the shopping is over all the shopping details come to mobile through a message, while doing the shopping no need to pull or push to smart trolly it will automatically follow the human element.

IV. BLOCK DIAGRAM AND ITS DESCRIPTION

The working steps for the smart trolly system:-

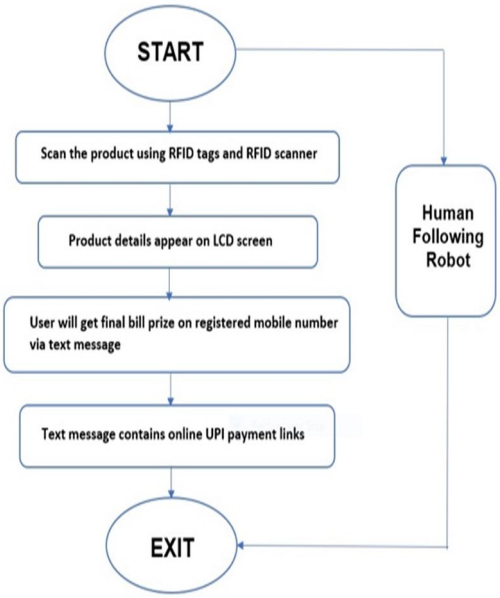


Fig 1.1 Block diagram

The basic layout of a smart trolly system:-

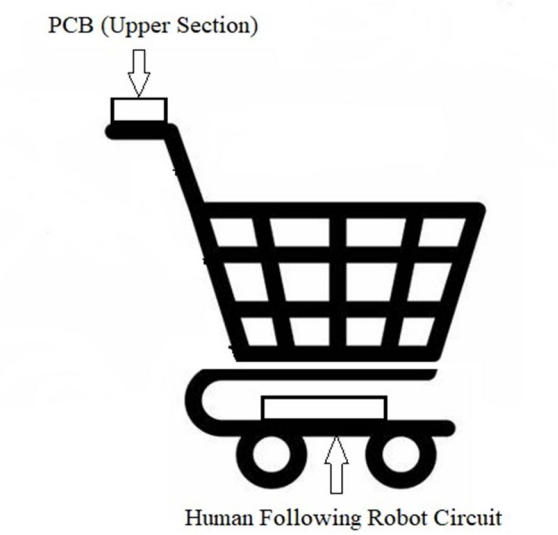


FIG 1.2 Block diagram

Our smart trolly consists of two different circuits. The first circuit is the billing circuit, which consists of Em-18, Arduino nano, Led (Green and Yellow), Lcd 16*2 with I2C, and Buzzer (fig 1.1). With the help of our billing circuit, we can the number of products and the price, that we are buying.

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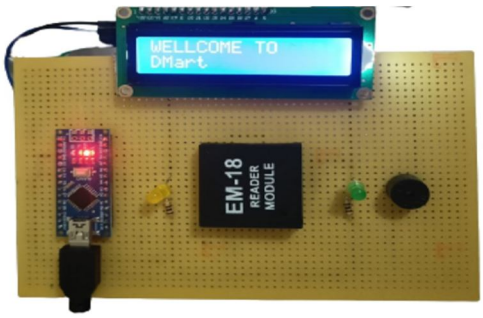


Fig 1.1 Billing circuit

The second is the human following circuit, It consists of a 4 * motor (100 rpm), L298n motor driver, Arduino Uno,2*IR sensor, Ultrasonic sensor and jumper wire (male to male, male to female, female to female). By making a human following circuit in a smart trolly which will be following humans carrying their shopping in the trolly as shown in fig 1.2.

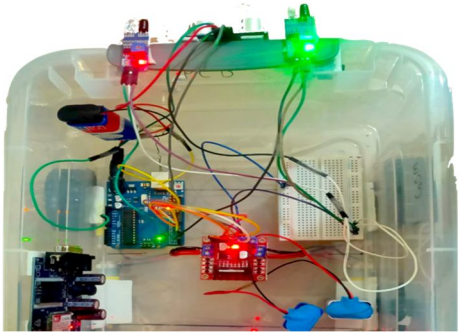


Fig 1.2 Human following system

In the billing circuit the GSM 800 module is used which makes our trolly more advance and more efficient for the payment process it sends a message of a shopping bill and asks for the type of payment process which is phone pe or googles pe. fig(1.3)

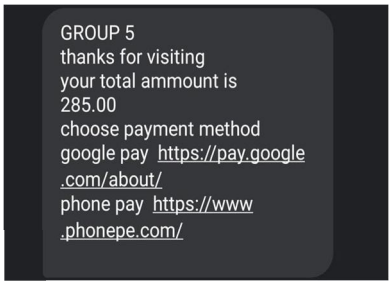


Fig 1.3 Message to customer

V. HARDWARE SPECIFICATIONS

A. RFID Reader EM-18

RFID is wireless identification technology which uses radio waves to identify RFID tags. When RFID tags come in a range of RFID readers read information stored in tags. In this project, we have stored the prices of products in RFID tags for automated billing purposes. RFID Reader has 9 pins from which we are using 3 pins in our project. VCC, GND and TX are used. VCC is connected to a power source, GND is connected to the ground and TX is used for giving an output of data. The operating voltage of EM18 is +4.5V to +5.5V, the operating temperature range is 0ºC to +80ºC and the reading distance is around 10m depending on tags.

B. RFID Tags

RFID tags are cards which are used to store information about any person or object. RFID reader continuously emits radio waves and when RFID tags are detected in range information in the tag is read by the RFID reader and displayed on display. We are using these tags to store the prices of grocery items for billing.

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C. Ultrasonic Sensor

The ultrasonic sensor is a 4-pin sensor used to measure the distance of the object. It uses sound waves to calculate distance. We are using the ultrasonic sensor in the trolley for measuring the distance from humans and following them. The detection range of the sensor is 2cm to 800 cm and a +5v DC power source is required.

D. IR Sensor

An infrared (IR) sensor is a 3-pin sensor used in many electronic devices. It is used for detecting the heat of the target and its motion. It also detects obstacles between the paths. We are using an IR sensor in our trolley for human following purposes. The operating voltage of this sensor is 5V and the range is around 20cm.

E. GSM

The GSM 800a is a GSM module that gives any microcontroller GSM functionality, meaning it can connect to the mobile network to receive calls and send and receive text messages, and connect to the internet using GPRS, TCP, or IP. This module is used in the project to send billing amounts and details to the customer on their mobile number via SMS. It requires a sim card to be inserted in the module to send SMS to customers.

F. I2C

The I2C chip converts the I2C data from Arduino into the parallel data required for the LCD. It also has a small trim pot to make adjustments in the display's contrast and there is a backlight jumper which produces a backlight to display.

G. Arduino UNO

Arduino UNO board. It is a micro-controller kit that is used to get data from peripheral devices (IR sensor, RFID reader, etc). The Arduino UNO Microcontroller board is based on the ATmega328P IC. The ATmega328P is a good platform for robotics applications. This makes the robot follow humans and detect objects in its path and Information from the RFID reader is also processed through it. Arduino UNO board consist of sets of digital and analogue pins that may act as an interface to various expansion boards and other circuits. It contains everything needed to support the microcontroller. The operating voltage of Arduino UNO is 5V and it can also be operated between 6V-20V.

VI. SYSTEM OVERVIEW

Our project is divided into two circuits that are billing circuit and the human following circuit, which makes our project more advance and efficient. EM-18, Arduino-Uno, Lcd 16 * 2, and Gsm 800M modules are such items used in shopping trolleys that make them fully automatic with the human following. In this system, we get the product information like the product we are buying and what is the total of the whole product which we have bought. When the shopping is over we get all the information about the shopping bill on our mobile through the gsm 800m module.

VII. METHODOLOGY

Whenever a customer chooses a product to buy, the customer himself has to scan the product using an RFID tag. Those RFID tags contain the prizes of the particular product. As soon as the customer scans the product the buzzer will ring up as well as the green light will blow. After scanning the particular product's RFID tag, the total prize will be shown on the LCD screen. After completing the shopping, the customer has to scan the final tag. The red led will blow after scanning the final tag and the final bill prize will be sent to the registered mobile number of the customer via text message. The text message will contain the final bill prize and online UPI links through which customers can conveniently and securely pay. The billing circuit of the trolley contains the Human Following Robot. This robot will follow the customer using a combination of ultrasonic sensors, Arduino board, L298N motor driver IC and DC motors. The principle of the overall framework is to reduce human efforts for shopping.

VIII. RESULT AND DISCUSSION

In this project, we will solve the problem that is faced by people shopping and essay to make their shopping more efficient and suited. Talking about shopping trolls, it is costly. But the billing time is reduced and we don't need to push the trolley. It also makes the conventional method of shopping more efficient.

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Combining the billing circuit in the model and the human following circuit in the model here we get the result of the smart trolly model as shown in Figure 1.4.

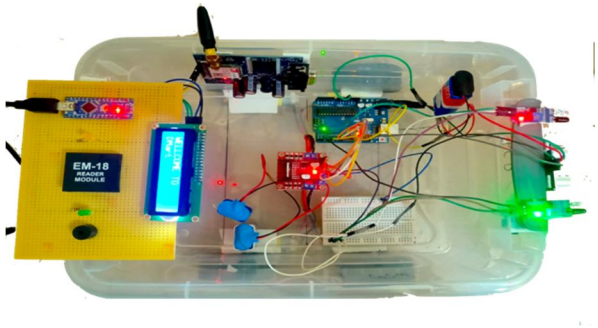


Fig 1.4

IX. CONCLUSION

The project designed in this report is based on the working of a smart shopping trolley, which works in such a manner that the customer needs to just lead the trolley and the trolley will automatically follow the customer with the help; of a human following robot which will be attached at the bottom of the trolley. This paper also signifies the inclusion of smart detection circuit so that the products when added to the trolley will be detected using the technique of radio frequency identification, wherein RFID tags will be used to scan the products and the addition of a total amount of the bill will be communicated to the user/customer with the help of GSM module. The work is finally developed with a mission to reduce unnecessary human efforts while shopping and also improve the productivity of customers by reducing the billing queues.

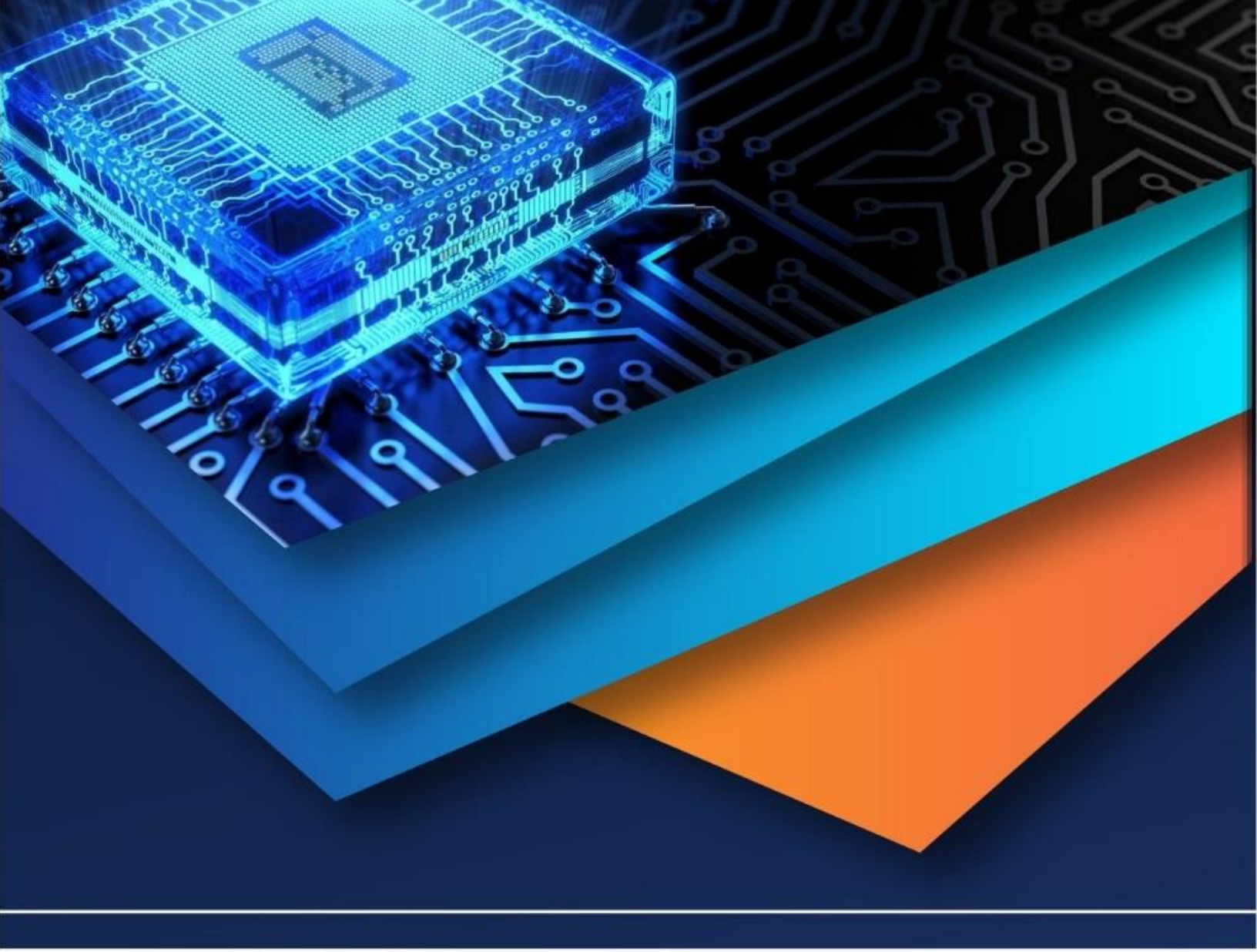
X. ACKNOWLEDGEMENTS

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