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Automatic Human Follower Trolley with Smart Billing

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***Abstract:** An automatic mobile trolley was a prototype of wheel robot that serves as a trolley or shopping cart. This paper proposed an automatic mobile trolley using ultrasonic sensors and RFID sensor for smart billing. It can follow human movement automatically. It did not need to be encouraged or withdrawn. It would make an easier shopping for people as customers. The trolley controlled by a microcontroller module unit.*

1. Introduction

Shopping wagons in the supermarkets in day moment shopping conditioning is now substantially visible. guests are pushing trolleys around them to carry the particulars they bought. The usual process of travelling the trolley is done manually by the mortal with the trouble of his/ her. thus, if a client carries a baby while doing shopping it's a real burden to the client to push the trolley or to a impaired person with one hand is nearly insolvable to push the trolley. People can see huge rush in supermarkets on leaves and weekends the rush is indeed more when there are special offers and abatements. The main purpose of the exploration design was to address the below issues by developing amulti-functional automated trolley. Follow Me is an automated trolley that's able of carrying goods while following the client automatically without mortal trouble. operation of this system will impact on ultramodern day

2.Litreature Review

An automatic human following trolley, this trolley is being guided behind the client with use of ultrasonic and IR detectors mortal ensuing ways. Considering the functional data that they developed, the exploration group developed an automated trolley which follows the client with use of an Arduino to ride the trolley the exploration group came up with the methodology detectors to track the path which the guests walks. also, the developed exploration consists of a TV which is fixed in side of the trolley to track the goods which the guests bought and automatic billing system which is developed. likewise, the trolley to be developed is conforming of some multifunctional tasks of Electronic shopping wain grounded on Radio frequency Identification(RFID) technology. This trolley contains a function to track the goods e.g. Viewing the product name and the cost, to display the particulars they've used a Liquid Crystal Display(TV) screen. The debit of the system is the trolley does only the functions that are mentioned over.

3. Methodology

The Trolley has two parts:

- Smart billing Part using RFID sensor
- Automatic human Trolley using Ultrasonic and IR sensor

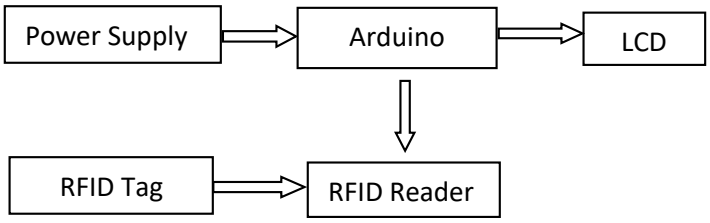
3.1 Smart billing Using RFID Sensor

3.1.1Component used in Making smart billing:

1. RFID Reader: The system include an RFID reader, which is responsible for scanning the RFID tags on the items in the trolley. The reader may be integrated into the trolley handle mounted on a fixed structure in the store.
2. RFID tags: Each item in the store is affixed with an RFID tag, which is responsible about the item such as its price and product code. The tags are read by the RFID reader when the trolley passes by or reader is brought near to the tags.
3. Arduino uno: The Arduino uno is a microcontroller board based on the ATmega328P microcontroller. It is an open source hardware platform that provide a simple and easy to use interface for programming and controlling electronic projects.

4. Display: The display is connected to the microcontroller and is used to display the items and their respective prices as they are scanned by the RFID reader. It may be a small screen mounted on the trolley handle.
5. Power Source: The system require a power source that is connected to the trolley. The power source should be able to sufficient power to the component of the system for the entire duration of the shopping trip.

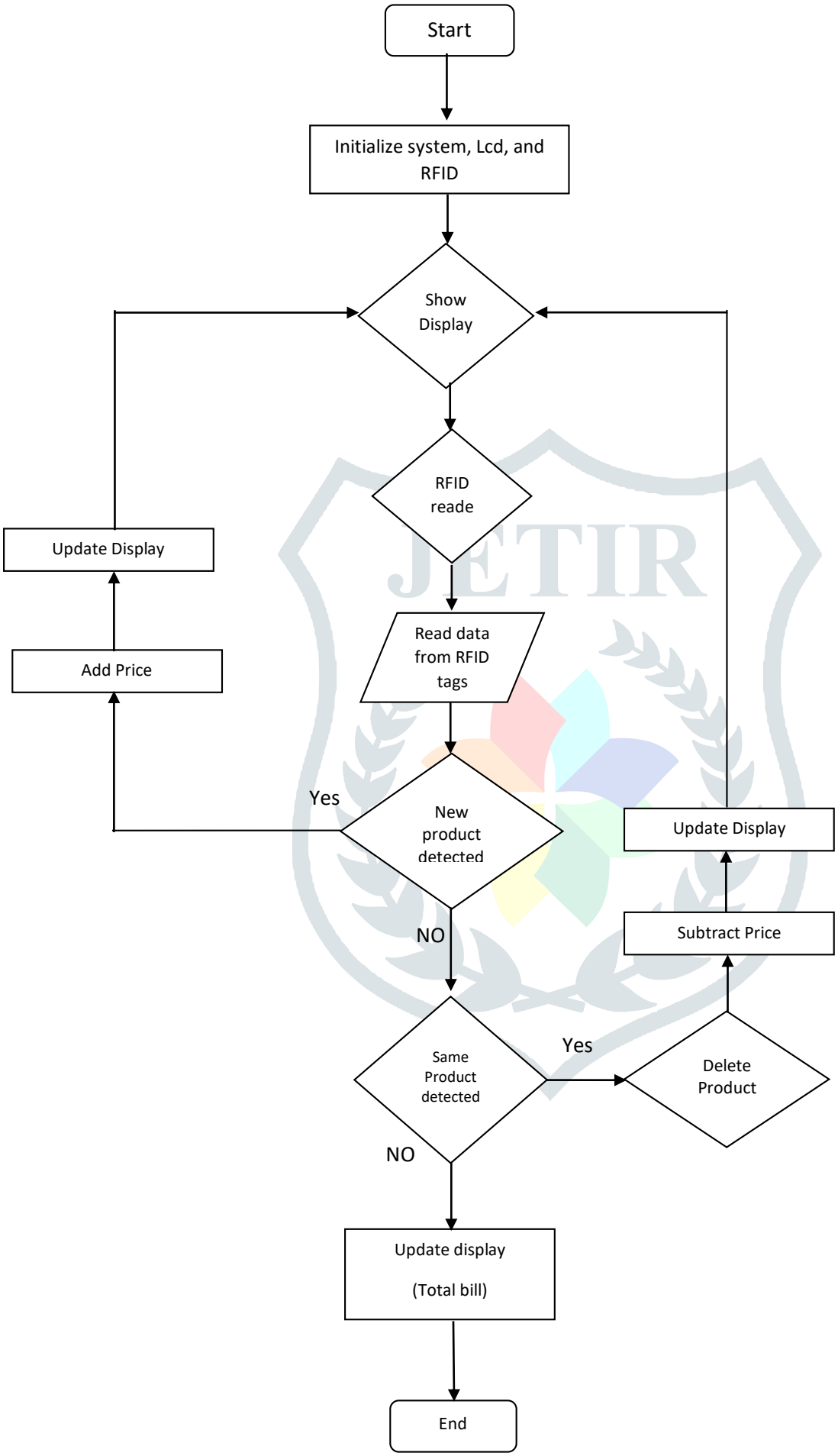
3.1.2 Block Diagram of Smart billing



3.1.3 Explanation of Working of Smart Billing:

1. First Switch on the button to start the all component like Arduino, motor drive, LCD, ultrasonic sensor, RFID reader etc.
2. Every product has different and RFID tag which contains unique id.
3. When shopper drops any product in the cart .First he has to scan the product and RFID reader read the tag. The information of the product is extracted and the same time billing information is updated
4. Rate of product and product name displays on LCD. And at last total sum is also displayed.
5. Product that are not needed taken out but we have to rescan the product in front of RFID reader to subtract the price.
6. Updated price is displayed on LCD.
7. Final bill is ready and we can do payment on counter.
8. END.

3.1.4Flow chart of Smart Billing:

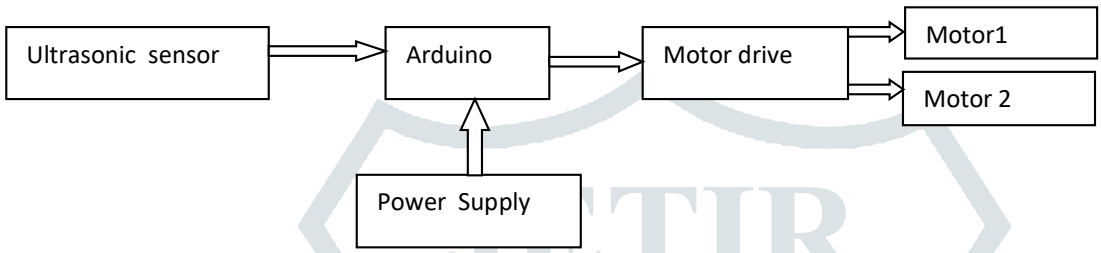


3.2 Automatic human trolley

3.2.1 Component use in Automatic human Trolley:

1. Ultrasonic sensor: Ultrasonic sensor use sound wave with frequencies above the upper limit of human hearing (20 kHz) to detect object and measure distances.
2. Arduino Uno: It is a microcontroller board based on the ATmega328P microcontroller.
3. Infrared Sensor: It is work by detecting the amount of infrared emitted by an object.
4. Power Supply: An automatic human trolley require a power source. We are using 12V battery in the trolley.
5. Mechanical Structure: The trolley also require a mechanical structure that provide stability and support of the sensor. It include the wheels and motor.

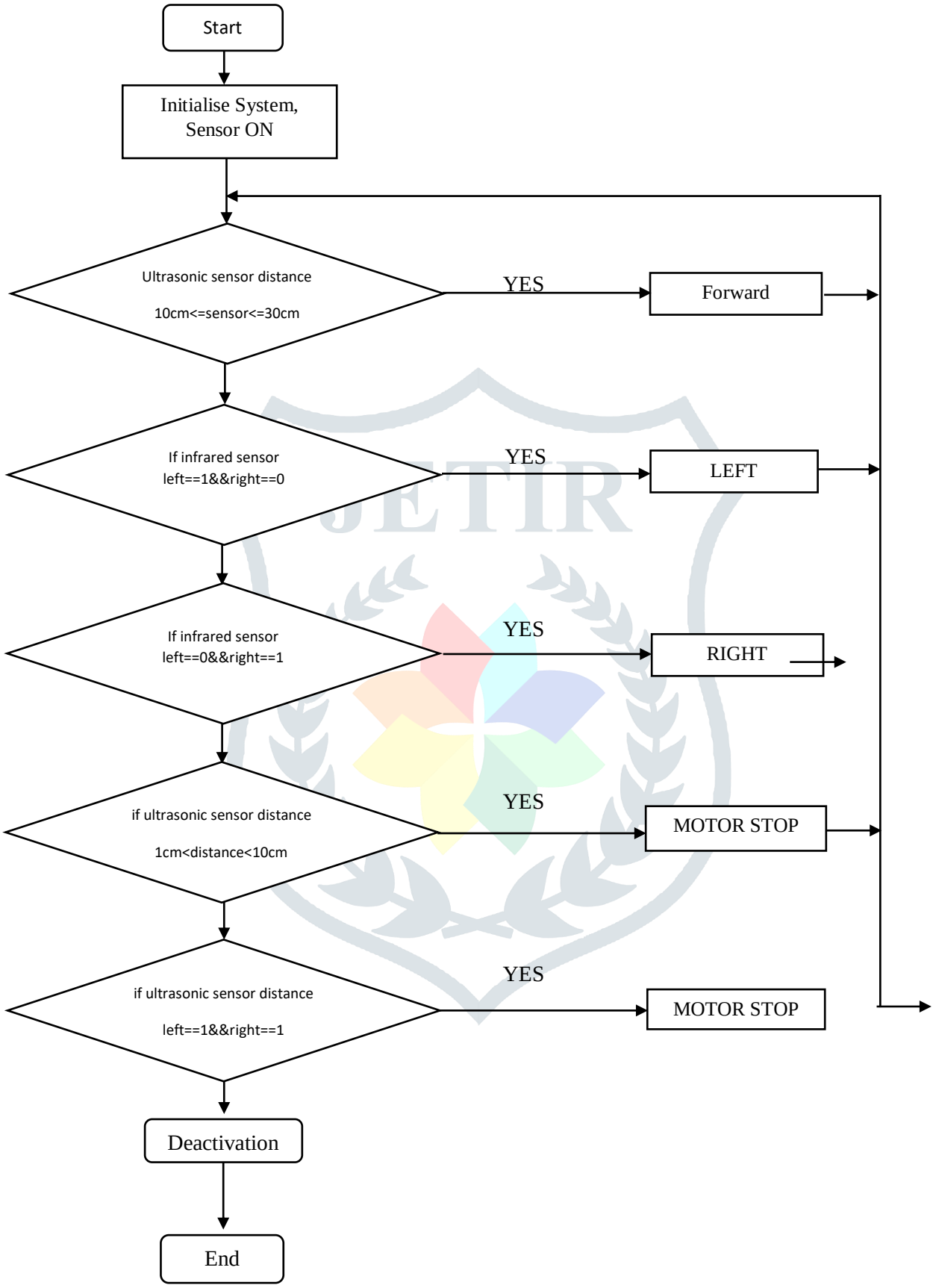
3.2.2 Block Diagram of Automatic Human Trolly system:



3.2.3 Explanation of Working of Automatic Human Trolley:

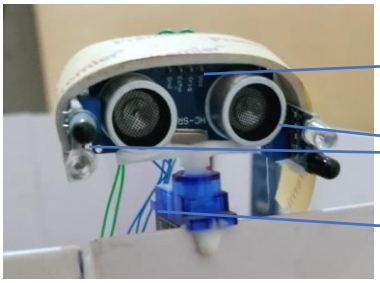
1. Switch on the button starts all the sensor.
2. The ultrasonic sensor is mounted on the servo motor which help it to rotate in sideways direction.
3. 2 IR sensor are placed sideways of ultrasonic sensor, one at each side.
4. At first when the switch is on servo motor rotate the ultrasonic sensor sideways first in right direction then in left direction.
5. Ultrasonic sensor and IR sensor are connected with Arduino Nano.
6. Arduino Nano is connected to the motor driver, which further connected to the two motor in the trolley.
7. Ultrasonic sensor is regularly detecting the distance of the object from the trolley.
8. Commands are set which control the motor of the trolley for movement. Left and Right direction movement are also controlled by these motors.
9. If distance of object is more than 10 cm and less than 30 cm trolley moves forward.
10. IR sensor are used for left and right direction signals. It can be described as if the object is move left side then right side IR sensor give ‘0’ signal to the Arduino. Arduino then off the left motor which cause the left side rotation or anticlockwise movement of the trolley. It is also done vice versa. This is also use for the movement of servo motor.
11. If distance is less than 10 cm then both the motor are stop.
12. If left signal and right signal both are ‘1’ then motor will stop.

3.2.4 Flow Chart:



4.Designing of the Trolley

4.1 Components

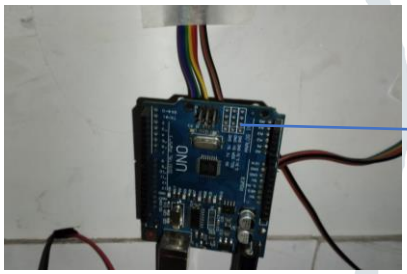


Ultrasonic Sensor

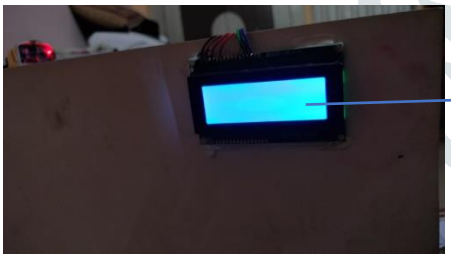
IR sensor

Servo Motor

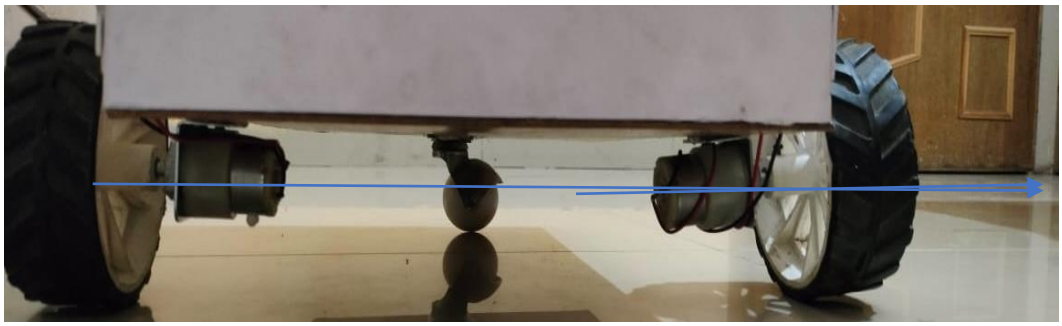
RFID sensor



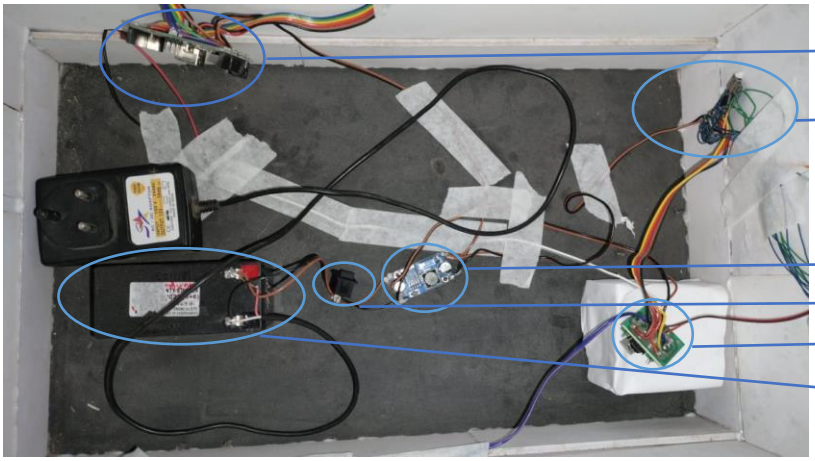
Arduino UNO



LED 20X4



Motor



4.2 Explanation of Connection of Components

All components are supplied by the 12-volt battery source. the Battery is rechargeable and connected to its charger. A diode is also connected between the charger and battery for preventing reverse charging. The battery is connected to the switch. Then it is connected to the buck converter. This converter is very useful for our trolley as the motor requires a 12-volt battery source and other components like Arduino UNO, Arduino nano, ultrasonic sensor, IR sensor, and LED require a 5-volt source. This converter provides 12-volt power to the motor driver and 5-volt power to the other component. After the converter, our trolley now has two separate parts. The billing part is controlled by the Arduino UNO, It is connected to the RFID and LED. RFID use to scan tags and the display shows the current position of no. of products in the trolley and the total bill. The automatic human following part is controlled by the Arduino Nano. Arduino Nano is connected to the Ultrasonic sensor and Infrared Sensor for continuously monitoring the motion of the object or human in front of the trolley. The ultrasonic sensor and infrared sensor are mounted over the servo motor. The Servo motor is also connected to the Arduino Nano. Arduino connected to the servo motor control it for rotating the sensors. The motors are connected to the motor driver which is connected to the Arduino nano. 2 Motors are connected to the driver these motors are used to move the trolley forward and move it left and right.

5.Conclusion

Supermarkets in the world plays a major part when it comes for shopping and the supermarkets which live in the request apply numerous effects to contend with other supermarkets. “ Follow Me ” automated smart trolley provides some benefits to the supermarkets as well as to the guests. “ Follow Me ” trolley correspond of some multifunctional tasks similar as it's suitable to follow the guests automatically so that the client doesn't needs to push the trolley manually. All the over mentioned functions and technologies were used to fulfil all the objects of this “ Follow Me ” Multifunctional Automated Trolley and the exploration group hope the exploration would be a benefit for the developing supermarkets. Hope that this exploration study will be helpful for the experimenters who interested in the automated systems as well as software structure and will develop analogous models with further advance technologies and features. During the development of the design following are the limitations which were figured out Supermarket guests should be used to an robotic terrain; “ Follow Me ” trolley detects only the closest object when travelling automatically; Long battery life;

6.FUTURE WORK

Recommendations to those who are willing to develop this system further are as follows Setting up a navigation chart to the operation to identify the where the products are been stored. Promoting the operation to client own mobile device. transferring SMS orE-Mail after the purchasing is finished. Add a payment system which is fixed to the trolley to pay using guests disbenefit or credit card. Developing a label which uniquely identifies only the specific client. As the exploration was limited to a specific time period the group was suitable to concentrate only a limited quantum of factors. In the unborn the group is willing to do further inquiries and develop further styles that will be included to the tackle device as well as to the android operation.

7.ACKNOWLEDGMENT

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