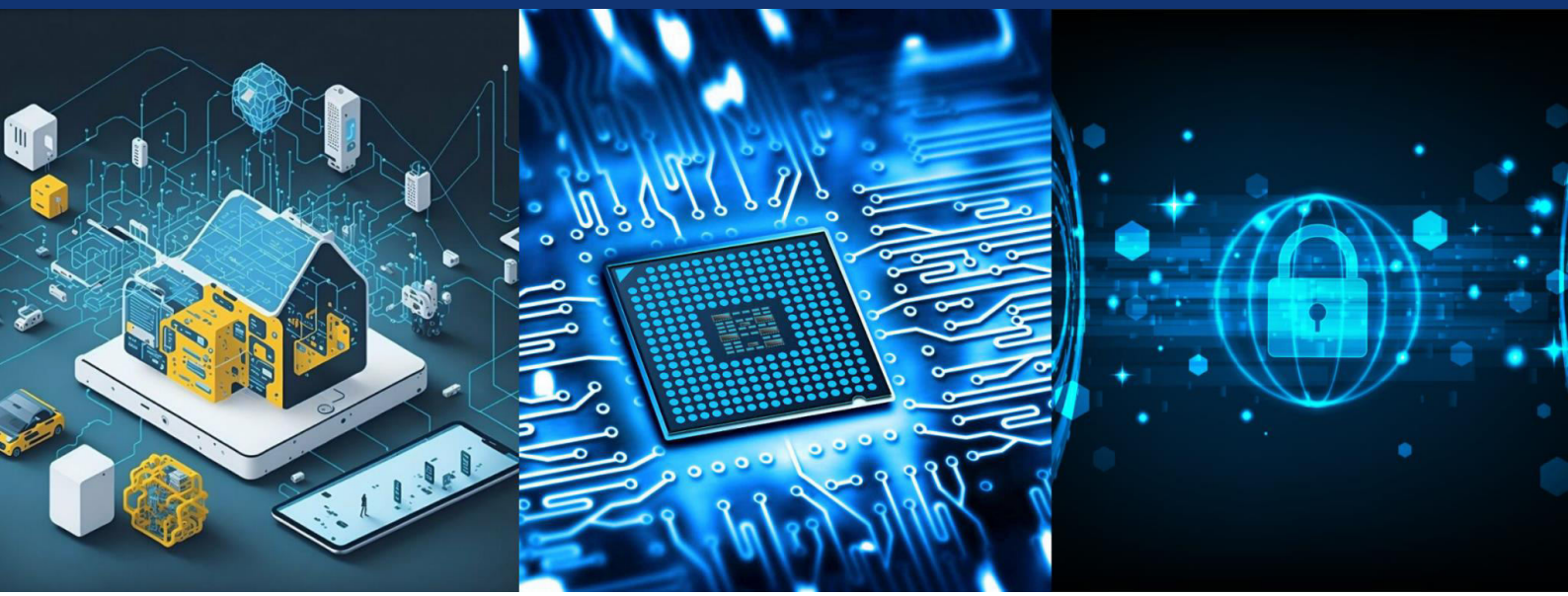
IJIRCCE

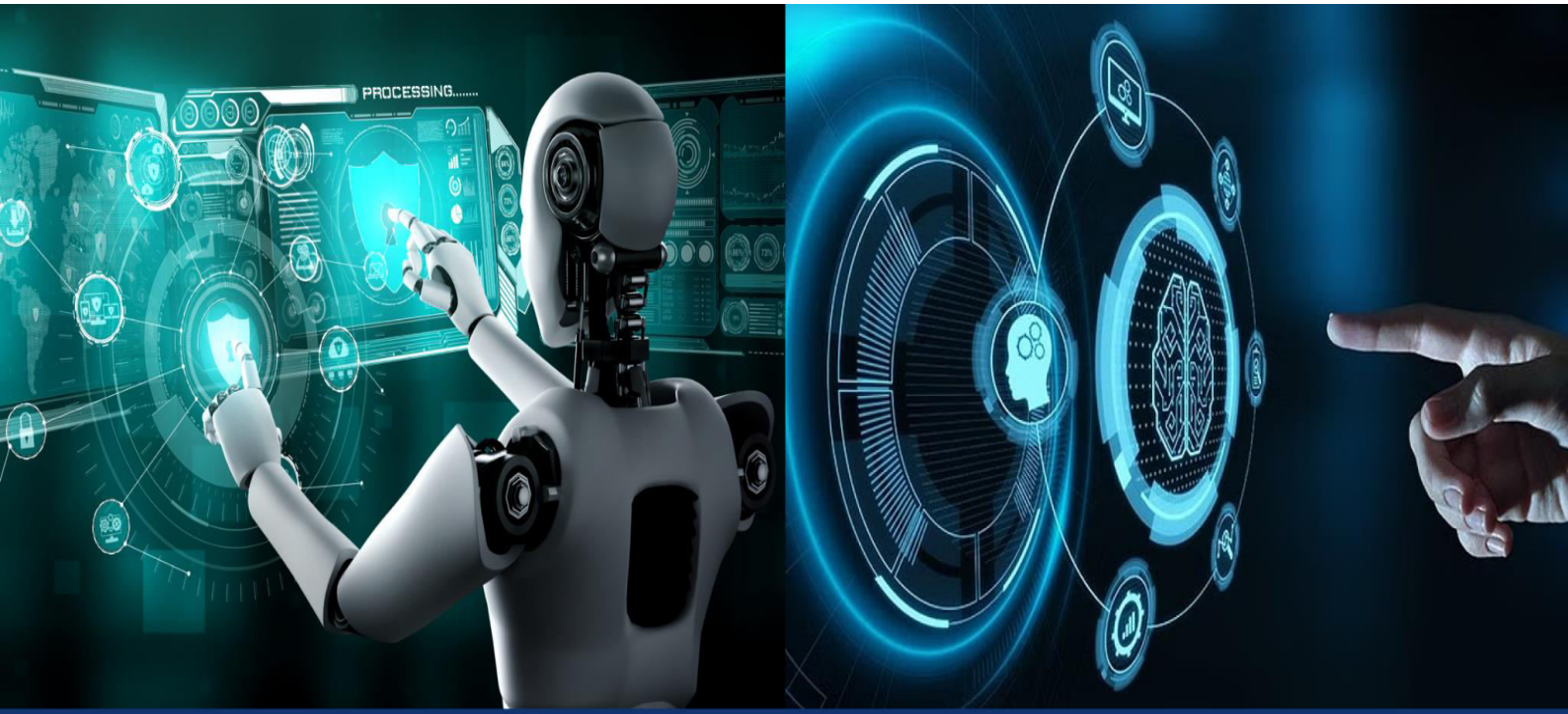
ISSN(O): 2320-9801

ISSN(P): 2320-9798



International Journal of Innovative Research in Computer and Communication Engineering

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.771

Volume 14, Issue 3, March 2026

© 2026 IJIRCCE | Volume 14, Issue 3, March 2026| DOI:10.15680/IJIRCCE.2026.1403040

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Smart Shopping Trolley Follow the Customer

Inamdar Javeriya[1], Hon Harshada[1], Gole Gauri[1], Jamdhade Ankita[2]

U.G. Student, Department of Mechatronics Engineering, Sanjivani K.B.P Polytechnic College, Kopargaon, Maharashtra India[1]

Associate Professor, Department of Mechatronics Engineering, Sanjivani K.B.P Polytechnic College, Kopargaon, Maharashtra, India[2]

ABSTRACT: In modern supermarkets and shopping malls, customers often face difficulty in carrying heavy shopping baskets or pushing traditional trolleys for a long time. This can make the shopping process uncomfortable, especially for elderly people and customers carrying many items. To solve this problem, the Smart Shopping Trolley Follow The Customer system is proposed.

The main objective of this project is to develop a smart trolley that can automatically follow the customer while maintaining a safe distance. The system uses sensors, a microcontroller, and motor driver circuits to detect the movement of the customer and control the movement of the trolley. Sensors continuously monitor the position of the customer and send signals to the microcontroller. Based on this information, the trolley moves forward, stops, or changes direction accordingly.

The proposed system reduces the physical effort required to push a trolley and improves the convenience of shopping. It also helps customers move freely in the store without worrying about handling heavy carts. In addition, the trolley is designed with obstacle detection capability to avoid collisions and ensure safe operation inside crowded shopping areas.

This project demonstrates how automation and embedded systems can be used to improve the shopping experience in retail environments. The Smart Shopping Trolley system provides a practical solution for modern supermarkets and represents a step toward smart retail technology in the future.

KEYWORDS: Smart Shopping Trolley, Customer Following System, Automation, Arduino Microcontroller, Ultrasonic Sensors, Motor Driver, Smart Retail Technology.

I. INTRODUCTION

In modern supermarkets and shopping malls, customers usually use shopping carts or baskets to carry the items they want to purchase. As the number of items increases, the weight of the trolley also increases, making it difficult for customers to push or move the trolley for a long time. This problem becomes more serious for elderly people, children, and physically weak customers. Carrying heavy baskets or pushing large trolleys can make the shopping experience uncomfortable and tiring.

With the advancement of technology, automation systems are being widely used in many areas to make human work easier and more efficient. Smart technologies such as sensors, microcontrollers, and embedded systems are now being used to develop intelligent devices that can assist humans in daily activities. One such application is the development of a smart shopping trolley that can automatically follow the customer.

The Smart Shopping Trolley Follow The Customer system is designed to reduce the physical effort required during shopping. The trolley is capable of automatically following the customer using sensors and a control system. The sensors detect the position or movement of the customer and send signals to a microcontroller. Based on this information, the microcontroller controls the motors and moves the trolley in the direction of the customer while maintaining a safe distance.

© 2026 IJIRCCE | Volume 14, Issue 3, March 2026| DOI:10.15680/IJIRCCE.2026.1403040

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Another important feature of the system is obstacle detection. In a crowded supermarket environment, the trolley may encounter obstacles such as other customers or objects. The sensors help detect these obstacles and stop or change the movement of the trolley to avoid collisions and ensure safety.

II. LITERATURE SURVEY

Many researchers have worked on improving shopping systems by using automation and smart technologies. Various smart trolley systems have been proposed to make shopping easier, faster, and more convenient for customers. The following studies explain some important technologies used in smart shopping systems.

1. RFID Based Smart Shopping Trolley

Several research studies introduced smart shopping trolleys using RFID technology. In this system, RFID tags are attached to products and an RFID reader is installed on the trolley. When a customer places an item inside the trolley, the reader automatically detects the product and adds it to the billing list. This system helps in automatic billing and reduces waiting time at checkout counters. However, these systems mainly focus on billing automation and do not help customers in moving the trolley.

2. Sensor Based Obstacle Detection System

Some researchers have developed trolley systems using ultrasonic or infrared sensors to detect obstacles in shopping areas. These sensors help the trolley detect objects such as walls, shelves, or other customers and prevent collisions. The microcontroller processes the sensor signals and controls the movement of the trolley. This technology improves safety and helps in smooth movement inside crowded supermarkets.

3. Customer Following Robotic Systems

Recent research has focused on robotic systems that can automatically follow a person. These systems use sensors, cameras, or signal tracking methods to detect the position of a person and move accordingly. Customer-following technology is commonly used in service robots and automated carriers. This concept inspired the development of the Smart Shopping Trolley Follow The Customer system, which automatically follows the customer and reduces the need to manually push the trolley.

From the above studies, it is clear that combining sensor technology and automation can improve the shopping experience. The proposed system integrates these technologies to create a smart trolley that follows the customer safely and efficiently.

III. METHODOLOGY

The methodology of the Smart Shopping Trolley Follow The Customer system explains the design and working process of the proposed system. The main aim of this project is to develop an automated trolley that can detect and follow the customer while maintaining a safe distance.

The system is designed using a combination of sensors, a microcontroller, a motor driver, and DC motors. These components work together to detect the position of the customer and control the movement of the trolley.

First, sensors are used to detect the presence and movement of the customer. Sensors such as ultrasonic sensors or infrared sensors continuously monitor the distance between the trolley and the customer. The sensor sends signals to the microcontroller whenever it detects movement or a change in distance.

The microcontroller acts as the main control unit of the system. It receives input signals from the sensors and processes the data according to the programmed instructions. Based on the received data, the microcontroller sends control signals to the motor driver.

The motor driver is responsible for controlling the direction and speed of the DC motors. When the microcontroller sends a command, the motor driver activates the motors and moves the trolley forward, left, or right depending on the position of the customer.

© 2026 IJIRCCE | Volume 14, Issue 3, March 2026| DOI:10.15680/IJIRCCE.2026.1403040

www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

The system is also designed with an obstacle detection feature to improve safety. If the sensors detect any obstacle in front of the trolley, the microcontroller immediately stops the trolley or changes its direction to avoid collision.

Through this process, the trolley automatically follows the customer and moves smoothly in the shopping environment. The methodology ensures that the system works efficiently, safely, and reliably in real-time shopping conditions.

IV. EXPERIMENTAL RESULT

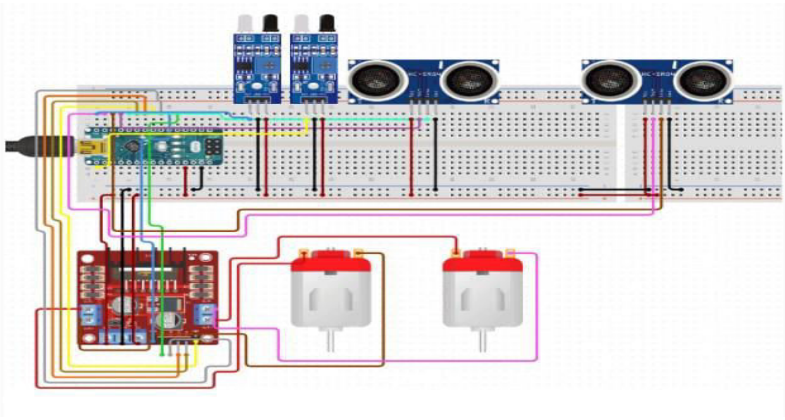
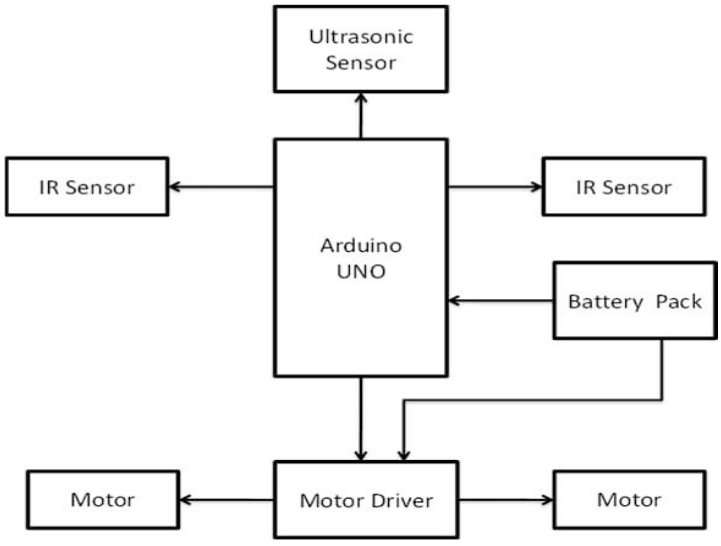


Fig. 1. The experimental setup of the Smart Shopping Trolley Follow The Customer system consists of an Arduino microcontroller, ultrasonic sensors, IR sensors, a motor driver module, and DC motors. The sensors are used to detect the position and movement of the customer as well as obstacles in the surrounding environment. These sensors continuously send signals to the Arduino microcontroller.

The Arduino acts as the main control unit of the system and processes the signals received from the sensors. Based on the sensor data, the microcontroller sends commands to the motor driver module. The motor driver then controls the rotation and direction of the DC motors, which move the trolley accordingly.

During the experiment, the system was tested in a controlled environment to observe the trolley's ability to follow the customer and avoid obstacles. The results showed that the trolley was able to move smoothly and maintain a safe distance while following the customer.



www.ijircce.com | e-ISSN: 2320-9801, p-ISSN: 2320-9798| Impact Factor: 8.771| ESTD Year: 2013|

International Journal of Innovative Research in Computer and Communication Engineering (IJIRCCE)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Fig.2 . The block diagram of the Smart Shopping Trolley Follow The Customer system shows the main components used in the project and their connections. The Arduino UNO acts as the central controller of the system. It receives input signals from the sensors and controls the overall operation of the trolley.

The ultrasonic sensor is used to measure the distance between the trolley and the customer. It helps the system maintain a safe distance while following the customer. The IR sensors are used to detect the direction and movement of the customer as well as obstacles present in the path.

All the sensor signals are sent to the Arduino microcontroller for processing. Based on the received signals, the Arduino sends control commands to the motor driver module. The motor driver controls the speed and direction of the DC motors connected to the trolley wheels.

The battery pack provides power to the entire system including the Arduino board, sensors, and motors. With the help of these components, the trolley can automatically follow the customer and move safely in a shopping environment.

V. CONCLUSION

The Smart Shopping Trolley Follow The Customer system provides an intelligent solution to improve the shopping experience in supermarkets and shopping malls. The system uses sensors, a microcontroller, and motor control technology to automatically follow the customer while maintaining a safe distance.

The developed system reduces the physical effort required to push a trolley and makes shopping more convenient, especially for elderly and physically weak customers. The use of ultrasonic and IR sensors helps the trolley detect obstacles and move safely in crowded environments.

The experimental results show that the system works effectively in detecting the customer's movement and controlling the trolley accordingly. Overall, the proposed smart trolley system demonstrates how automation and embedded technology can be used to develop innovative solutions for modern retail environments.

In the future, this system can be further improved by integrating technologies such as RFID billing, mobile applications, and advanced tracking systems to make shopping faster and more efficient.

REFERENCES

[1] P. Karthikeyan, R. Suresh, "Smart Shopping Cart with Automatic Billing System Using RFID," International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 6, Issue 3, 2017.
[2] S. Kumar, A. Gupta, "Design and Implementation of Smart Shopping Trolley Using Arduino," International Journal of Engineering Research and Technology (IJERT), Vol. 8, Issue 5, 2019.
[3] M. Patel, R. Shah, "Sensor Based Customer Following Robot System," International Journal of Innovative Research in Science, Engineering and Technology, Vol. 7, Issue 4, 2018.
[4] H. Singh, P. Verma, "Automation in Retail Systems Using Embedded Technology," International Journal of Modern Engineering Research, Vol. 9, Issue 2, 2020.
[5] R. Gupta, S. Sharma, "Arduino Based Object Following Robot," International Journal of Computer Applications, Vol. 162, Issue 5, 2017.
[6] A. Mehta, P. Desai, "Smart Shopping System Using Embedded Technology," International Journal of Advanced Engineering Research and Science, Vol. 5, Issue 6, 2018.
[7] N. Patel, D. Shah, "Design of Automatic Shopping Cart with Sensor Technology," International Journal of Innovative Technology and Exploring Engineering, Vol. 9, Issue 3, 2020.
[8] K. Ramesh, V. Kumar, "Obstacle Detection Robot Using Ultrasonic Sensors," International Journal of Engineering Science and Computing, Vol. 6, Issue 4, 2016.
[9] Arduino, "Arduino UNO Microcontroller Board," Available: www.arduino.cc.
[10] S. Jain, A. Singh, "Smart Retail Automation Using Sensor Based Systems," International Journal of Scientific Research in Engineering and Technology, Vol. 7, Issue 2, 2018.

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INNO SPACE SJIF Scientific Journal Impact Factor

doi crossref

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

www.ijircce.com

Scan to save the contact details