International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 01 | Jan - 2025 SJIF Rating: 8.448 ISSN: 2582-3930

Obstacle Avoiding Robot using Arduino Uno

Dr. V Siva Nagaraju, Supriya Ala, Vaishnu Devi CM

Professor, ECE, Institute of Aeronautical Engineering
Student of ECE, Institute of Aeronautical Engineering
Student of ECE, Institute of Aeronautical Engineering

Abstract - An obstacle-avoiding robot has been developed to navigate autonomously in various environments. The robot uses sensors to detect obstacles in its path and adjusts its movement to avoid collisions by either changing direction or stopping. By following a set of simple decision-making rules, the robot can effectively navigate through different spaces. Extensive testing in diverse environments demonstrates its ability to move safely and efficiently. The research aims to improve autonomous robots, with potential applications in home assistance, industrial setting, and other areas requiring safe and reliable navigation.

***Key Words*:** Obstacle-avoiding robot, Autonomous navigation sensors, collision avoidance, safe movement, Decision-making rules, reliable navigation

1.INTRODUCTION

An obstacle-avoiding robot is designed to move on its own while safely avoiding objects in its path. These robots use sensors, like ultrasonic, to see the environment around them and detect obstacles. When an obstacle is found, the robot can change direction or stop to prevent collisions. This ability to navigate without hitting anything is important for robots that need to work in busy or changing environments. Obstacle-avoiding robots can be used in various areas such as homes, factories, and hospitals, where they can help with tasks like cleaning, delivery, or transportation. The goal of this technology is to make robots safer, smarter, and more helpful in everyday tasks.

2. Body of Paper

2.1 Hardware components

- **Arduino Uno**: Arduino reads distance data from sensors, processes it, and decides whether to move forward, stop, or turn, ensuring the robot avoids obstacles.
- **Gear Motor:** Converts electrical energy into mechanical energy to drive the wheels.
- **Robot Wheel:** Attached to the gear motors, they allow the robot to move.
- **Motor Driver (L293D):** Enables the Arduino to control motor direction (forward/reverse), speed and it also Provides enough power to the motors.
- **Ultrasonic Sensor:** Detects obstacles by emitting sound waves and measuring the time taken for the echo to return.
- **Bluetooth Module:** Allows wireless communication with the robot using a smartphone or other device.
- **Li-ion Battery:** Powers the entire robot, including the Arduino, motors, sensors, and Bluetooth module.
- **Li-ion Battery Holder:** Holds the Li-ion batteries securely and provides connections to supply power.
- **Jumper Wires:** Connect all components, such as the Arduino, motor driver, sensors, and Bluetooth module, without soldering.
- **Card Board:** base for organizing and connecting electronic components neatly.
- **Switch:** Turns the robot on or off by connecting or disconnecting the battery's power supply to the circuit.

2.2 Working Principle of the System

- The robot uses an ultrasonic sensor to detect objects in its path.
- The sensor sends sound waves and measures how long echoes take to return, calculating distance.
- The sensor sends this distance data to the Arduino, the brain of the robot.
- The Arduino processes the data and decides to move forward, stop, or turn to avoid obstacles.
- The motor driver receives commands from the Arduino and controls the motors to move the wheels.
- This process repeats continuously so the robot can navigate safely.
- Bluetooth module is added, so that the robot can also be controlled manually with a smartphone.

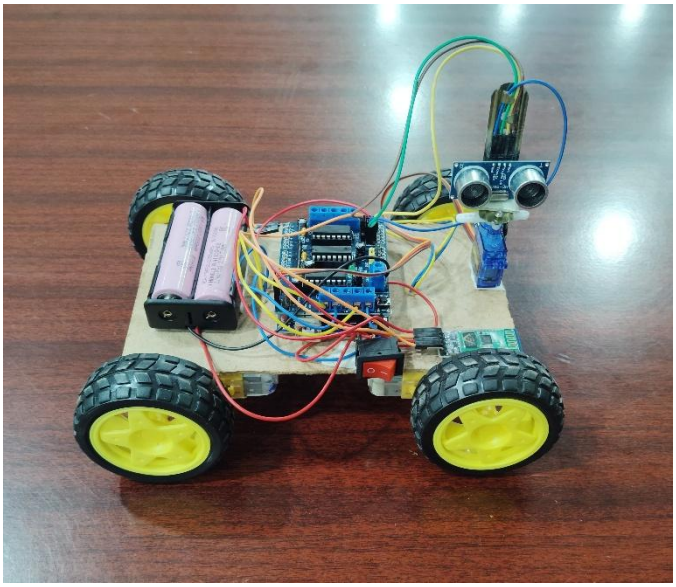
2.3 Challenges

- **Sensor Accuracy**: Ultrasonic sensors may struggle with detecting very small, transparent, or irregularly shaped objects.
- **Programming Errors**: Incorrect logic or bugs in the Arduino code can cause the robot to behave unpredictably.
- **Power Issues**: Low battery levels can reduce motor performance, affect sensor readings, or cause the robot to stop working altogether.
- **Motor Driver Overheating**: Continuous operation of motors can cause the motor driver (L293D) to overheat, leading to reduced performance or damage.
- **Alignment Problems**: Misaligned wheels or motors can cause the robot to drift or move inefficiently.
- **Environment Interference**: Noisy environments or reflective surfaces can interfere with ultrasonic sensor readings.
- **Limited Processing Power**: The Arduino Uno has limited memory and processing power, which may restrict adding advanced features.

- **Bluetooth Range**: If using a Bluetooth module, its range may be limited, affecting remote control functionality.
- **Component Durability**: Frequent use or collisions can lead to wear and tear of motors, wheels, or connections.
- **Wiring Complexity**: Managing multiple connections with jumper wires can get messy and lead to incorrect connections.

2.4 Applications

- **Home Automation**: Integrated into smart home systems as robotic vacuum cleaners or assistants.
- **Healthcare**: Helps in hospitals for tasks like delivering medicines or supplies autonomously.
- **Surveillance and Security**: Deployed for patrolling restricted or hazardous areas while avoiding obstacles.
- **Agriculture**: Used in fields to monitor crops, distribute water, or apply fertilizers without damaging plants.
- **Military and Defense**: Used for reconnaissance or bomb disposal in challenging environments.



3. CONCLUSIONS

- An obstacle-avoiding robot shows how automation can help machines move and navigate on their own, making them useful in areas like warehouses, security, and healthcare. It works by using sensors to detect obstacles and programming to make decisions in real time. Building this robot is a great way to learn about robotics, coding, and electronics.
- Although it works well, improvements like better sensors and more efficient power management can make it even better. Overall, this project is a strong starting point for creating more advanced and intelligent robotic systems in the future.

ACKNOWLEDGEMENT

We would like to express our sincere gratitude to all those who contributed to the successful completion of the research on **Obstacle Avoiding Robot using Arduino Uno**. Our heartfelt thanks to our mentor, Dr. V Siva Nagaraju, for their valuable guidance, continuous support, and encouragement throughout the study. We extend our gratitude to our peers and colleagues who provided constructive feedback and assistance during the design and implementation phases of the project.

REFERENCES

1. **Yadav, D., & Jain, S. (2020).** Autonomous Obstacle Avoidance Robot Using Arduino and Ultrasonic Sensor.
2. **Alam, M.S., &Rahman, M. T. (2018).** Development of an Obstacle Avoiding Robot Using Arduino Microcontroller.
3. **Kumar, R., &Dhanalakshmi, R.(2017).** Design and Implementation of an Obstacle Avoidance Robot.
4. **Bhosale, S.V., Kadam, S.S., & Kasar, S.V. (2016).** Obstacle Avoidance Robot Using Ultrasonic Sensors.