Robotics Project **8th June, 2023**

Bangabandhu Sheikh Mujibur Rahman Digital University

Project Proposal on

Smart Robo Car

Proposed To

- Samsuddin Ahmed
  Assistant Professor,
  Department of IRE, BDU

- Farzana Akter
  Lecturer,
  Department of IRE, BDU

- Nurjahan Nipa
  Lecturer,
  Department of IRE, BDU

- Sadia Enam
  Lecturer,
  Department of IRE, BDU

Proposed By

1. Rafiul Rabbi Zahid [ID: 2001004]
2. Rakibul Hasan Rakib [ID: 2001007]
3. Avik Halder [ID: 2001009]
4. Akibul Hasan Anik [ID: 2001010]
5. Chayon Kumar Das [ID: 2001015]
6. Suvro Kumar Das [ID: 2001021]

Introduction

In recent years, robotics has seen tremendous advancements and has found many applications in various fields. Obstacle avoidance and line following is a critical aspects of autonomous robotic systems. It can be used in various applications like the medical sector, autonomous industry, and transportation. This robot car can autonomously navigate a definite path while avoiding obstacles. This project aims to design and build a smart robo car using a combination of hardware and software technologies.

Objectives

The main objectives of this project are as follows:

1. Design and build a robot platform that can move autonomously in a given environment.
2. Develop intelligent obstacle avoidance and line-following algorithms to enable the robot to navigate around obstacles in its path.
3. Integrate sensors and actuators to enable the robot to detect its path and obstacles. And adjust its movement accordingly.
4. Conduct tests to evaluate the performance of the obstacle of the smart robo car in various environments.

Components

To build “Smart Robo Car”, we will require the following components initially:

1. Arduino UNO R3
2. L293D Motor Shield
3. DC Motors
4. 4WD Chassis
5. Jumper Wires
6. LiPo Battery with case
7. Servo Motor
8. IR Sensor
9. HC-SR04 Ultrasonic Sonar Sensor

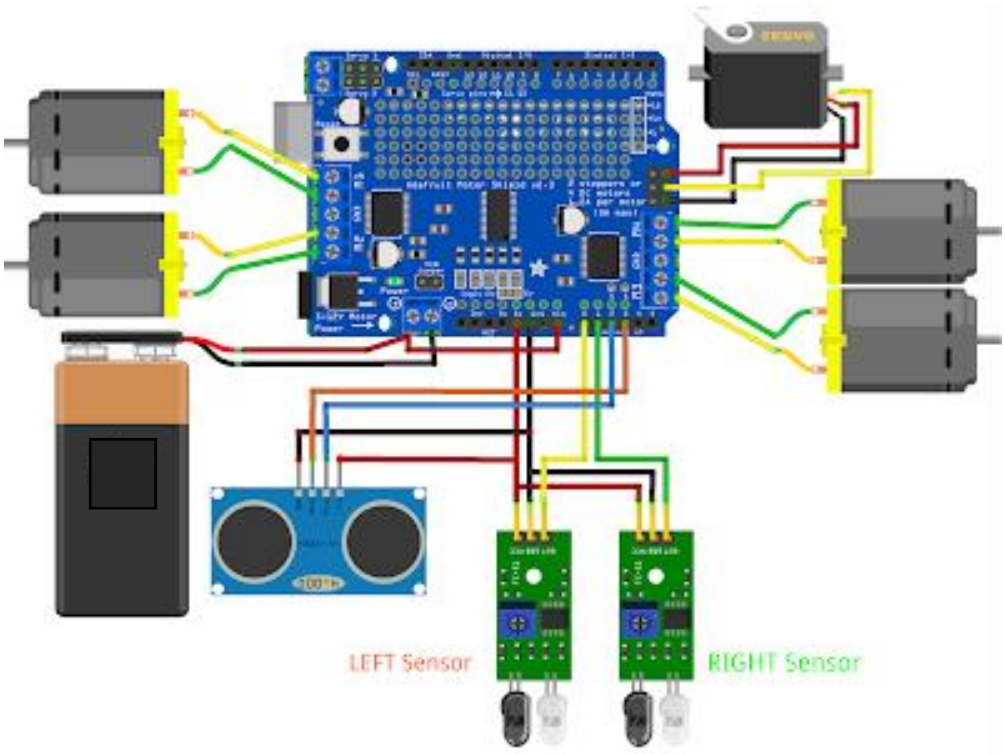
10. Ultrasonic Sonar Sensor Mounting Bracket

Methodology

The project will be implemented in the following steps:

1. **Design and build the robot platform:** This involves selecting the appropriate components such as motors, wheels, chassis and power supply and assembling them into a functional robot.
2. **Implement obstacle avoidance algorithms:** This involves selecting and implementing suitable algorithms for line following and obstacle detection and avoidance. These algorithms will use sensors such as ultrasonic sensors and IR sensors to detect the line and avoid obstacles.
3. **Integrate sensors and actuators:** This involves connecting the sensors and actuators to the microcontroller board and writing code to interface with them.

Circuit Diagram



Expected Outcome

The expected outcomes of this project are:

1. **Line Following**: The robot car should be able to detect and follow a line marked on the ground, typically using sensors like infrared or color sensors. It can use this line as a guide to stay on course and follow a specific path.
2. **Obstacle Detection**: The robot car should be equipped with sensors such as ultrasonic or infrared sensors to detect obstacles in its path. These sensors help the car determine the presence and distance of obstacles, allowing it to react accordingly.
3. **Obstacle Avoidance**: When an obstacle is detected, the robot car should be programmed to take appropriate action to avoid it. This may involve stopping, changing direction, or maneuvering around the obstacle to continue following the line.
4. **Autonomy**: The robot car should operate autonomously without the need for constant human intervention. It should have a control system that processes sensor data, makes decisions, and controls the movements of the car to maintain line following and obstacle avoidance.
5. **Reliable Performance**: The robot car should be able to reliably follow the line and avoid obstacles in various environments and conditions. It should be designed to handle different surface textures, lighting conditions, and types of obstacles.
6. **Speed and Efficiency**: The robot car should be capable of maintaining a consistent speed while following the line and avoiding obstacles. It should be programmed to make efficient and intelligent decisions to navigate the path as quickly as possible while ensuring safety.
7. **Flexibility**: The robot car may have additional features such as adjustable speed settings, customizable path configurations, or the ability to adapt to different line patterns. These features enhance the versatility and usefulness of the robot car for various applications.

Application

The applications of this project are:

1. **Industrial Automation**: The robot car can be used in industrial settings for tasks such as material handling, transportation, and inventory management. It can navigate through a predefined path, follow lines on factory floors, and avoid obstacles to transport goods efficiently.
2. **Warehousing and Logistics**: In warehouses and distribution centers, the robot car can be employed to automate inventory tracking, goods movement, and sorting. It can follow lines on the warehouse floor, identify obstacles or obstructions, and safely maneuver through the environment.
3. **Home Automation**: The robot car can be utilized in home automation systems for tasks like floor cleaning, monitoring, and delivery services. It can follow lines on the floor, detect and avoid obstacles or furniture, and efficiently perform the assigned tasks.
4. **Education and Research**: The line follower obstacle avoiding robot car is often used in educational institutions and research laboratories to teach robotics, automation, and control systems. It provides a hands-on platform for students to learn about sensor integration, decision-making algorithms, and motor control.
5. **Security and Surveillance**: The robot car can be employed for security and surveillance purposes. It can patrol predefined routes, follow lines to cover specific areas, and detect and report any unusual activities or intrusions. The obstacle avoidance capability allows it to navigate around obstacles without getting stuck.
6. **Agricultural Automation**: In the agricultural sector, the robot car can be utilized for tasks such as crop monitoring, irrigation, and spraying. It can follow lines between rows of crops, detect obstacles like rocks or trees, and perform automated tasks in the field while avoiding collisions.
7. **Entertainment and Robotics Competitions**: The line follower obstacle avoiding robot car is popular in robotics competitions and entertainment events. It can participate in line-following competitions, obstacle courses, or maze-solving challenges, providing entertainment and showcasing the capabilities of robotics technology.

8. **Medical and Healthcare**: In healthcare settings, the robot car can be used for tasks like medicine or equipment delivery, patient monitoring, or automated assistance. It can navigate through corridors, follow lines to designated locations, and avoid obstacles to provide efficient services.

Conclusion

The proposed project aims to develop a line follower robot that combines the capabilities of IR sensors and ultrasonic sonar sensors. By integrating these sensors and developing appropriate algorithms, the robot will be capable of accurately following a line while avoiding obstacles in real time. This project will not only enhance the robot's navigation abilities but also provide valuable insights into sensor integration and control system design.