

IoT Based Smart Companion Human Following Robotic Model

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Abstract: *The paper titled “IoT Based Smart Companion Human Following Robotic Model” focuses on the design and development of an autonomous robotic system capable of following a human without manual control. The primary objective of this project is to create an intelligent robotic vehicle that can detect and track a person while maintaining a safe distance using sensor-based technology. This system is built using an Arduino microcontroller as the main processing unit, which controls the overall functioning of the robot. The robot uses an ultrasonic sensor to measure the distance between the robot and the human, ensuring safe and consistent tracking. Additionally, infrared (IR) sensors are used to detect the direction of movement, allowing the robot to move forward, turn left, or turn right accordingly. The L298N motor driver is used to control the DC motors, enabling smooth and efficient movement of the robot. The working principle of the system is based on continuous sensing and real-time decision making. The sensors continuously monitor the surroundings and send data to the Arduino, which processes the information and controls the motors accordingly. If a human is detected within a specific range, the robot follows the person. If the person moves away or is not detected, the robot stops or adjusts its direction. This ensures reliable and accurate human following behavior..*

Keywords: IoT, Human Following Robot, Arduino Microcontroller, Ultrasonic Sensor, Infrared (IR) Sensors, L298N motor driver

I. INTRODUCTION

The project “IoT Based Smart Companion Human Following Robotic Model” is an innovative system designed to develop an autonomous robot that can follow a human without any manual control. The system is based on embedded technology and uses sensors along with a microcontroller to detect and track human movement in real time. The robot is built using an Arduino microcontroller, which acts as the brain of the system. It receives input from sensors such as the ultrasonic sensor and infrared (IR) sensors. The ultrasonic sensor is responsible for measuring the distance between the robot and the human, ensuring that a safe distance is maintained at all times.

The IR sensors help in detecting the direction of movement, allowing the robot to adjust its path accordingly. Based on the sensor inputs, the Arduino processes the data and sends commands to the motor driver, which controls the movement of the robot. The robot can move forward, turn left, or turn right depending on the position of the human. This enables smooth and intelligent human following behavior. The system operates continuously by sensing the environment, processing the data, and taking appropriate actions. It demonstrates key concepts of automation, control systems, and real-time processing. The design is simple, cost-effective, and efficient, making it suitable for educational and practical applications. technology can be effectively utilized



II. LITERATURE SURVEY

The development of human-following robots has been an active area of research in the field of robotics and embedded systems. Various techniques and technologies have been proposed and implemented to enable robots to detect, track, and follow human beings efficiently. Earlier systems primarily relied on simple sensor-based approaches such as infrared (IR) sensors and ultrasonic sensors for object detection and distance measurement. These systems were cost-effective and easy to implement but had limitations in accuracy and environmental adaptability. Ultrasonic sensors are widely used for measuring distance due to their simplicity and reliability, while IR sensors are effective for detecting direction and obstacles. Some advanced research has introduced camera-based systems and computer vision techniques, where robots use image processing and artificial intelligence algorithms to identify and follow humans. These systems provide higher accuracy and better tracking capabilities but require more computational power and are relatively expensive. In recent years, IoT-based robotic systems have gained popularity due to their ability to integrate with smart devices and enable remote monitoring and control. These systems combine embedded hardware with communication technologies to enhance functionality and user interaction. Based on the literature survey, it is observed that sensor-based systems are more suitable for low-cost and educational projects, while AI-based systems are better for high-end applications. Therefore, in this project, a combination of ultrasonic and IR sensors with an Arduino microcontroller is used to achieve efficient and reliable human-following behavior. This approach provides a balance between cost, simplicity, and performance.

III. SYSTEM ARCHITECTURE

The system architecture consists of sensors, a controller, and actuators working together. Ultrasonic and IR sensors detect the human's distance and direction. The Arduino Uno processes sensor data and makes movement decisions. The L298N Motor Driver controls the DC motors based on commands. The robot follows the human autonomously while maintaining a safe distance.

IV. SYSTEM DIAGRAMS

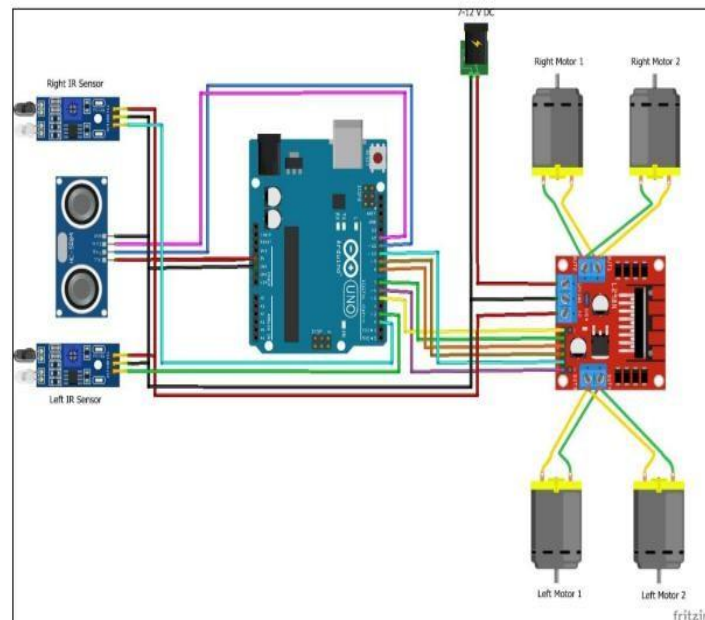


Fig 1. Circuit Diagram



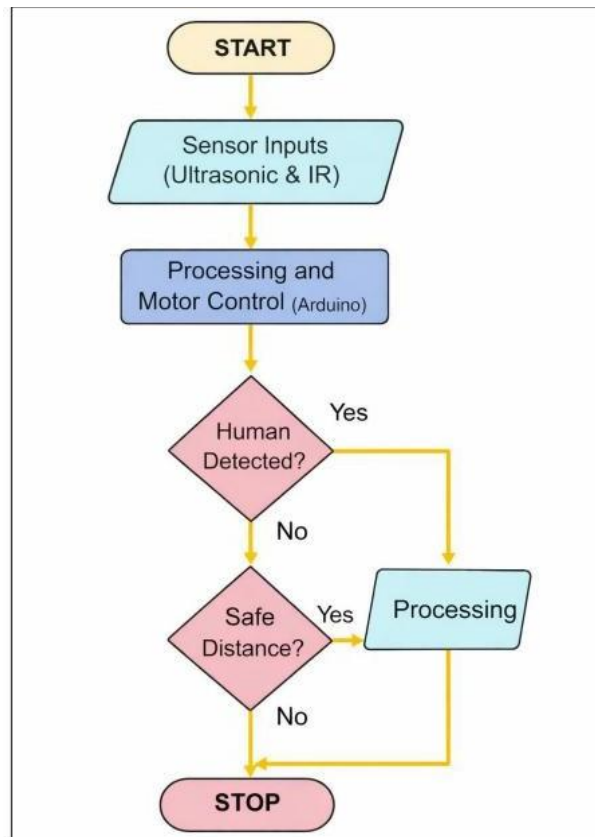


Fig2. Working

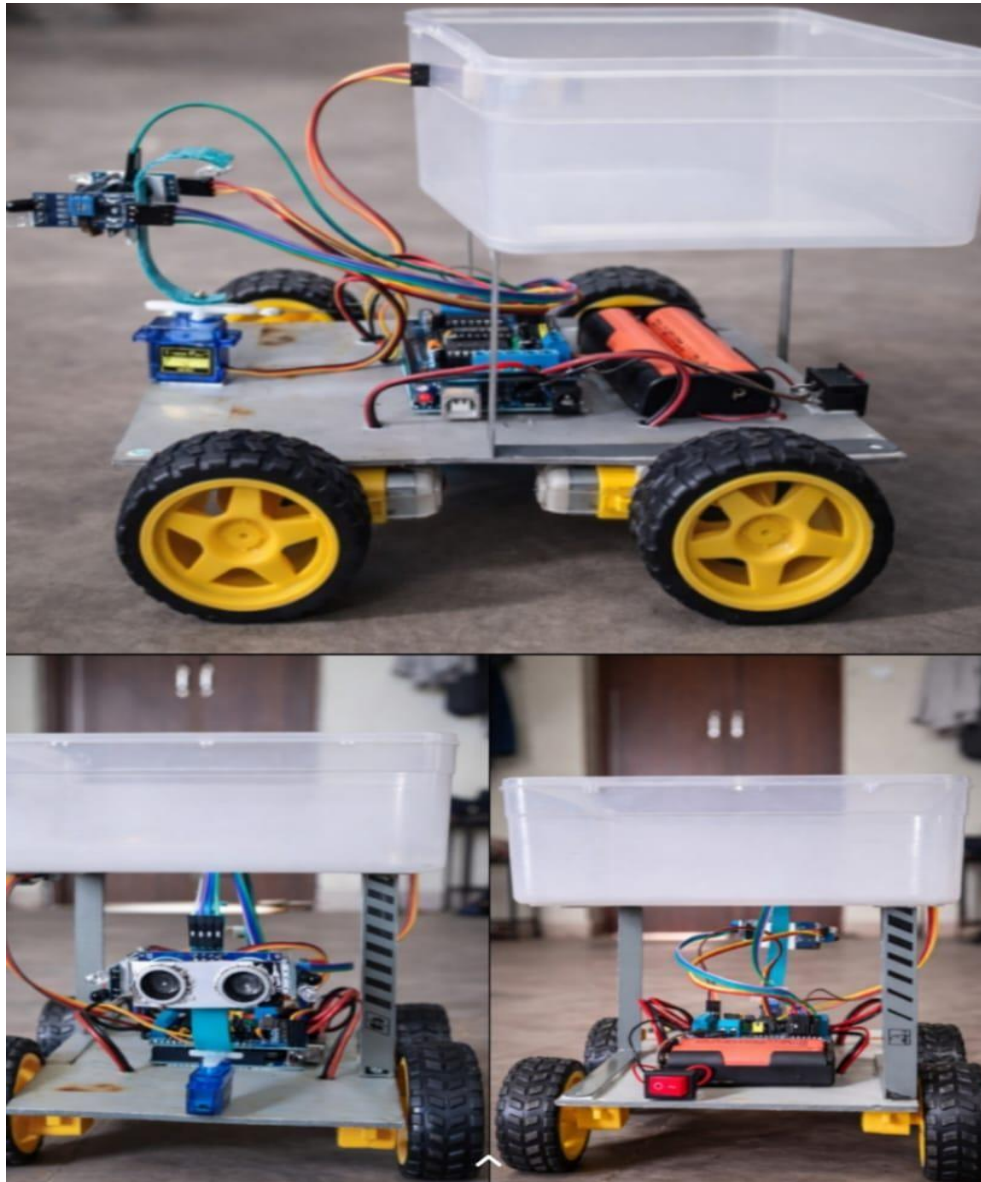
V. IMPLEMENTATION

The system is implemented using the Arduino Uno with ultrasonic and IR sensors. Sensor data is continuously collected to detect human distance and direction. The controller processes the data and makes real-time movement decisions. The L298N Motor Driver drives the DC motors for navigation. The robot autonomously follows the human while maintaining a safe distance.

VI. RESULTS AND DISCUSSION

The system enables real-time human detection and tracking using sensors and the Arduino Uno. The robot follows the human smoothly with the help of the L298N Motor Driver while maintaining a safe distance.





VII. CONCLUSION

The project “IoT Based Smart Companion Human Following Robotic Model” successfully demonstrates an autonomous robot that follows a human using sensors and an Arduino Uno. It uses ultrasonic and IR sensors to detect distance and direction, while the L298N Motor Driver controls smooth movement based on real-time decisions.

This system is cost-effective, easy to implement, and shows practical use in areas like smart carts, assistance robots, and personal companions. Although it has some limitations, it provides a strong base for future improvements using AI and advanced technologies.



VIII. ACKNOWLEDGMENT

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