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Obstacle Avoiding Bluetooth Robot Car using the Internet of things

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***Abstract*: In this contemporary world, robotics has been fast growing and interesting field. The process of collaborating the robot's intelligence with the internet of things will yield a useful product to mankind. This paper talks about one such output which is a robot car. The main motivation for this design is to allow the car to navigate in an unknown environment by avoiding collisions and manual control using a Bluetooth mobile app. A robot is a machine that can perform tasks automatically or with guidance. The project proposes a robotic vehicle with intelligence built into it to guide itself whenever an obstacle comes ahead of it. And, we can control steering manually by mobile phone.**

Keywords: Robot Car, Bluetooth, Obstacle, Manual mode, Automatic mode, Arduino Uno, Bluetooth HC-05, Driver Module, Servo Motor, Ultrasonic Sensor.

I. INTRODUCTION

This project is designed to build an obstacle-avoidance robotic vehicle using ultrasonic sensors for its movement. In the first stage, the robot car is designed for manual mode. It will continue to move in accordance with the commands received using an Android mobile phone using Bluetooth. The Android phone will use its built-in Bluetooth to send commands to the vehicle so that it can travel in the desired direction, such as moving forward, moving backward, turning left, turning right, and stopping. We will continually monitor to see if the Bluetooth module is producing serial data. In the second stage, the robot car is modeled in automatic mode. The servo will start out in the automated mode at a 90-degree angle. The robot will stop moving if the sensor reading at 90 degrees is less than 25 cm. The objective of the implementation is to navigate securely by avoiding various obstacles, determining the precise path by comparing sensor data at various angles and navigating in manual mode by utilizing phone signals.

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II. LITERATURE SURVEY

In [1], C. Thirumarai Selvi, N. Anishviswa, G. Ashok Karthi, K. Darshan, M. Gowtham Balaji worked on a voice-activated vehicle with a camera that is built from the Arduino Uno, a Bluetooth module, a motor driver circuit, a camera, and a microSD card module. In [2], Renan Vieira, Eduardo Argento, and Téo Revoredo designed a robot automobile to provide a law of motion that will guide the automobile in a smooth, uninterrupted, and obstacle-free manner from an initial pose outside a parking place to a final pose inside the latter. In [3], Joseph Z. Ben-Asher, and Elon D. Rimon examined the time-optimal routes taken by a mobile robot that resembles a car while navigating a planar terrain devoid of obstacles. The robot's forward and reverse speeds are managed by bounded acceleration and a set front-wheel steering rate. The paper builds on earlier findings that addressed this issue for a streamlined car-robot model with bounded speed and limited heading rate. In [4], B Padmaja, P V Narasimha Rao, M Madhu Bala, and E Krishna Rao Patro suggested a system that senses the environment using mathematical models like neural networks and image processing methods. The robot car is implemented as three main parts: obstacle detection, road sign, and signal identification, and curving road detection (steering) (collision avoidance). In [5], Saad Ahmed Rahat, Ahmed Imteaj, and Tanveer Rahman proposed a voice recognition-based system whose operation will be extremely user-friendly. Anyone can easily operate the speech recognition technology in our robot automobile using voice commands, and they can also direct the robot to travel an estimated distance. In [6], Peng Yiheng, Zhang Hong, Hu Tianyu, Zhong Bo designed a mobile robot that resembles a car to meet the needs of an automated warehouse. The robot generates maps, navigates, and positions itself. The robot car can complete both the simulation's and the target's actual running criteria.

III. COMPONENTS HARDWARE COMPONENTS

A. Arduino Uno

Six of the Arduino Uno's 14 digital I/O pins are used in this project.

B. Bluetooth HC-05

This module is used to connect to any nearby device using Bluetooth.

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C. Driver Module L298N

Driver component is used to connect the wheels of the car for the movement of the car.

D. PWM Servo Motor

With a range accuracy of roughly 3mm, the HC-SR04 ultrasonic module offers a non-contact measurement function from 2 cm to 400 cm. It is primarily used in this project to rotate the ultrasonic sensor to detect the distance between the car and obstacle.

E. Ultrasonic Sensor

This component is the main device in this paper where it is used to analyze the distance of the hurdle.

IV. SOFTWARE COMPONENTS

Mobile applications namely Bluetooth RC are used to control the car in mode ‘M’ (manual mode using Bluetooth in mobile phones) and Android Droid. Arduino ide for compilation and uploading the program onto the Arduino board.

V. SYSTEM DESIGN

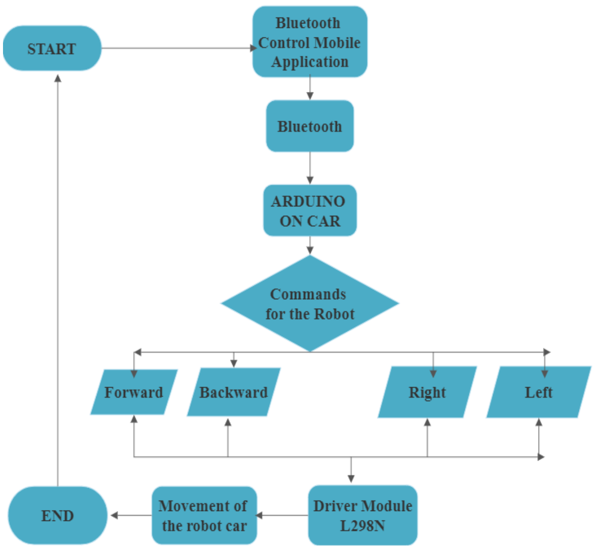

Figure 4.1 Block Diagram of Bluetooth Car

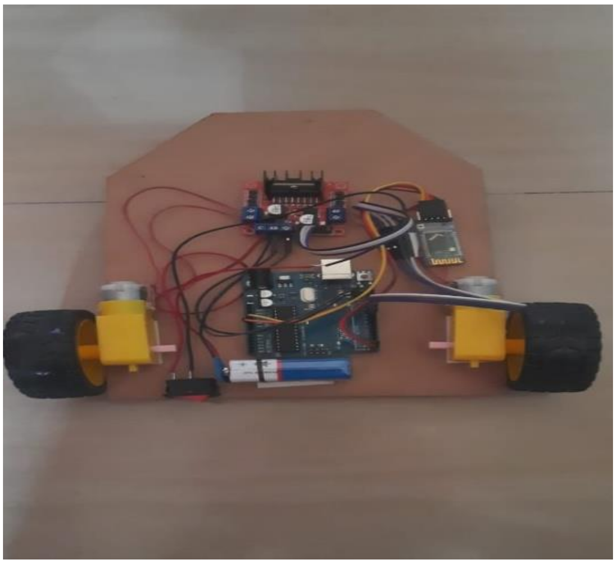

Figure 4.2 Circuit Diagram of Bluetooth Diagram

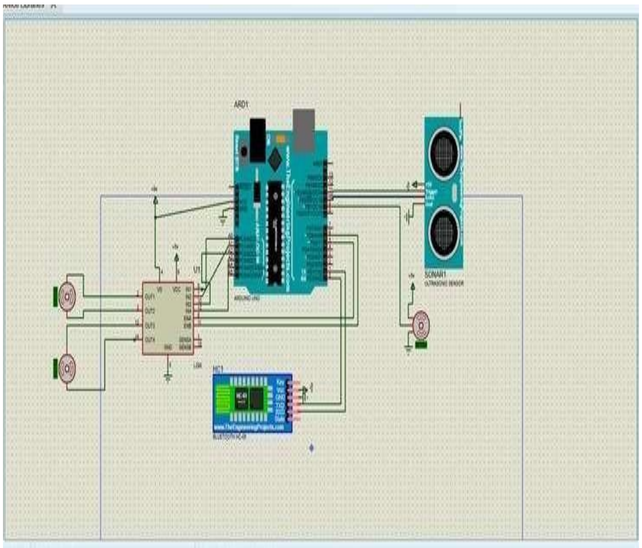

Figure 4.3 Circuit Diagram of automatic robot car

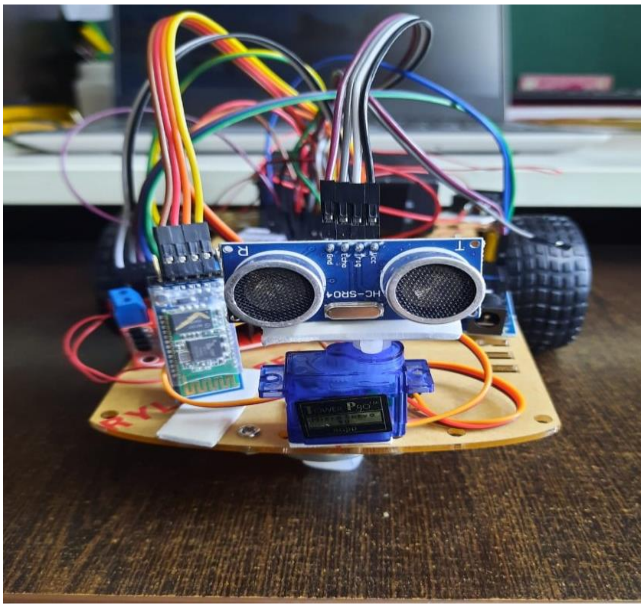

Figure 4.4 Obstacle Avoiding Robot Car

VI. IMPLEMENTATION

The design of the project is mainly divided into two parts. It is namely the Manual mode and the Automatic mode.

A. Manual Mode

In this design, Bluetooth module is used to connect with the android phone to control the robot car’s steering. It is basically monitored by humans. Bluetooth HC-05 is connected to the RX and TX pins of Arduino and controlled using the mobile application Bluetooth RC. Fig. 4.2 shows the circuit connections and the model of the car. Fig. 4.1 illustrates the block diagram of the model robot car. However, this paper also has an extension to the idea. The main objective of this paper is the robot car should be trained to be intelligent in a way where it can make its own decision for the movement without any human intervention.

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B. Automatic Mode

When the servo is at 90 degrees in the beginning, the programme will continuously check the reading of the ultrasonic sensor. Here, the sensor reading is taken using a library by the name of "New Ping. h". We may obtain the centimeter-based distance between the sensor and the obstruction by calling the built-in function "sonar. ping cm ()". This software uses a different library called "Servo. h" to control the servo.

The servo will initially be at the 90-degree position. The robot will stop moving forward if the reading from the sensor at a 90-degree position is less than 25 cm. The servo is then tilted to take readings at 60 and 120 degrees. The side with the higher reading will be turned to after these readings have been compared. The servo will turn to the 30- and 150-degree positions if both readings are likewise below 25 cm. And will rotate so that the reading is maximized. Once more, it will check the values at 0 and 180 degrees if they are still below 25 cm. The robot will walk backward and recheck the readings at the 0 and 180-degree points if all the readings are less than 25 cm. Until it takes a turn and leaps to the beginning of the program, this procedure will continue. The reading will then be verified at 90 degrees, and the process will be repeated.

Fig. 4.3 depicts the circuit diagram of the model. The DC motors are managed by a motor driver integrated circuit (IC) called L298N. It is a 16-pin IC that has the capacity to run two motors at once. The enable pins, which are attached to the Arduino board's 5th and 6th pins, are the 1st and 9th pins. The first motor's microcontroller receives control inputs at pins 2 and 7. They are each wired to Arduino pins A0 and A1, respectively. The second motor's microcontroller inputs for control are pins 10 and 15. They are attached to Arduino's pins A2 and A3. When the robot is turned ON, both of its motors start to operate, and it starts to move. The robot and the obstacle in front of it are continuously measured by the ultrasonic sensor during this period. If the separation between the robot will stop moving and rotate the sensor using a servo motor to take readings at various angles if the distance between the robot and the obstacle is less than 25 cm. By merely examining the angle at which the sensor provides the maximum reading, it is possible to determine the proper turn that should be made. That route will have fewer obstacles. The 9th pin of the Arduino is connected to the signal line of the servo motor. By creating a PWM signal on its signal line, the servo is rotated. Fig. 4.4 shows the model of the robot car.

VII. CONCLUSION AND FUTURE SCOPE

It can be concluded from the paper that the objective of this hardware project is accomplished and worked autonomously, that is, after feeding the code, it required no human interaction and could work on its own, even in unknown and dynamic environments. And in manual mode by using smartphone, we are giving commands via Bluetooth a wireless connection. This project can be extended by connecting both ideas by inventing an application where we can switch the modes and plug in the camera to monitor the robot car.

DECLARATION

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Availability of Data and Material/ Data Access Statement	Not relevant.
Authors Contributions	I am only the sole author of the article.

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