Obstacle Avoidance and Voice Control Unit for Autonomous Car

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Abstract— **This paper proposes a design variant of obstacle avoidance and voice control for the automobile's car unit. The future advancement in this technology will help us in for the handicapped ones who cannot drive the vehicle on their own, transportation purposes, hazardous environment places where human interaction might be impossible and so on. Also, the use of sensors will provide greater safety from sudden hits.**

A Bluetooth module is used to create a communication link between the car and human voice commands via Android Application. The RF transmitter of the module can take human voice commands through the application which will then be converted into encoded digital data up to an adequate range of 100 meters from the robot. The receiver of the module decodes the input data before feeding it to the microcontroller to drive DC motors via motor driver L298D for necessary movements. An Arduino UNO which is the brain of our system is programmed to read voice commands and respond accordingly.

Obstacle detection can be done by ultrasonic sensors interfaced with the Arduino UNO. Considering this feature, in the future it might prove a milestone in vehicle automation. Further the project can be developed using the Internet of Things, Artificial Intelligence technology where a user can control the car from any corner of the world.

Keywords— Obstacle detection, Voice command, Ultrasonic Sensors, Bluetooth module, Motor Driver, Infrared sensor, Arduino UNO

1. INTRODUCTION:

The combination of major fields such as mechanical, electrical and electronics provides automation systems which are known as Robots. The growths in these industries are a major reason for the efficiencies in every sector by reducing the human effort and interaction [1]. By doing such, this promises us a safer environment in dangerous and insightful grounds. Due to its precision and absolute accuracy it has made a major presence in all the essential fields whether it is education, bio-medicals, engineering and so on.

A. Obstacle avoidance

To achieve the obstacle avoidance in the system we are using an Ultrasonic distance sensor which is connected to the L298D motor shield followed by Arduino UNO. This sensor is used to detect any object at some certain distance using sonar. This non-contact ultrasound sonar is used to measure the distance between the object and the sensor. It consists of two transmitters, a control circuit and a receiver for emitting and receiving pulse data respectively. A high ultrasonic sound is emitted by transmitters which will get reflected by any nearby object and the sensor will see toward to get any return echo. The distance for object detection can be subsequently changed by our own means in the coding algorithm. The distance will get calculated of the transmitted signal and receive echo in the control system.

B. Speech recognition

The ability of the machine to receive and interpret the human voice or to understand and carry out spoken commands can be concluded as speech recognition. It works on the basis of algorithms codes that match the

sound of the detected speech or voice with word sequences and interpret it as a command in Arduino IDE which is a coding platform for Arduino UNO. With the help of these we can command around our systemas per the desired needs.

2. LITERATURE SURVEY:

The essential focus of this research is speech recognition technology by converting speech into the text message. Controlling hardware utilizing speech was impractical before. This examination will help us in actualizing this innovation for the debilitated ones who can't drive the vehicle all alone [2]. The utilization of sensors will give more noteworthy wellbeing from abrupt hits because of the auto stopping mechanism and hinder include. A Bluetooth module (HC-05) is utilized to set up a correspondence connection between the vehicle and human voice orders using the Android Application.

The RF transmitter of the Bluetooth can take human voice orders which are changed over to encoded advanced information for the benefit of a satisfactory range (up to 100 meters) from the car. The recipient unravels the information before taking care of it to the microcontroller to drive DC engines through engine driver L293D for vital work [3]. An Arduino UNO is modified to peruse voice orders and react appropriately. Ultrasonic sensors interfaced with the Arduino can help in snag identification. Considering this component for the future degree may demonstrate achievement in vehicle robotization.

3. SOFTWARE IMPLEMENTATION:

A. Arduino IDE (Integrated Development Environment).

Arduino Integrated Development Environment - or Arduino Software (IDE) - consists of a text editor, code message, text console, toolbar with standard function keys, and a series of menus. It connects to Arduino and Hardware to download programs and interact with them. Programs written using Arduino Software Integrated Development Environment platform are called sketches (codes). These sketches are written in a text editor and are saved with .ino file extension. The editor in the platform has features for cutting/pasting and searching/replacing codes. The message area provides feedback while saving and sending and also displays errors. The console displays the text output, including complete error coding and other information text. In the lower right corner of the window shows the configured board and serial port. Toolbar buttons allow you to verify and upload programs, build, open, and save sketches, and then open a serial monitor.

Arduino Open Software (IDE) makes it easy to write code and upload it to the board. It works on Windows, MacOSX, and Linux. The Arduino project provides an integrated Arduino development environment (IDE), which is a platform application written in Java. It is designed to introduce programming techniques to artists and other young people who are unfamiliar with software development. It includes a code editor with features such as syntax highlighting and automatic steering and provides an easy one-click way to integrate and load programs on the Arduino board. The Arduino IDE main window is shown in Fig 1. Arduino Software (IDE) uses the concept of a sketchbook: a common place to store your programs (or sketches) [3]. The programs in the sketchbook can be opened in the file **menu> sketchbook** or on the open button in the toolbar. The first time you open Arduino software, it will automatically create a guide for your sketchbook. You can view or change the location of the sketchbook area with the preferences box.

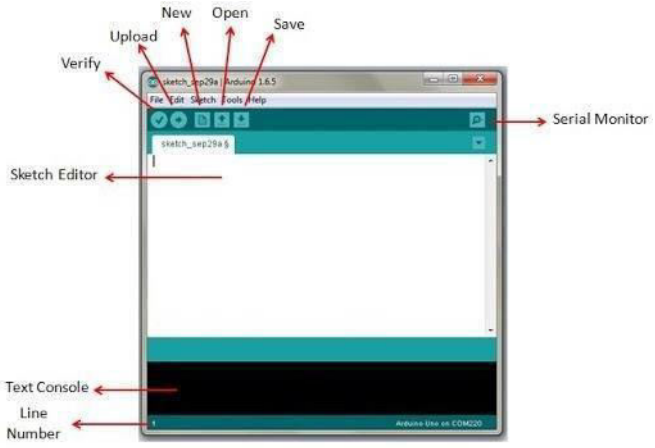

Fig.1: Platform of Arduino IDE for coding.

. To use the short library, select **Sketch> Import** Library. This will include one or more **#statements** including the top of the sketch and link the library to your program (sketch). Because libraries are loaded onto the board with your program (sketch), it increases the amount of space it takes up. There is a list of reference libraries. These libraries are included with Arduino software. Another library can be downloaded from various sources or from the Library Manager. To get started with IDE version **1.0.5**, you can import a library from a Zip file and use it in the program (sketch).

B. Android Application.

The Android application allows you to connect to the HC-05 module via Bluetooth and allows you to send signals to Arduino so that it can perform the tasks you want successfully. The application sends 5 signals, numbers from 1 to 5 used to adjust the sandwich agreement accordingly.

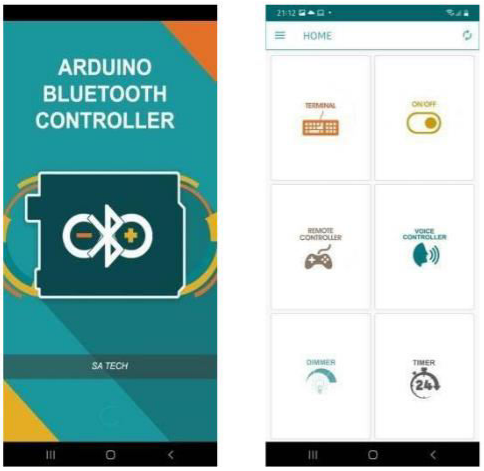

Fig.2.1 & 2.2. Arduino Mobile Application platform

- This consist of 3 parts
  - □ Android device
  - □ Bluetooth module
  - □ Arduino UNO

4. PROBLEM STATEMENT

1) The present automobiles are not suitable for handicapped and old age people.

2) This technique of our project will help them to drive their vehicle on their own.

3) This use of sensors will provide greater safety from sudden hits due to auto braking and slow down feature.

4) Prevention from hazardous and fatal situations.

5) Automatic braking and Bluetooth module controller will make the process handy and easy to detect and to provide judgments for the vehicle**.**

5. PROPOSED SYSTEM:

Speech Recognition is a technology which permits the procedure of a speech input to text and is speaker independent. This permits it to be used in numerous applications differing from digital assistants to controlling machinery.

This paper put forward strategies which can be used in managing a robotic vehicle through connected speech input. The speech recognizer platform will be an Android smartphone which communicates with the car using Bluetooth Connectivity. This method permits for systematic recognition and effortless data transfer. Additionally, the car will also have the potential to detect obstacles and notify the user to use a different command. Our proposed technique will be functional for applications such as assistive robots for people with disabilities or in industrial applications such as work robots

6. ANALYSIS:

When the car gets power from 9v lithium-ion battery supply, the Arduino Uno gets booted up, and the car starts, after this driver gives command to the car via Arduino Bluetooth App. The commands of the driver are, “Move Forward”, “Move backwards”, “turn left” and “turn right.” After that, the car senses the obstacle in front/back via sensors (ultrasonic sensor, IR sensor) it stops. Then the car waits for the next given by the driver depending upon the command Car will move accordingly. Following block diagram gives a look at the methodology of the system.

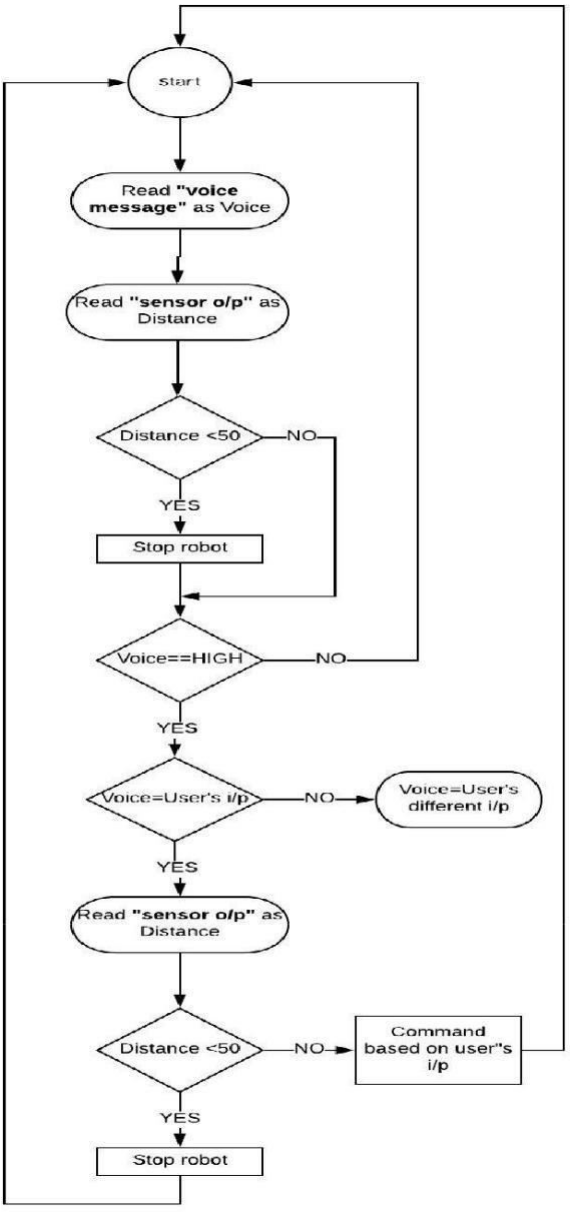

Fig. 3: Block diagram showing the methodology working.

7. SIMULATION:

We used tinker cad software. For testing & simulation Tinker cad is easy-to-use software for 3D design electronics, and coding. We have designed our circuitry on this software [4].

We use this software to simulate and test the circuitry of our project. We tested the ultrasonic sensor with Arduino Uno which is the brain of the system.

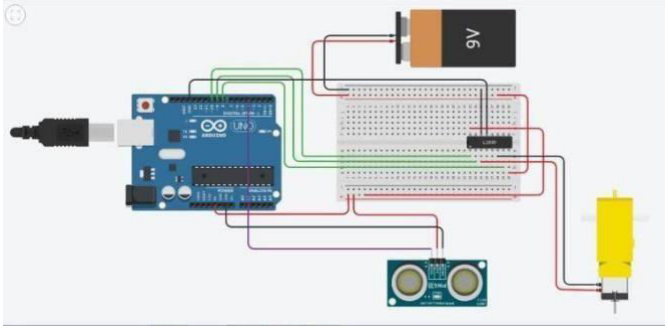

Fig.4: Obstacle avoidance simulation using Tinker Cad software.

As we can see in fig no 4-circuit diagram shows the simulation of obstacle avoidance using an ultrasonic sensor and Arduino UNO. When the car is turned on rpm of the motor changes. In this circuitry we are using breadboard for the modification of the obstacle avoidance system. A L289D motor shield has been used to drive the motor shield for motor movements.

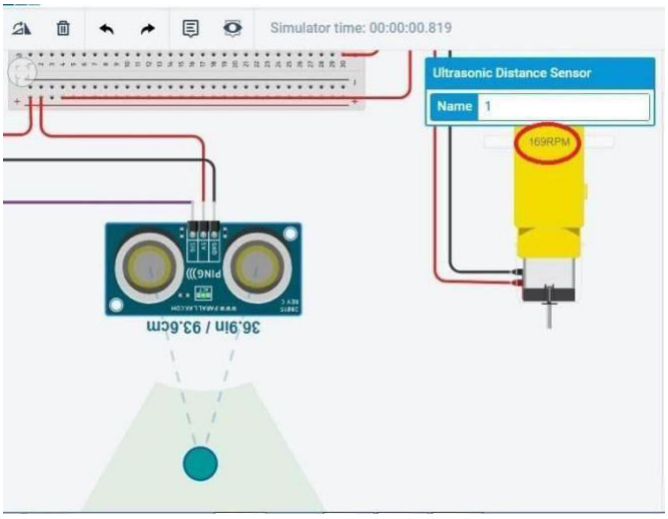

Fig. 5: Motor movement when the object is away from the specified distance

In fig no 5 we can see the rpm of the motor is in movement. The distance in the codes is less than and equal to 51 cm. There are 4 pins in total as follows, VCC, ECHO, TRIGGER, GND. The input goes to VCC pin of Ultrasonic sensor. Thus the motion takes place in the motor as per desired characteristics.

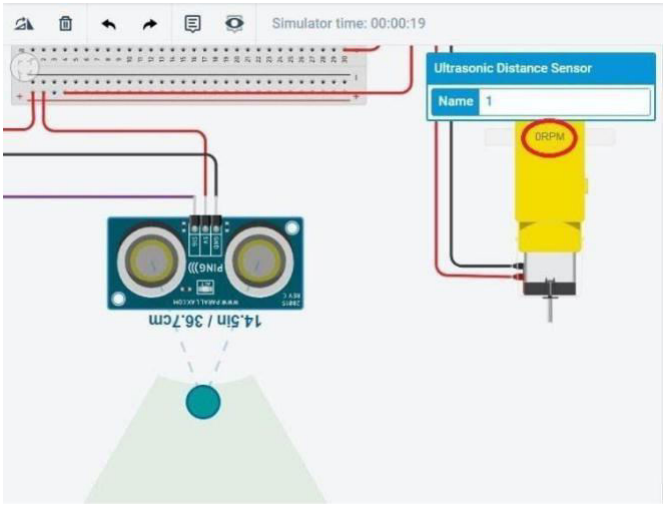

Fig. 6: Motor movement when the object is in specified range.

In fig no 6 the distance is more than 51 cm so the motor is in run state. As we saw when the object is closer to 51 cm or less than that to ultrasonic Sensor the motor has stopped its movement and the rpm is now gone to 0 rpm in 5 milliseconds of window.

8. RESULT:

Therefore, our voice-controlled obstacle-avoiding car prevents the car from collisions and is aware of its surroundings. It also finds obstacles and makes movements according to the user voice command. Our car is accurate because the Bluetooth module is used for communication and works best between short ranges as the robot can travel in two seconds when input is provided. We have used an ultrasonic sensor and an IR sensor for its advantage.

The ultrasonic sensor does not react to light, smoke, dust, mist, etc., so we have used it on the front side of the robot whereas we have used an IR sensor on the rear side of the robot. IR sensor helps to detect the obstacle on the rear side hence, helping the car to avoid collision. Voice command is used for detection advanced communication with the car using the android app. Therefore, a good performance is available for this project.

9. REFERENCES:

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