Development of IoT Enabled Voice Controlled Robot Using Arduino

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Abstract - **Internet of Things allows computing devices, sensor, power-driven and digital technologies, things, creatures or persons to transmit information over a setup without requiring direct human resources interface. In this paper, we developed voice control robotic car using Arduino. The proposed system is designed based on micro controller connected to smart phone through Bluetooth device. The micro controller used here is an Arduino Uno. The Bluetooth module is used for receiving the voice commands. Commands are processed, and speech-to-text conversion is done within the app using Google's speech-recognition technology. After receiving the voice command data, the robot responses to the command by performing movement to the specified direction.**

Index Terms - **Speech Recognition, IOT, Arduino, Voice Commands Robot movement, Voice to text conversion etc.**

I. INTRODUCTION

Speech signals are one of central means of communication for human beings. Almost every conversation or communications will begin by the means of voice signals. Speech and various voices can be converted into electrical form by the usage of microphone. One of the modern inventions of technology allows voice recognition. It converts the speech signals to computer text format. This voice recognition system is used to control and generate speech acknowledgement through external servers. Robot has ability to understand thousands of voices and perform the actions accordingly. These robotic assistants are used in various sectors for manufacturing and tooling of instruments because humans can make mistakes but machines like robots will work according to the commands given by the manager. Various robotic assistants are involved in surgeries and operations because they work with high precision.

II. LITERATURE SURVEY

Speech recognition technology used to capture the spoken words using a microphone and convert them into digitally stored set of words. The quality of the speech recognition system analyzed with two factors accuracy and speed. Speech recognition system has many applications. Software is commonly used in hands free computing, automatic translations, robotics and automated customer service etc. Software has its own weaknesses and nagging problems. The human voice commands are given to the robotic assistant remotely, by using a smart mobile phone. Robot performs action on online cloud server. The speech signal commands converted to text form are communicated to the robot over a Bluetooth network. The effectiveness of the voice control communicated over a distance is measured through several experiments. Performance evaluation is carried out with encouraging results of the initial experiments. Earlier robots were developed using the ZigBee protocol which were costly [1]. Another approach to develop robot using the sound card and a micro phone are not user friendly. A technique to give voice command using android based smart phone using Bluetooth is presented to construct the robot based on micro-controller. The robot can accept instructions from users verbally and interact with user by speaking various sentences. Communication takes place in user friendly manner [2]. Gaps found in earlier approach is Voice Recognition System has a disadvantage with human voice is that every person have their own accent which is a difficult task for the robot to understand. Maintenance of this system is very difficult. Range of Bluetooth Technology is very less up to 10 meters. So, there is a need to develop user friendly robot with less power and cover maximum range.

III. DEVELOPMENT OF VOICE CONTROLLED ROBOT USING URDUINO

The proposed system design based on micro-controller connected to smart android phone through Bluetooth module for receiving voice command. The voice command is converted to text by an app of the android phone and sends necessary data to the micro-controller for controlling robot movement. After receiving the data the robot responses according to the command to perform movement at proper direction according to the voice command. In Our project micro controller is associated to user smart phone through Bluetooth module for the reception of voice commands. The received voice commands will be converted to text by application available in user's android smart phone and sends the required data to the micro controller for the movement of robot. After receiving command robot makes a proper movement with specified direction according to the given voice command. The development of a voice-controlled robot is demonstrated with ability to follow voice command from user and does communicate with user by using pre-recorded human voice sound. The movement of the proposed robot will be controlled by the voice command of the user. The user uses an android operated smart phone to give voice command. The command can be fetched using an app which will convert the voice command into text. The phone will be connected to the micro controller using a Bluetooth module.

Advantage of Proposed System

1. System follows user friendly approach.
2. The system consumes very less power (upto 30W).
3. Voice Commands are transmitted and received through wireless serial communication with the help of Bluetooth technology.
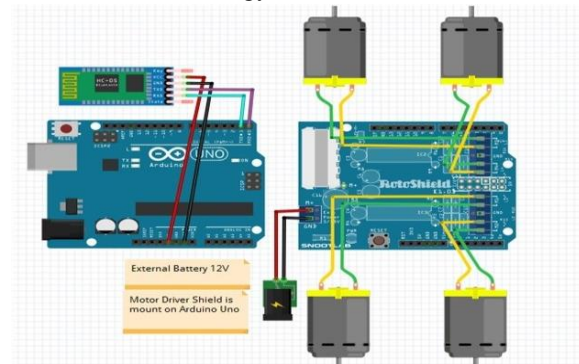

Fig1.Circuit Diagram

Voice control system block diagram consist of Bluetooth Module, Arduino Uno, Motor Driver Shield, Battery
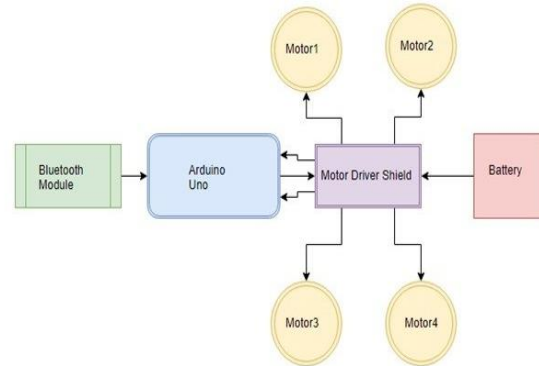

Fig.2. Block Diagram of Voice Controlled Robot

- The Bluetooth module is connected to the Arduino Uno and motor driver shield.
- Motor driver required for controlling the movement of the robot and operated by the micro controller to control the four different motors forward, backward, left, and right by controlling the direction of rotation of motors.
- Smart phones understand the voice input and transfer to the Bluetooth module via wireless communication.
- Circuit operates by converting the voice input to text and the and further processed by Arduino.

Input for Different logic is shown in Table.1:

Table-1: Input for different logic

Command	Ip1	Ip2	Ip3	Ip4	Direction
Stop	Low	low	Low	low	Stop
Forward	high	low	high	low	Forward
Backward	Low	high	low	high	backward
Left	Low	low	high	low	Left
Right	high	low	low	low	Right

IV. IMPLEMENTATION RESULTS AND DISCUSSION

Here we allow users to control the robotic vehicle remotely by voice commands. A Bluetooth module is usually a hardware component, wireless product to work with the computer. The blue tooth can be accessory or peripheral, wireless headphone or other product such as cellphones. Arduino Bluetooth control android application transmit command using Bluetooth to the Arduino Uno so that it can move in the required direction like moving forward, backward,

turning left, turning right and stop. After assembling the components of the Assembled robot is shown in Fig.3.
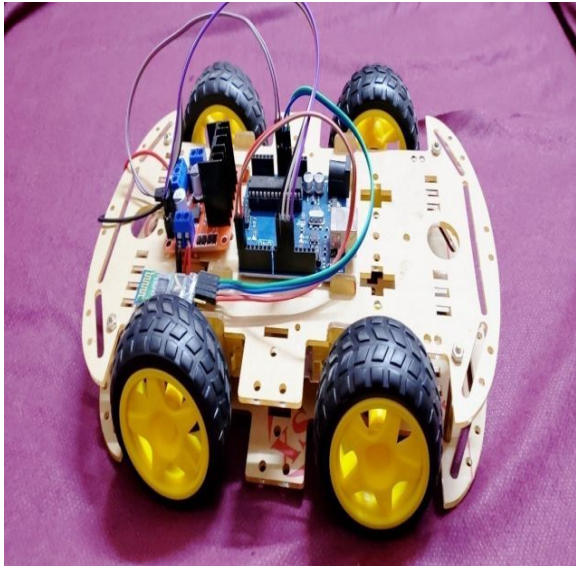

Fig.3.Developed Robot

Working of Application is summarized in following step 1 to step 9.

Step1: Step 1 is called as Default state of the Mobile Application. Default state of the Mobile Application is shown in Fig.4.
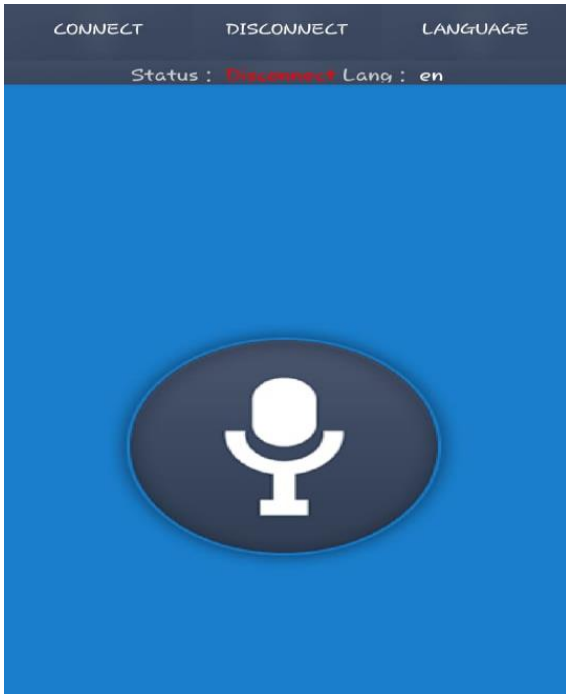

Fig.4 Default state of the Mobile Application

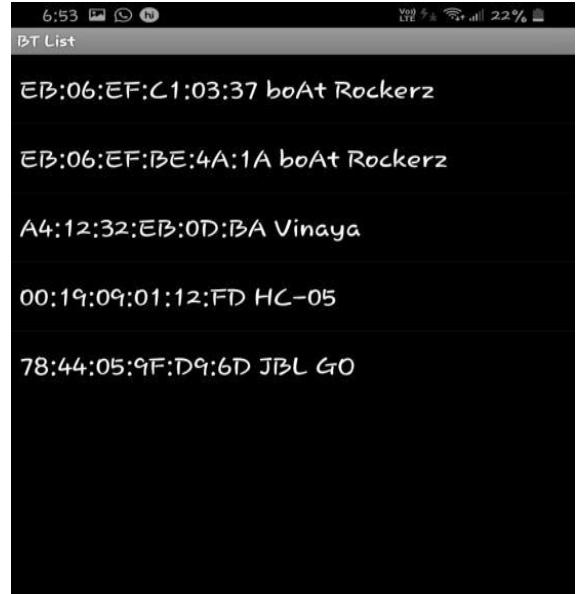Step 2: By turning on the HC-05 Bluetooth module and Bluetooth mobile connection get established is shown in following Fig.5.

Fig.5.Connecting to HC-05 Bluetooth Module

Step 3: By turning on the Bluetooth on mobile and HC-05 on Arduino Board the application gets connected to HC-05 is shown in following Fig.6.
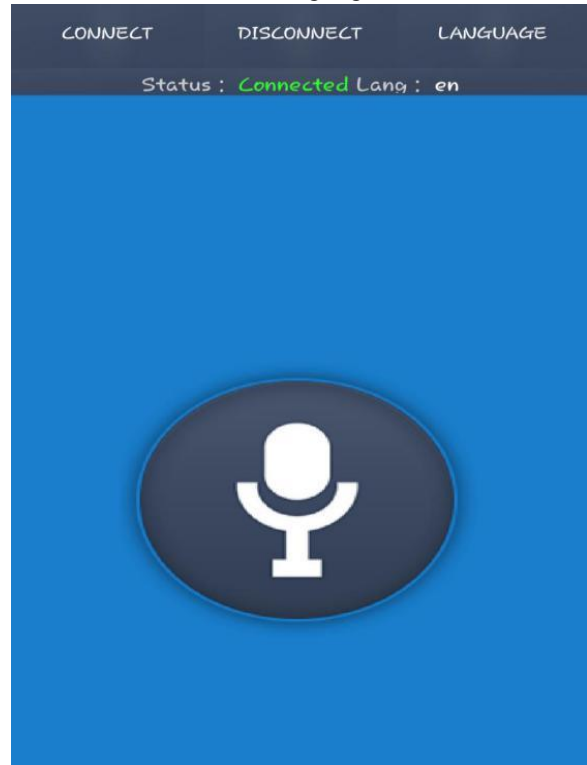
Fig.6. Application connected to HC-05

Step 4: After connecting to HC-05, by tapping the mic symbol in the application the dialog box will be enabled is shown in Fig.7.
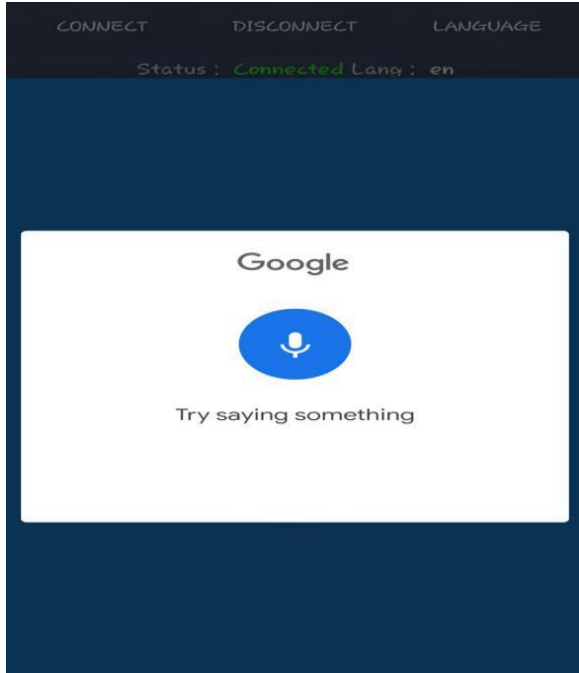
Fig.7. Tapping on the mic symbol will enable this dialog box

Step 5: In the enabled dialog box when the users says backward command will be transmitted to the robot and to take forward action is shown in Fig.8.
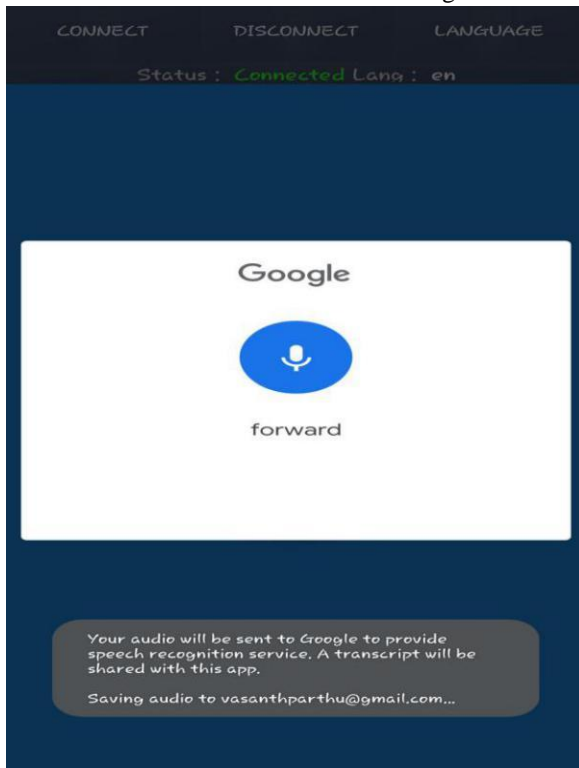

Fig. 8. Transmitting the command to robot to move forward

Step6: In the enabled dialog box when the users says backward command will be transmitted to the robot and take backward action is shown in Fig.9.
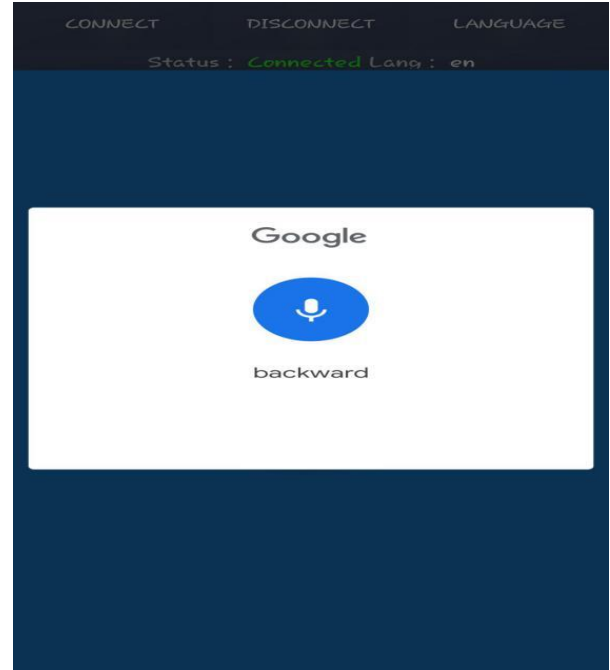

Fig .9. Transmitting the command to robot to move backward

Step7: In the enabled dialog box when the users says left command will be transmitted to the robot and take left action is shown in Fig.10.
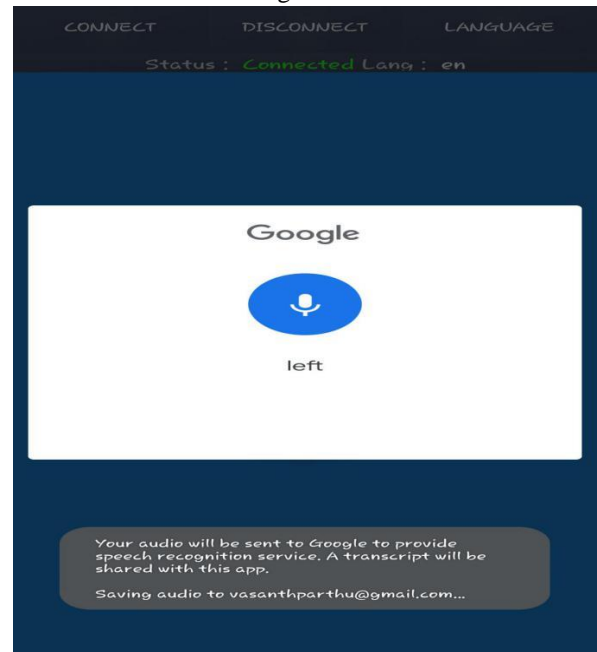

Fig. 10. Transmitting the command to robot to move to its left

Step8: In the enabled dialog box when the users says right command will be transmitted to the robot and take right action is shown in Fig.11.
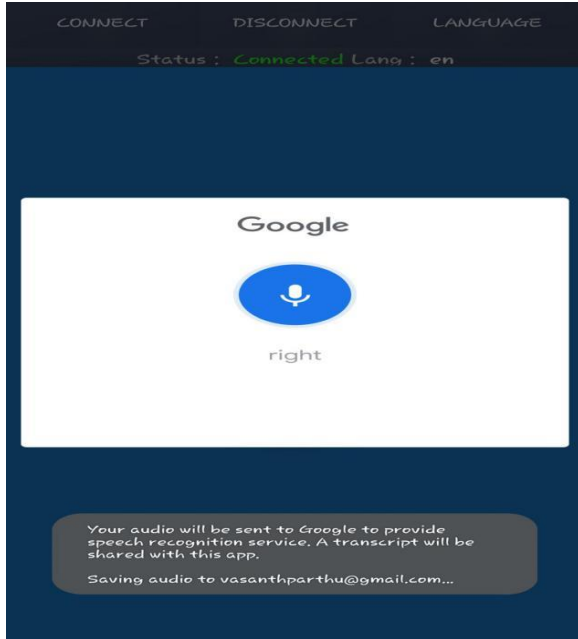

Fig.11. Transmitting the command to robot to move to its right

Step9: In the enabled dialog box when the users say stop command will be transmitted to the robot and robot stops accordingly is shown in Fig.12.
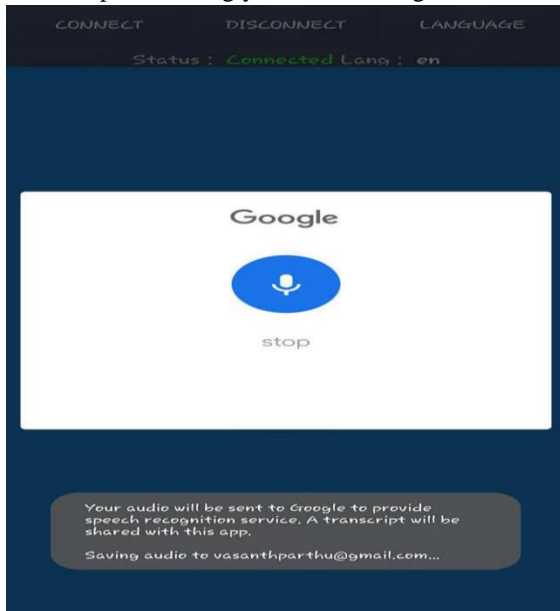

Fig. 12 Transmitting command to robot to stop its movement

V.CONCLUSION

The aim of the project is to give a small gift to the unfortunate people who are physically handicapped. By giving simple voice commands, their daily chores can be very easily accomplished. And the voice commands are successfully transmitted via Bluetooth and on receiving the commands the robot will perform desired operations. This project will reduce the human power and perform actions which humans can't perform. Such robots can be used in places like industries, military and defense, research purposes.

VI. ACKNOWLEDGMENT

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Dr. Suwarna Gothane presently working as Associate Professor in CMR Technical Campus, Hyderabad, Telangana, INDIA. She received her Ph.D (CSE) from Sant Gadge Baba Amravati University, Amravati in year 2019, M.E. (CSE) degree from P.R.M.I.T&R, Amravati in the year 2012 and B.E. (CSE) degree from H.V.P.M C.O.E & Technology, in the year 2006. Her area of interests is Data Mining, Machine learning.