RESEARCH ARTICLE

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Voice-based direction control of a robotic vehicle through User commands

Mohammadibrahim Korti[1], Girish B. Shettar[2] iD, Ganga A Hadagali[1], Shashidhar Shettar[3], Shailesh Shettar[3]

[1]PG Student, Department of Computer Science and Engineering, Basaveshwar Engineering College (A), Bagalkot, Karnataka, India
[2]Assistant Professor, Department of Information Science and Engineering, Basaveshwar Engineering College (A), Bagalkot, Karnataka, India
[3]Department of Computer Science and Engineering, Basaveshwar Engineering College (A), Bagalkot, Karnataka, India

Emails: mribrahimkorti@gmail.com, girishshettar06@gmail.com, hadagaliganga007@gmail.com, shashnshra1117@gmail.com, shaileshshettar100@gmail.com

Abstract

This paper aims at controlling the vehicle using speech recognition method. Vehicle is controlled through voice commands given by the end user which stops and moves in various directions such as forward, backward, right and left. The vehicle is mounted with camera and an LCD screen to view the commands and distance between the vehicle and the obstacles. Application works on voice commands with in a distance of 1 meter. Vehicle is attached with GPS. Vehicles can also be controlled remotely or autonomously with the help of controller and sensors. Vehicle provides signals whenever it founds obstacles during mobility. Vehicle moves with predefined commands

1. Introduction

Verbal communication is a supreme way of communication with people. Humans naturally have the skills of talking and acquiring it easily and communicate with each other with speech throughout our life span.

Evolution of various technologies in the past era, articulation via voice becomes a dominant interface for many systems. For complicated interfaces, voice commands are unchallenging to interact with devices. This paper aims to manage the movement of the vehicle by using voice commands (Randhave, Bachkar, and Jadhav Zhou et al.).

The vehicle is able to move accordingly by accepting the voice commands. Voice recognition module translates the voice commands into machine understandable code as input. This input empowers the machine to recognize the words. Authorized person sends the voice commands and subsequently these commands are processed (Sulaiman Chaudhry et al. Andrew et al.).

This convenience makes user to achieve their task efficiently. Analogy with conventional control – interfaces, voice identification interfaces make easy by reducing the complexities. The advantage of using speech recognition includes capturing the live stream which will be used for security. When voice command is given as input, the first term to be considered is voice identification i.e., making the system to recognize human voice. Voice identification is a technology where the system understands words given via speech. Speech is an ideal procedure for vehicle control, manage and communication (Aneela et al. Rashid et al. Salgar, Koli, and Koli).

The scheme relies on two sets of instructions issued to the vehicle, controlled by the Arduino controller which allows acting in accordance to

the instruction recognized by the voice recognition module. Voice operated vehicles may also be used to aid the movement of elderly or handicapped individuals. Unfortunately, voice operated wheelchairs are not quite popular yet, because of numerous challenges in speech recognition (Saradi and Kailasapathi). All existing feature extraction methods have showed a good recognition rate only in a clean environment. Results obtain in noisy environments still require considerable improvement (Kaur, Srivastava, and Kumar). speech-based robotic prototype designed to aid the movement of elderly or handicapped individuals. Mel frequency cepstral coefficients (MFCC) are used for the extraction of speech features and a deep belief network (DBN) is trained for the recognition of commands (Kaur). Vehicle which can be controlled by voice commands via smart phone by using Arduino Mega processor and Bluetooth sensor are designed and developed. The Google Voice and Voice Bot application is used for voice commands. This is done by speech to text technique of Google for the conversion from voice to text, text is then transmitted to ESP32. (Iskender et al. Sowmya and Supriya Ghadge et al.). This allows efficient recognition and covert transmission of commands to an unmanned aerial vehicle by converting voice control commands into a kind of steganographic feature vector, which implies hiding voice control information unmanned aerial vehicle (Lavrynenko et al.). We are aiming to build a vehicle which can recognize commands such as move forward, backward, left, rotate, and right.
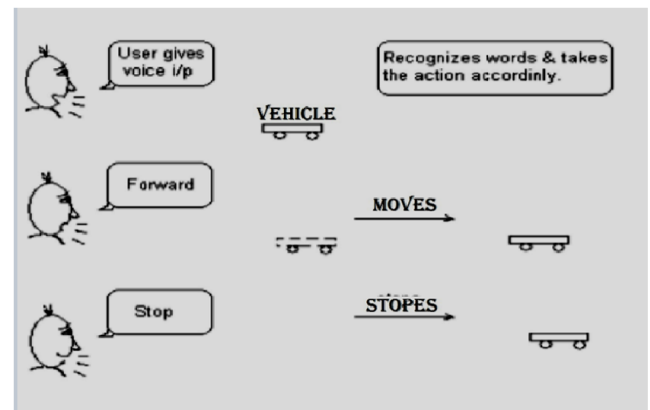
1.1. Overview of Present Work

End user gives the Voice commands like Forward, Backward, Right, Left, Stop, and Rotate. Record unit stores the recorded voice, we train the kit by storing the voice commands in Speech recognition module v3.1. Module checks whether the recorded voice matches the processed voice, if it matches then the vehicle takes appropriate action

Example: if end user gives the command like forward then voice recognition is done and vehicle starts moving in forward direction.

1.2. Objectives

- The main objective of the project is to build wireless vehicle.

- To control the movement of vehicle using

FIGURE 1. Overview of the Present Work

speech recognition system.

- Application is implemented, without any man handling based on voice recognition module.

1.3. Methodology

There are various well developed effective steps for the process of voice recognition. Different systems vary on the nature of these steps and execution of these steps but a homogeneous approach is followed by most successful systems.

1.4. Problem Statement

Moving the vehicles without driver is a challenge. Accidents are caused during moving even the driver is on the seat. Challenge is to identify an object at a minimum distance during mobility and take appropriate safer directions or move the vehicle by providing voice-based instructions.

By developing a sensor-based system without human intervention which identifies obstacles at a shorter distance and helps to move in safer directions.

1.5. Existing System

The existing system is voice recognition system in that system. Vehicle is controlled remotely or by using android based application. Commands are given to the mobile application through microphone that is connected to vehicle via Bluetooth. Bluetooth module received the signal sent from the android phone. Then vehicle acts appropriately based on the instruction given to the vehicle. This system works only with the application of the android that leads to the major drawback of the system.

Advantages

- The system has very less power consumption.

- Cost of system in low because of smart phone which nearly available to everyone.

Disadvantages

- Range of Bluetooth technology is up to 10m only.

- Delay in transmission and reception of command is high.

- The Bluetooth connection gets dropped frequently.

- Maintains of system in difficult.

- Needs a greater number of detector or sensors.
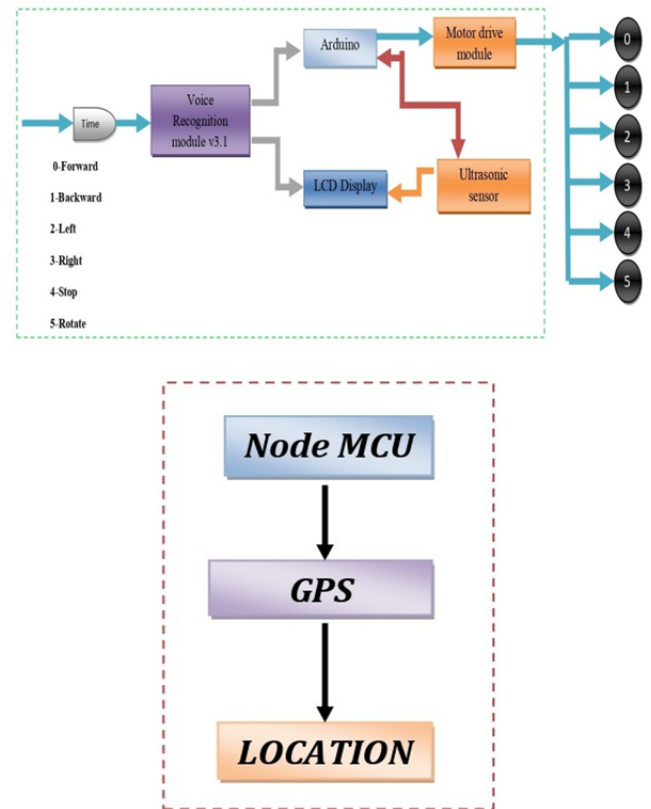
2. Working Model of Voice Based Vehicle Control

- Voice recognition vehicle makes the system to understand human voice.

- Vehicle controlled through voice commands received by the end user and moves in forward, backward, right and left, stop directions.

- The vehicle is mounted with LCD screen to view the received commands.

- Vehicle is fixed with GPS by that we can major the distance covered by the obstacles.

Advantages

- Safety

- Vehicle for disabled.

Concern

- Voice must be clear

FIGURE 2. Block Diagram Voice Based Vehicle Control

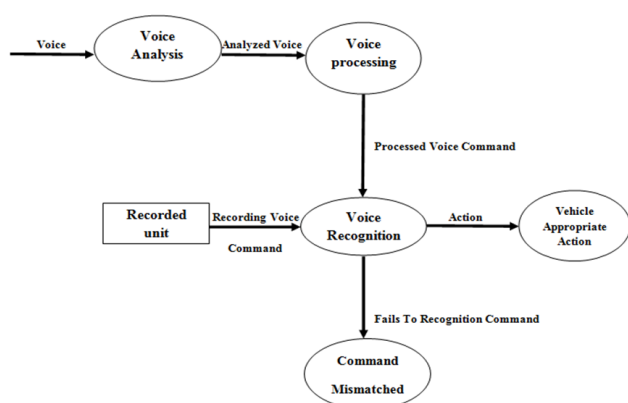### 2.1. Block Diagram of Voice Based Vehicle Control

The main components of this working system are Arduino, sensors and motor assembly interacting with each other as shown in Figure 2:

The end user gives the command to the application via mike, mike will receive the command and that convert sound into an electrical signal that will be the input signal to the amplifier. It will increase the power of the signal that signal is the inputs to the memory unit. Recording unit contains command like forward, backward, left, right, stop, rotate that are stored, while train the kit by storing the voice commands in Speech recognition module v3.1. It will be the input to the memory unit. And that are sent to the voice command reorganization block, If it doesn't matches to the recorded voice then that it will be dropped, if both command matches then it will send that command back to the memory unit ,intern memory unit send to the Arduino ,where Arduino is the open source electronic prototyping platform enabling user to create interactive electronic objects .It helps to control the voice .We cannot directly connect Arduino to the motor ,if we

directly connect ,then Arduino will die so we should use control circuit and driver circuit in between . Arduino send either 0 or 1 to the control unit, it will trigger the driver circuit, driver circuit intern controls the motor, then motor will react to the appropriate command either to move forward, backward, left, right stop, rotate.

2.2. *Data Flow Diagram of Voice Based Vehicle Control*

The sequence of implementing the Voice Based Vehicle Control working model is shown in below in Figure 3 in the form of flow work.

FIGURE 3. **Data Flow Diagram of Voice Based Vehicle Control**

Dataflow diagram is a graphical representation of flow of data through an information system, modeling its process aspects. The flow diagram states that End user gives the Voice command to the Voice Analysis block, analyzed voice is given to the voice processing model. Recorded unit stores the recorded voice, and train the kit by storing the voice commands in Speech recognition module v3.1.recorded voice and processed voice both are given as input to Voice recognition block ,that checks whether the recorded voice matches processed voice, if matches then vehicle takes appropriate action else voice fails to recognition the voice.

3. Experimental Results

This section gives the results with the snapshots of the voice-based vehicle control. This All Section shows the Forward, Backward, Right, rotate, Left, Stop directions.

The output of "Voice Based Vehicle Control" is to provide best platform by controlling vehicle with

simpler vehicle hardware architecture. It presents a review of vehicle controlled through voice commands received by the end users and moves in forward, backward, right and rotate, left, stop. Voice based vehicle control which describes how to control a vehicle using speech recognition method and Vehicle can move on with predefined commands. The system is controlled by using GPS for tracking the location of vehicle. It is controlled by using Arduino UNO.
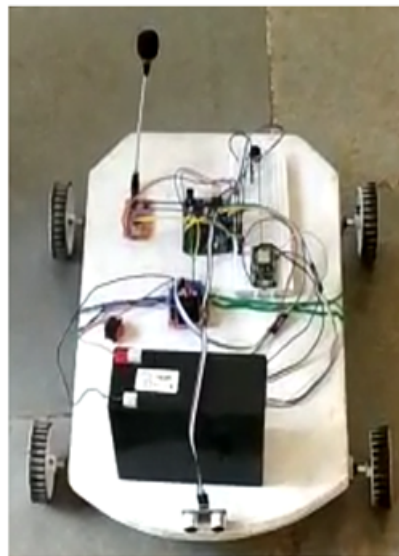
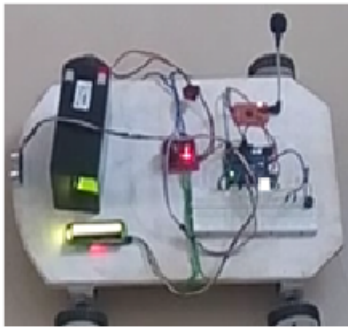
FIGURE 4. **Forward Mode of Vehicle Control**
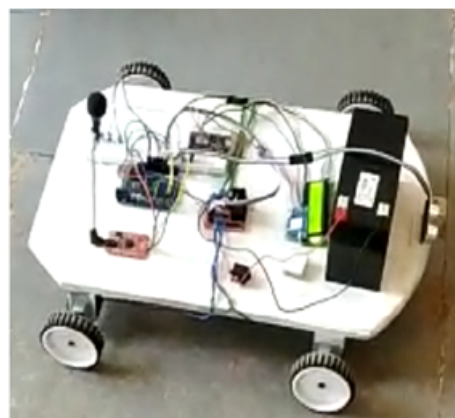
FIGURE 5. **Right Mode of Vehicle Control**

4. Conclusion

The paper title "Voice Based Vehicle Control" is a model to control a vehicle using speech recognition method. Vehicle is controlled through voice

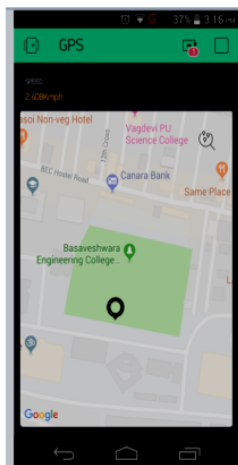**FIGURE 6.** Left Mode of Vehicle Control

FIGURE 7. BackwardMode of Vehicle Control

FIGURE 8. Shows a GPS Location of the Vehicle

commands given by the end user and moves in forward, backward, right, left, rotate, stop directions. The vehicle is mounted with LCD screen to view the commands and distance between the vehicle and the obstacles. It can easily recognize the voice commands and runs smoothly. This can be an extent by taking help of Google map to indicate the nearby location of the vehicle. This paper will be signifi-
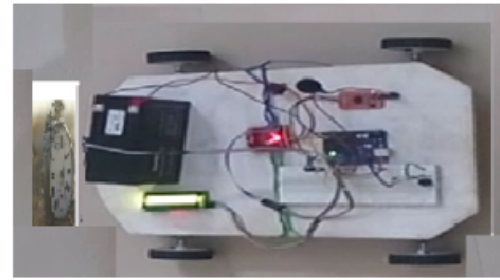
FIGURE 9. **Shows Display the Centimetre on Obstacles and Vehicle**

cant asset to the field of robotics. Voice based control system can be extend to receive the commands from a remote location. The vehicle can be mobilized by proper predefine context and geographical information commands.

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ORCID iDs

Girish B. Shettar ⓘ https://orcid.org/0000-0002-6311-6583

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