VOICE COMMAND ROBOTICS CAR

CENTER FOR COMPUTER AND COMMUNICATION TECHNOLOGY; SOUTH SIKKIM (737121). 6TH SEMESTER TRAINEE FROM COMPUTER SCIENCE AND TECHNOLOGY,

NAME OF THE TRAINEE: ABIKSHITTIMSINA[1], DEVCHANDRASHARMA[2], NIRMALASHARMA[3], ALLEN ONGCHEN BHUTIA[4]
NAME OF THE GUIDE: SUJALAPRADHAN5.

Abstract: The main purpose of our project is to develop a car which is capable of performing certain action according to the voice command provided by the valid user through the application installed in his/her smartphone. We call this technology as voice/speech recognition technology .while our car will be integrated with this advanced technology. While developing our project our main focus area will be voice identification and voice recognition system. The purposed system will not be capable of recognizing the complete sentences while it will be capable of recognizing only those command which are implemented while preparing our system and is capable of performing certain action with regards to those commands . The system will allows user to provide voice commands through a microphone inbuilt on the smartphone for controlling the action/movement of the car. The voice command by the valid user will be delivered to the purposed system. after that with the implementation of vector Quantization(VQ) technique along with the Mel-wrapping filter bank for reducing the amplitude of the noise and also improving the signal to noise ratio, the code being inserted on the Arduino UNO (microcontroller) will start comparing the command delivered by the user with the commands being stored on the storing device on the purposed system. The result of purposed system shows that the car is capable of performing certain action according to the 5 basic commands provided by the user; those commands are forward, turn right, turn left, reverse, stop, with the help of the code being inserted in the microcontroller in MATLAB.

Key words: speech/voice recognition, speech/voice identification, Arduino UNO, vector quantization techniques (sq.).

1. Introduction

Living in twenty first century, car performs essential position for our regular visiting in addition to enhancing our day by day existence style. Most of the automobiles aren't pleasant for body disabled or handicapped person. Besides that, a few operation along with police, military, rescue operation want unmanned car to do the activity because the scenario they face day by day is risky and every so often inaccessible through human. Such activity with excessive threat should be manage with distance without putting human life st risk Now a days with the implementation of new and superior era we are able to witness the most important improvement in our economy, military, healthcare , entertainment , and transportation gadget. With the assist of new and superior era there exists distinct methods thru which we are able to manage the purposed gadget without even going nearer or close to the manage part of it along with through enforcing far off controls .with the assist of voice popularity era we are able to manage the gadgets with sure human voice command . The term "voice popularity" is used to refer as speech popularity wherein the popularity gadget is educated to a specific speaker. However, there are variations among voice popularity and speech popularity. Voice popularity is a gadget which relates on figuring out the voice command of a specific educated person. Whilst speech popularity identifies nearly everybody spoken phrases in the suitable sense. The purposed gadget will compares the command spoken the person will the command saved at the gadget reminiscence card so simplest if the command through the person suits the command saved at the gadget after then simplest it's going to carry out sure motion in any other case it's going to now no longer carry out any motion at the person command.

2. Related Work

Speech/voice is a verbal supply of interface for human to device verbal exchange in addition to human to human verbal exchange voice popularity era will offer the clean verbal exchange in-between human to machines voice popularity era continues to be in its intial growing section and plenty of scientists are running in this era to make it greater efficient even as we are able to nevertheless witness this superior era in lots of small sectors there exists especially classes of voice popularity era the ones are speaker established and speaker impartial the machine this is being skilled with the aid of using the consumer who can be running the machine is called speaker established this machine best responds correctly to the consumer that skilled the machine the gain of speaker established machine is that it may reap better command remember and higher accuracy than speaker impartial machine meanwhile machine impartial is a machine that responds to a phrase irrespective of whos the only that speaks due to this reason the machine wishes to reply to exceptional type of speech patterns inflection and enunciations of the goal phrase command remember for speaker impartial machine is typically decrease than speaker established machine however the accuracy may be maintained inside processing limits normally with inside the area of

industry speaker impartial voice machine is needed evaluate to speaker de pendent due to the fact greater peoples speech may be recognized in place of limits it right all the way down to the only who skilled the machine the maximum well-known shape of voice popularity may be performed via characteristic analysis which typically leads to speaker-impartial voice popularity this approach procedures the voice enter the use of linear predictive coding lpc or fourier transform approach after which will try and discover the feature similarities among the anticipated enter and real voice enter these similarities can be gift for a extensive variety of speakers so the machine want now no longer gain knowledge of with the aid of using every new consumer this approach will now no longer waste time on locating the fit among the real voice enter and a formerly saved voice template the maximum famous approach is the hidden markov models hmm there are others approach that used for speech popularity machine which include artificial neural network ann and dynamic time warping dtw in hmm- primarily based totally speech popularity the audio sign can be regarded as a piece-clever desk bound sign this lets in assumption that speech is about a desk bound system in a quick length of time in voice popularity hmm offer the best setup feasible with the aid of using outputting a chain of n dimensional real-valued vectors each 10 milliseconds with n cost is greater than 10 the vectors might include cepstral coefficients which can be received with the aid of using taking a fourier rework of a quick-time window of speech and de-correlating the spectrum the use of a cosine rework then taking the maximum significant first coefficients dynamic time warping dtw is an set of rules that measures similarity among sequences which can also additionally range in time or speed dynamic time warping dtw offers a temporal alignment even as evaluating pre-recorded pattern with the enter speech sign this will boom the accuracy of the popularity system as the space of those indicators has been decreased to the minimum which eased the matching of the voice sign the approach dynamic time warping dtw changed into brought to the facts mining network with the aid of using berndt and clifford in 1994 the approach thats used for mapping vectors from a big vector area to a smallfinite vectors in that vicinityarea is called vector quantizationvq even as the unmarried vector in a vicinity is called acoustic vector the series of a set of codeword changed into additionally known as a codebook the use of the lbg set of rules we are able to generate speaker-precise vq codebook for every regarded speaker the distance from a vector to the nearest codeword of a codebook is known as a vqdistortion.

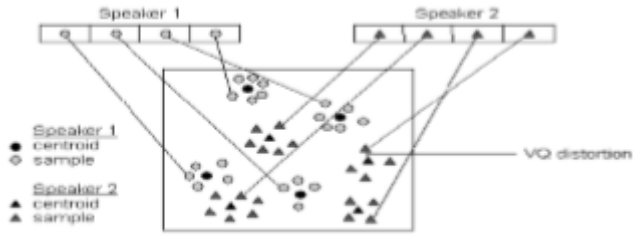

Fig. 1: Example illustration of vector quantization technique [11]

3. Methodology

The purposed gadget reveal the implementation of a voice-managed vehicle through the usage of Arduino UNO. On this purposed gadget the customers will offer the sure precise voice instructions to the gadget with the help of an Android app being set up at the consumer smartphone. While the Bluetooth module set up at the purposed gadget will capture the signal(command) and byskip it in addition to the Arduino UNO(microcontroller) being set up at the gadget/vehicle. Arduino UNO will controls the actions of the auto regular with the best acquired instructions. The vehicle will movements forwards, backwards, left and right, and prevents respectively regular with the voice instructions. The purposed gadget is includes a transmitter (Android smartphone) and a receiver (vehicle). Block diagrams of the transmitter and receiver aspects are proven in Figs 2 and three, respectively. Screenshot of the format of Voice control app is proven in Fig. 4.

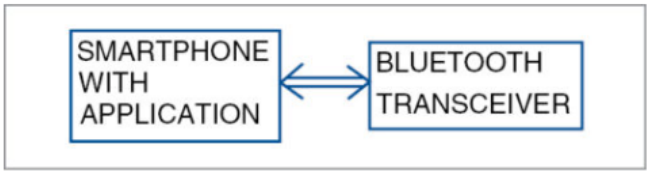

Fig. 2: Block diagram of transmitter side

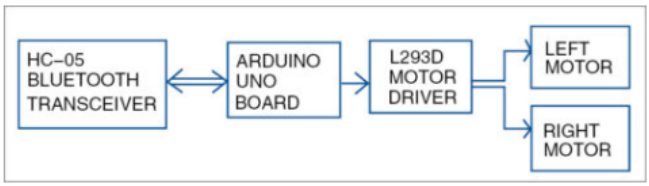

Fig. 3: Block diagram of the receiver side

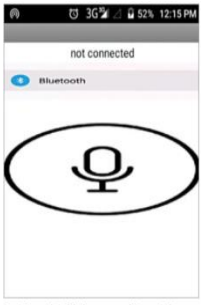

Fig. 4: Screenshot of the home screen of Voicecontrol app

3.1Circuit and working

The circuit diagram of the receiver side of the robot is shown in Fig. 2.

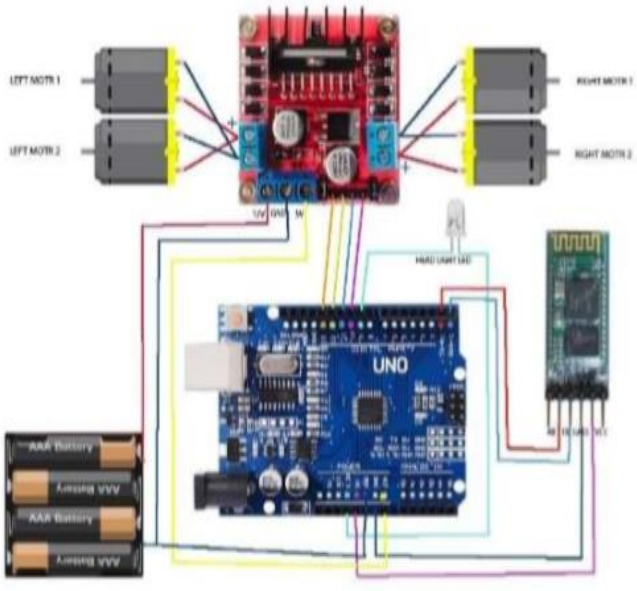

Fig.2 Circuit Diagram

3.1.1Major components used in this project are described below.

PARTS LIST

Semiconductors:	
BOARD1	- Arduino Uno board
IC1	- 7805, 5V voltage regulator
IC2	- L293D motor driver
Capacitors:	
C1-C2	- 0.1µF ceramic disk
Miscellaneous:	
BATT.1	- 12V battery
M1-M2	- 12V DC geared motor
CON1	- 6-pin female Berg connector for Bluetooth module - 8-pin female Berg connector for Board1 - 2-pin terminal connector for battery - 2-pin male Berg connector for motors M1 and M2 - HC-05 Bluetooth module - Android smartphone

The consumer telephone include the speech-popularity app (voicecontrol.apk) used right here turned into advanced the use of MIT App Inventor. When the app is going for walks with inside the telephone, consumer's voice instructions are detected via way of means of the microphone gift with inside the telephone. Commands are processed, and speech-to-textual content conversion is performed with inside the app the use of Google's speech-popularity technology. Text is then despatched to the receiver side thru Bluetooth.

Arduino Uno R3. Arduino Uno is an AVR ATmega328P microcontroller (MCU)-primarily based totally improvement board with six analogue enter pins and 14 virtual I/O pins. The MCU has 32kB ISP flash memory, 2kB RAM and 1kB EEPROM. The board affords the functionality of serial conversation thru UART, SPI and I2C. The MCU can function at a clock frequency of 16MHz. In this project, virtual I/O pins 2, 3, four and five of Arduino are configured as output pins. Pins zero and 1 of Arduino are used for serial conversation with HC-05 Bluetooth module. Text acquired thru Bluetooth is forwarded to Arduino Uno board the use of UART serial conversation protocol. Arduino application voice_ctrl.ino exams the textual content acquired and, if it's miles an identical string, Arduino controls the moves of the robotic accordingly. Voice instructions used for controlling the robotic and their capabilities are proven in Table I.

TABLE I
FUNCTIONS OF DIFFERENT VOICE COMMAND

Voice command	Function
Forward	• Robotic car moves forward
Backward	• Robotic car moves backward
Right	• If previous command was forward, the car turns right and continues to move forward • If previous command was backward, the car turns right in backward direction and continues to move backward
Left	• If previous command was forward, the car turns left and continues to move forward • If previous command was backward, the car turns left in backward direction and continues to move backward
Stop	• Robotic car stops moving

hc-05 bluetooth module- the hc-05 module is a user-friendly spp module bluetooth serial port protocol the serial bluetooth module has fully passed the bluetooth v20 edr certification hardware specifications typical sensitivity -80 dbm to 4 dbm rf transmission power 33 to 5 vio programmable io control pio programmable baud rate uart interface for edge antenna connection embedded software function they are the standard baud rate of the slave is 9600 baud the standard baud rate of the slave is 9600 information bit 8 bit to be processed 1 parity check-if there is no parity check a standard power tool connection will be automatically established by default the pairing tool can be connected automatic pin coupling-standard pin 1234 indicates that the hc-05 bluetooth module has six pins see below the resolution has been reduced and the module has been disabled using this method will no longer activate the module and may no longer be able to communicate when the authorization is not used or the authorization is linked to 33v the module is in the open state this means it will continue to work and may require oral changes when using a 3 to 5 v power supply the txd and rxd pins are grounded these pins are used as uart interface for voice communication can be used as an indicator of popularity if the module is not paired or not paired with another bluetooth instrument the signal will be lostin this low state the built-in led will flash continuously to indicate that the module is not paired use other tools when this unit is connected or paired with another bluetooth instrument the signal is too large the built-in status led flashes periodically for example a few seconds this indicates that the module is paired the driving force of the l293d engine using this is a modern h-2 axis motor because the virtual pins of arduino cannot provide

enough advanced functions to separate the car from the robot car h waves can also be used to control the movement of electric motors the active pins 1 and 9 of the microcircuit are connected to 5vthe four output pins of the l293d chip are connected to the vehicles m1 and m2 on the receiver table ii lists the general signals in abnormal circuits used to properly control the robot machine arduino ide 1five is used to program arduino in this project the steps of the arduino software are as follows a select the correct com port and card from the tools menu in the ide b load the delivery code voicectrlino onto the card.

TABLE II
SIGNAL LOGIC LEVELS AT DIFFERENT STAGES OF RECEIVER SIDE FOR A PARTICULAR COMMAND

Command from user	Arduino output via digital pins (2, 3, 4, 5)	L293D driver inputs (2, 7, 10, 15)	L293D driver outputs (3, 6, 11, 14)
Forward	HLHL	HLHL	HLHL
Backward	LHLH	LHLH	LHLH
Right	• LLHL for 1s, then HLHL if previous command was forward • LLHL for 1s, then LHLH if previous command was backward	• LLHL for 1s, then HLHL if previous command was forward • LLHL for 1s, then LHLH if previous command was backward	• LLHL for 1s, then HLHL if previous command was forward • LLHL for 1s, then LHLH if previous command was backward
Left	• HLLL for 1s, then HLHL if previous command was forward • HLLL for 1s, then LHLH if previous command was backward	• HLLL for 1s, then HLHL if previous command was forward • HLLL for 1s, then LHLH if previous command was backward	• HLLL for 1s, then HLHL if previous command was forward • HLLL for 1s, then LHLH if previous command was backward
Stop	LLLL	LLLL	LLLL

3.2 Block Diagram of Project

The block diagram of the challenge is proven in figure 1 the following is a primary block diagram of a voice-managed robotic with arduino the robotic includes an android telecellsmartphone that could understand the command and transmit it to the bluetooth module via the bluetooth connection distinct with the aid of using the user and ship the command to the bluetooth tool consistent with the desired command arduino uno r3 gets instructions and makes use of it to carry out all approaches that require 12 volt power first this command or statistics is transformed into textual content shape in amr voice control when acquired withinside the bluetooth module the statistics or command is digitized in order that the arduino can carry out operations consistent with the acquired command or statistics .

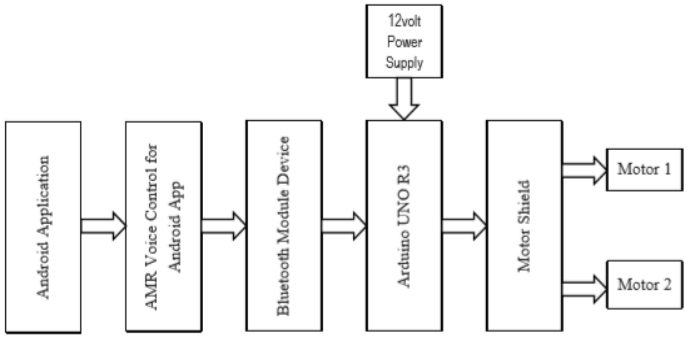

Fig.1 Block Diagram of Voice Control Robot

4. HARDWARE REQUIREMENTS

1. Arduino Uno: The arduino uno is an open-supply microcontroller board depending on the microchip atmega328p microcontroller and created with the aid of using arduinocc. It's programmable with the arduino ide via a type b usb cable. It is able to be managed with the aid of using the usb hyperlink or with the aid of using an outdoor 9-volt battery but it recognizes voltages among 7 and 20 volts.

2. Motor Driver: This L298N Based Motor Driver Module is a effective engine driving force, best for using DC Motors and Stepper Motors. It makes use of the wellknownL298 engine driving force IC and has the domestically available5V controller which it is able to gracefully to an outdoor circuit. It can manipulate as much as four DC engines, or 2 DC engines with directional and pace manipulate.

3. Bluetooth Module: Hc05 module is straightforward to apply bluetooth spp serial port protocol module designed for clean wi-fi serial affiliation setup the hc-05 bluetooth module is applied in a grasp or slave configuration developing it an awesome decision for wi-fi communication.

4. Ultrasonic Sensor: A ultrasonic sensor is an device that gauges the separation to an item utilising ultrasonic sound waves an ultrasonic sensor makes use of a transducer to ship and get ultrasonic heartbeats that hand-off returned statistics approximately an objects nearness high-recurrence sound waves replicate from limits to create unmistakable reverberation designs .

5. Servo Motor: A servomotor is a rotating actuator or instantly actuator that takes into consideration actual manage of angular or linear function pace and acceleration it accommodates of an inexpensive engine coupled to a sensor for function enter it likewise calls for a fairly delicate controller often a devoted module established explicitly to be used with servomotors.

6. BO Motor with Tires**:** *DC engine (BO) changes over electric powered power into mechanical power. DC MOTOR idea is the region gears decrease the price of the*

car however increment its torque is called gadget decrease.

5. SOFTWARE REQUIREMENTS

1. Arduino IDE: the arduino integrated development atmosphere ide could be a cross-diploma application for windows macos linux thats written in capacities from c and c its dispensed to compose and transfer comes to arduino good sheets.

2. The Android App: Android phone with an software is the transmitter end. At first, there have to integrate of Bluetooth HC-05/HC-06. When matching is done, at that factor it have to be associated. When the software is jogging withinside the phone, the client's voice orders are prominent through the telecall smartphone microphone.

How to use Android application to control the Robot for that the steps are given below :

1) Install the pallication "AMR Voice Control" from Google play store 2) After installation, activate the Bluetooth of smartphone and Bluetooth module. 3) Now pair your smartphone Bluetooth with Bluetooth module HC-05 and therefore the default password for pairing is "0000" or "1234". 4) Now the appliance and robot is prepared to perform the operation. 5) Now click on the "MIC" of the appliance and provides specific command to the robot. 6) the purposed system will perform the certain action according to the command 7) the operator of the system will provide command to the system by the installed application on his/her smartphone. 8) supposed the operator provides the command forward then the command will be delivered to the Bluetooth module installed on the car after that Bluetooth module will pass that command to the microcontroller and microcontroller will guide the system with regards to code being inserted and perform the particular action as commanded. meanwhile the purposed system will perform other action following the similar procedure.

6. WORKING

the block diagram of the easy voice managed robot car is given it includes the telephone that acknowledges the voice instructions and are being wirelessly transferred to the bluetooth module hc05 the module at that factor adjustments over the order to content material and the collection of characters are despatched to the arduino for extra coping with the arduino microcontroller decodes the string were given and correspondingly plays in addition capacities the alerts are despatched to the motor that consequently powers and drives the vehicles linked to it at the transmitter place instructions are given to the cellular utility thru the mic this transportable handset is related to the transferring car by bluetooth module the transportable utility applied is changed in order that the voice orders given to the handset are acquired by means of the mic and those easy voice orders are modified over to superior phrase successions a to d transformation those saved sequences are than transmitted to the robot car through bluetooth transceiver module and are despatched to the transceiver controller android utility transceiver is used to decode the acquired sign with the bluetooth module the controller contrasts those alerts and the positioned away application orders in it and convert them into voice strings the voice strings are then used to run the servo engines for the precise c programming language of time the microcontroller sends instructions which whilst performed facilitates in running of the engine motive force the yield of the arduino is going to the engine motive force ic and it controls the precise engine a dc energy deliver is needed to run the gadget the dc energy deliver feeds the microcontroller and the bluetooth module

7. FUTURE SCOPE

1) Useful for speech popularity safety gadget useful for army purpose.

2) Automatic goal gadget may be implemented.

3) This robotic is beneficial for the ones regions wherein people cant attain like hearthplace situation exceedingly poisonous regions etc.

4) If we use different technology like zigbee or gps we are able to enhance the variety of the robot.

5) The robot is beneficial for surveillance.

8. CONCLUSION/RESULT

Programmable (software program) mission. This mission operated on human voice command with android application. The implementation of this mission is straightforward, so this robotic is useful for human life. The Voice Control Robot is beneficial for disable humans and tracking purpose. It works on easy voice command the voice managed robotic is an smooth, so it is straightforward to use. It is beneficial for the ones regions wherein people can't reach. We can put in force Image processing on this robotic, in order that we are able to locate the shadeation of the item or focused system. The length of this robotic is small, so we are able to use this robotic for spying purpose. It may be used for surveillance. We can put in force net cam on this robotic for safety purpose. The voice popularity software program has an accuracy of 76% for become aware of a voice command and it's also enormously touchy to the encircling noise.

9. REFERENCES

[1]lawrence rabiner and biing hwang juang fundamentals of speech recognition prentice hall new jersey 1993

[2]p chopra and h dange voice controlled robot department of electronics engineering kj somaiya college of engineering vidyavihar mumbai 2007

[3] k kannan1 dr j selvakumar2 arduino based voice controlled robot ijett volume 02 issue 01 march 2015 pp49

[4] nelson rai1 deepak rasaily2 tashi rapden wangchuk3 manoj gurung4 rit kr khawas5 bluetooth remote controlled car using arduino ijett volume-33 number 8-march 2016 page 381 [

5] google.com

[6] www.wikipedia.com

[7] sci-hub browser get entry to to ieee paper

[8] Smart telecellsmartphone primarily based totally robot manipulate for surveillance packages by mselvamijret 2014

[9] Controlling a robot the usage of android interface and voice by kishan raj kc2012

[10] Motion control of wheeled mobile robot by gyula mestersisy 2006