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Voice Command Operated Vehicle

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A B S T R A C T

This project is designed to control a robotic vehicle by voice commands for remote operation. An ARM series micro controller is used together with an Android Application for the desired operation. The Android Application is connected to the Bluetooth module (HC-05) present on the Robot via Bluetooth. The commands are sent to the robot using push buttons or voice commands present on the android application. At the receiving end two dc servo motors are interfaced to the micro-controller where they are used for the movement of the vehicle. The RF transmitter of the Bluetooth can take either switch press or voice commands which are converted to encoded digital data for the advantage of adequate range (up to 100 meters) from the robot. The receiver decodes the data before feeding it to another micro-controller to drive DC motors via motor driver IC for necessary work. This technology has an advantage over long communication range as compared to RF technology. Further the project can be developed using Io T technology where a user can control the robot from any corner of the world.

Keywords: CRYSTAL OSCILATOR, RESISTORS, SWITCHES, MOTORS, WHEELS, LCD, MICROCONTROLLER, DRIVE R MODULE, CONNECTIG WIRES BATTERY AND CHARGE

1. Introduction

This project banks on two major concepts namely robotics and voice recognition technology. Robotics as a discipline has seen unparalleled development since the early 1960s. It finds application in industries, manufacturing, bio engineering, space exploration and recreational activities like drones. Whereas speech recognition technology has also seen rapid development in the recent time. Models which might require 'training' to better adapt to the voice of the user resulting in increased accuracy. While those which do not require training are called speaker independent system. The voice commands can be a fixed set of commands (as in this project) while more advanced ones come with natural speech recognition which can process complete sentences or phrases in multiple languages and accent of the speaker. Like any other robotic application this project also has three major dimensions (a) Mechanical Construction (b) Electrical Circuitry (c) Computer Programmed. The mechanical construction of the project involves the frame of the vehicle and two DC motors which drive the vehicle. The electronic circuitry comprises of the Bluetooth module which facilitates the communication, Arduino which interfaces with the motor driver also a part of the circuitry. The third is the computer programmer written in IDE (Arduino) which acts the driver code for the vehicle. The driver code is installed on the Arduino which process the command received, interacts accordingly with the motor driver which makes the vehicle move.

2. Literature Survey.

Previously many projects have ventured into the realm of vehicle which communicates with its operator using voice in one way or the other. These projects function around the basic tenet of voice recognition or speech to text, the difference arises in the implementation driving code, sensor or mechanical part used. Some also include additional features like obstacle detection, conformation on receiving command, automatic breaking and speed limiting system. The purpose is to make innovation in the field of vehicle automation so that it caters to multi-dimensional requirements from critical applications space exploration and military use to humanitarian innovation to help those with disabilities to drive themselves. Some the projects might require 'training' to better adapt to the voice of the user resulting in increased accuracy. While those which do not require training are called speaker independent system. The voice commands can be a fixed set of commands (as in this project) while more advanced ones come with natural speech recognition which can process complete sentences or phrases in multiple languages and accent of the speaker.

3. Material and component.

3.1. DC MOTOR.

A DC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electro mechanical or electronic, to periodically change the direction of current flow in part of the motor. Most types produce rotary motion; a linear motor directly produces force and motion in a straight line. DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field winding's. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

3.2 Battery.

Working of Lead Acid Battery, the storage battery or secondary battery is such battery where electrical energy can be stored as chemical energy and this chemical energy is then converted to electrical energy as when required. The conversion of electrical energy into chemical energy by applying external electrical source is known as charging of battery. Whereas conversion of chemical energy into electrical energy for supplying the external load is known as discharging of secondary battery. During charging of battery, current is passed through it which causes some chemical changes inside the battery. These chemical changes absorb energy during their formation. When the battery is connected to the external load, the chemical changes take place in reverse direction, during which the absorbed energy is released as electrical energy and supplied to the load. Now we will try to understand principle working of lead acid battery and for that we will first discuss about lead acid battery which is very commonly used as storage battery or secondary battery. Materials used for Lead Acid Storage Battery Cells The main active materials required to construct a lead acid battery are Lead peroxide (pbo2). Sponge lead (Pb) Dilute sulfuric acid (H2SO4). Lead Peroxide (pbo2) The positive plate is made of lead peroxide. This is dark brown, hard and brittle substance. Sponge Lead (Pb) The negative plate is made of pure lead in soft sponge condition.

3.3 AT-Mega328p Micro-controller.

Arduino was born at the Ivrea Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IoT applications, wearable, 3Dprinting, and embedded environments. Arduino is a single-board m i c r o - c o n t r o l l e r to make using electronics in multidisciplinary projects more accessible. The hardware consists of a simple open-source hardware board designed around an 8-bit AtmelAVR micro-controller, or a 32-bit Oatmeal ARM. The software consists of a standard programming language compiler and a boot-loader that executes on the micro-controller. In its simplest form, an Arduino is a tiny computer that you can program to process inputs and outputs going into and from the chip. The Arduino is what is known as a Physical or Embedded Computing platform, which means that it is an interactive system, that through the use of hardware and software can interact with environment. For example, a simple use of the Arduino would be to turn a light on for a set period of time, let's say 30 seconds, after a buttonheads been pressed (we will build this very same project later in the book). In this example, the Arduino would have a lamp connected to it as well as a button. The Arduino would sit patiently waiting for the button to be pressed. When you press the button, it would then turn the lamp on and start counting. Once it had counted 30 seconds it would then turn the lamp off and then carry on sitting there waiting for another button press. You could use this set-up to control a lamp in an under-stair's cupboard for example. You could extend this example to sense when the cupboard door was opened and automatically

3.4 L298N Motor-Driver.

L298N is a dual H-bridge motor driver. Motor drivers act as current amplifiers since they take a low-current control signal and supply a higher-current signal. This higher current signal is employed to drive the motors. L2938 contains 2 inherent H-bridge driver circuits. In its common mode of operation, 2 DC motors can be driven at the same time, each in forward and reverse direction. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively. Enable pins ENA and ENB (corresponding to the two motors) must be high for motors to start operating. A simple schematic for interfacing a DC motor using L298N is shown below.

3.5 LCD Display.

LCD stands for Liquid Crystal Display. LCD is finding wide spread use replacing LEDs (seven segment LED s or other multi segment LED s) because of the following reasons: 1. The declining prices of L CDs. 2. The ability to display numbers, characters and graphics. This is in contrast to LED's, which are limited to numbers and a few characters. 3. Incorporation of a refreshing controller into the LCD, thereby relieving the CPU of the task of refreshing the LCD. In contrast, the LED must be refreshed by the CPU to keep displaying the data. 4. Ease of programming for characters and graphics. These

components are “specialized” for being used with the micro-controllers, which means that they cannot be activated by standard IC circuits. They are used for writing different messages on a miniature LCD.

3.6 Bluetooth Module.

The **HC-05** is a popular module which can add two-way (full-duplex) wireless functionality to your projects. You can use this module to communicate between two microcontrollers like Arduino or communicate with any device with Bluetooth functionality like a Phone or Laptop. There are many android applications that are already available which makes this process a lot easier. The module communicates with the help of USART at 9600 baud rate hence it is easy to interface with any microcontroller that supports USART. We can also configure the default values of the module by using the command mode. So if you looking for a Wireless module that could transfer data from your computer or mobile phone to microcontroller or vice versa then this module might be the right choice for you. However do not expect this module to transfer multimedia like photos or songs; you might have to look into the CSR8645 module for that.

4. Design

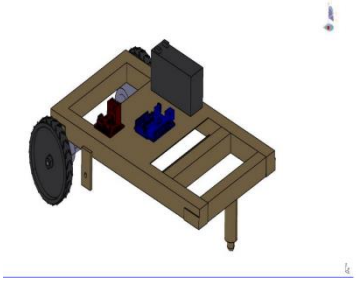


Fig.01. 3D Model

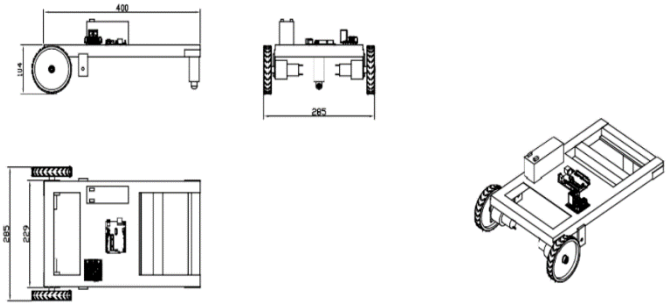
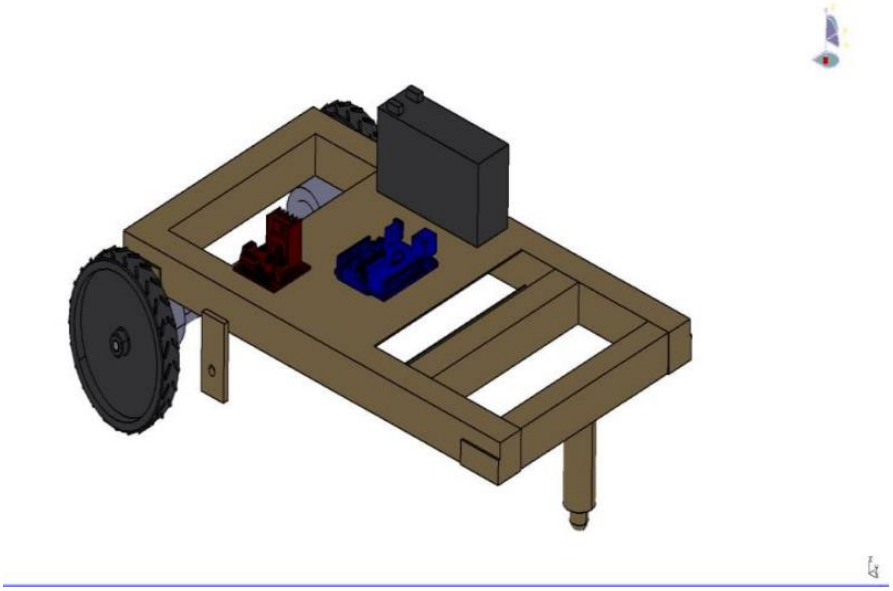


Fig.02. Drafting

- Computer-aided engineering (CAE) and Finite element analysis (FEA)
- Computer-aided manufacturing (CAM) including instructions to Computer Numerical Control (CNC) machines
- Photorealistic rendering and Motion Simulation.
- Document management and revision control using Product Data Management (PDM).



5. Calculation

4.1 Motor Calculation

Motor selection for wheels

Given,

Diameter for wheels=60mm

TORQUE REQUIRED TO RUN=

Torque = mass * radius of wheel

=2*9.81*30

=0.2943 Nm

=2.94 kgcm

Then we have to find motor of 5.88 Nm torque and rpm 30

We are using two motors for wheels .so that total torque is divided by these two motors.\

So torque required for 1 motor is 2.94kgcm

Therefore, we are selecting motor with 3 kgcm torque.

Power output of DC motor is =voltage *current

Power output of DC motor is =12*0.3

Power output of DC motor is =3.6 watt

Power=2*pi*N*0.2943/60 3.6=2*pi*N*0.2943/60

N=117 rpm

This is the maximum rpm value.

We are selecting motor with 30rpm

6. Conclusion

Design and develop of voice command operated vehicle is implemented. A powerassist automatic vehicle prototype that effectively meets the various transportation needs of individuals with hemiplegia or physical disabilities will be designed, manufactured, and tested. Intricate design detail and execution resulted in a visually simplistic design that promotes low cost and low maintenance. The modular aspect of the components allows the system to be retrofit to automatic wheelchairs with only minimal modifications.

The proposed framework of our project shows that how a robot can be control utilizing Bluetooth. The voice controlling orders are effectively transmitted through Bluetooth innovation and the desired activities effectively happen. This task lessens human endeavors at spots or circumstances where human intercessions are troublesome. Such frameworks can be brought into utilization at spots, for example, businesses, military and guard, investigate purposes, and so forth

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