

# SMART MULTI-UTILITY VEHICLE DRIVEN BY IOT AND ARTIFICIAL INTELLIGENCE

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**Abstract:** – In this paper the main aim of the project is to control the vehicle with input voice of human because, robots are getting smarter in every generation and Robot controlling method are also getting sophisticated. In early days manufacturing of robot was done with wired Remote control. Then wireless Remote control over Radio frequency signals and hand gesture was made. Today's engineers are in the process of developing the robot by the user's voice command. So, the main purpose of this project is to control the motion of the vehicle through the user's specific voice command. The speech recognition software running on a raspberry pi is capable of identifying the applied voice commands like 'run', 'stop', 'turn left', 'turn right', 'come back' etc. stored by a particular user. Being a multi-purpose Robot, it has multi features such as text reading which converts the handwritten words into speech, object recognition in which it detects the objects on real time. This project also includes Google Assistant that can interact with the user interface.

**Keywords:** *Personal Assistant, Text to speech, object recognition, Raspberry Pi, Voice Command System.*

## I. INTRODUCTION

Voice Controlled multi-utility vehicle is a Raspberry Pi vehicle whose motions can be controlled by the user by giving specific voice commands. The speech recognition software running on a raspberry pi is capable of identifying the applied voice commands, issued by a particular user. User can trigger the pi using 'HEY GOOGLE' or 'OK GOOGLE' to perform task. After processing the speech, the necessary motion instructions are given to the raspberry pi via USB mic. The special feature of the application is the ability of the software to train itself for the voice commands for a particular user. It also provides many other facilities in operating the robot.

In this vehicle, other functions are also implemented such as Google assistant, text reader and object detection. Google assistant is an artificial intelligence powered by virtual assistant by Google that is primarily available on mobile and smart home device. In this Google assistant, C++ program is written by Google, but in this robot, we are using Python program to develop Google assistance. Optical character Recognition (OCR) is a process that converts scanned or printed text images, handwritten text into editable text for further processing. This robot has presented a robust approach for text extraction and converting it to speech. Testing of device was done on raspberry pi platform. The pi is initially connected to the internet through VLAN either from WiFi. The software is installed using command lines. Following steps are to be followed: 1. The first setup is to download the installation script, 2. Second step is to convert it to executable form and 3. The last step starts the script which does the rest of the installation work. The pi camera is manually focused towards the text. Then, it takes a picture, a delay of around 5 seconds is provided, which helps to focus the pi camera, if it is accidentally defocused. After delay, picture is taken and processed by pi to hear the spoken words of the text through the earphone or speaker plugged into pi through its audio jack. An object detection system finds objects of the real-world present either in a digital image or a video, where the object can belong to any class of objects namely human, animal, car etc. In order to detect an image or a video the system needs to have a few components in order to complete the task of detecting an object, they are a model database, a feature detector, a hypothesizer and a hypothesizer verifier. This robot presents the various techniques that are used to detect an object, localize an object, categorize an object, and extract an object, appearance information and many more in images and videos.

## II. DETAILS OF PROPOSED SYSTEM

The proposed system is such that it can overcome the drawback of the existing system. The project design involve text to speech, Google Assistant, object recognition.

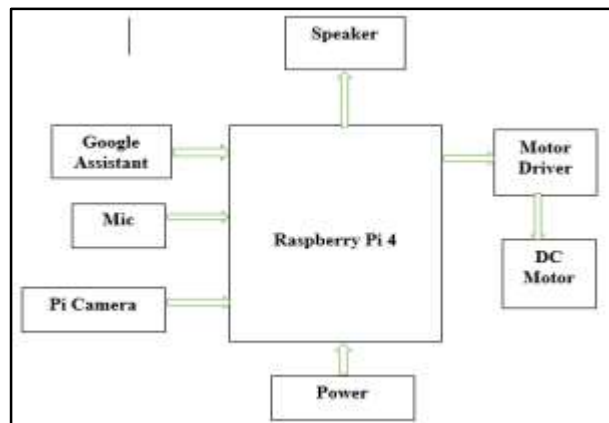


Fig1. Block diagram of voice control multi- utility vehicle

The Figure 1 describes the block diagram of the proposed system. The proposed system mainly consists of six modules:

- I. **Raspberry-Pi**:- Raspberry-pi is connected with each and every module via internet and wire to transfer and receive the data to communicate for the proposed function. The Raspbian OS is mounted onto the SD card which is then loaded in the card slot to provide a functioning operating system.
- II. **Pi camera (object recognition)**:- Pi-camera is connected with Raspberry pi via Ras-pi port, which is responsible for capturing the images to detect the object. The images of objects are captured from different angles and then these images are given to program as training data. The program creates the .xml file as a database to store images of each legitimate user. At the time of object detection process, web-cam captures the objects of user and compares with the available training data based on fractal points and matrices of image.
- III. **Pi-camera (text to speech)**:- Cam is connected to the Ras-pi which is used to convert the text messages in speech.
- IV. **Mic**:- Microphone is used to take the audio input of the sound. It is connected with Ras-pi via mic port. This audio input when further passed through the system would be searched for keywords. These keywords are essential for the functioning of the voice command system as our modules work on the essence of searching for keywords and giving output by matching keywords.
- V. **Motor (vehicle)**:- The DC motor is designed to convert the electrical current into energy that will drive the mechanics to a robot by applying a certain degree of torque to the motor shaft. DC motor is connected with Ras-pi. DC motor is connected with Ras-pi though Ras-pi pinout. In this proposed system when user gives a command via Raspberry-pi the motor will move as given command.
- VI. **Power supply** :- In this proposed system 5v, 2Amp micro USB adopter is applied as power supply via battery or mobile charger adopter.

### III. CIRCUIT DIAGRAM

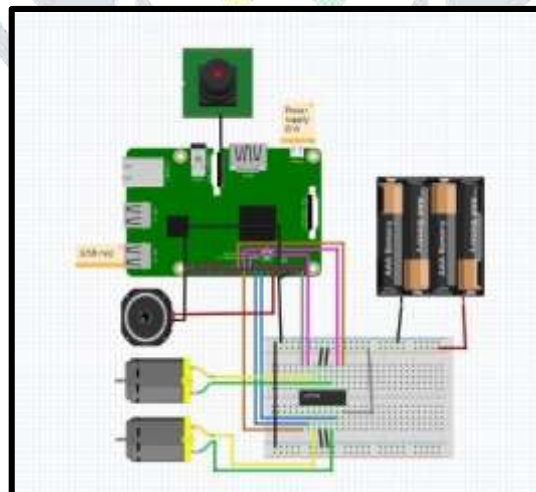


Fig.2 Circuit diagram of voice control multiutility vehicle

**L293D IC Pin Out:** The L293D is a 16 pin IC, with eight pins, on each side, to control two DC motors simultaneously. There are 4 OUTPUT pins and 2 ENABLE pin for each motor.

**Pin 2:** Input 1, when this pin is HIGH the current will flow through output 1.

**pin 7:** Input 2 when this pin is HIGH the current will flow through output 2.

**Pin 10:** Input 4, when this pin in HIGH the current will flow through output 4.

**Pin 15:** Input 3, when this pin is HIGH the current will flow through output 3.

### Connections with Raspberry Pi:

1. Module 5V (VCC)-Raspberry Pi 5V.
2. Module GND & GPIO's – Raspberry Pi GND.
  - a) GPIO 24-Pin 18> L293D-Pin 2
  - b) GPIO 23-Pin 16> L293D-Pin 7
  - c) GPIO 20-Pin 38> L293D-Pin 10 4) GPIO 21-Pin 40> L293D-Pin 15
3. c) Module VSS – Connected with 6V 4x1.5V battery pack

**Raspberry Pi:-** Raspberry Pi is the heart of the voice command system as it is involved in every step of processing data to connecting components together. The Raspbian OS is mounted onto the SD card which is then loaded in the card slot to provide a functioning operating system. The Raspberry Pi needs a constant 5V, 2.1 mA power supply. This can either be provided through an AC using a micro USB charger or through a power bank.

**USB Mic:-** USB Mic is used to take the audio input of the sound. This audio input when further passed through the system would be searched for keywords. These keywords are essential for the functioning of the voice command system as our modules work on the essence of searching for keywords and giving output by matching keywords.

**The Pi camera module:-** The Pi camera module is portable light weight camera that supports Raspberry Pi. It communicates with Pi using the MIPI camera serial interface protocol. It is normally used in image processing, machine learning or in surveillance. It is commonly used in surveillance drone since the payload of camera very less, but in this project, we are using to capture the object and recognize it. Also, it is used to capture the handwritten words and printed text to convert into speech.

**DC motor:-** At an electromechanical level, the DC motor is designed to convert the electrical current into energy that will drive the mechanics to a robot by applying a certain degree of torque to the motor shaft. Typically, a permanent magnet DC motor is used in the design and construction of robot.

**Robot kit :-** A robot kit is a special construction kit for building robots, especially autonomous mobile robots. The proposed system inbuilt robot vehicle for the movement.

### IV. RESULTS AND DISCUSSION

The Voice Command System works on the idea and the logic it was designed with. Our personal assistant uses the hot word to take a command. Each of the commands given to it is matched with the names of the modules written in the program code. If the name of the command matches with any set of keywords, then those set of actions are performed by the Voice Command System. In this project, we introduced the idea behind the Voice controlled multi-utility vehicle. First and foremost, objective of this project is to command the robot with the voice. The voice recognition software has accuracy around 75% in correctly identifying a voice command. But it is highly sensitive to the surrounding noises. There is a possibility of misinterpreting some noises as one of the voice commands given to the robot. Also, the accuracy of word recognition reduces in face of the noise. The sound coming from motors has a significant effect on accuracy.

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