



# GESTURE AND VOICE CONTROLLED ROBOTIC VEHICLE

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## Abstract

Generally, robots are programmed to perform specific tasks which humans cannot or takes more time. To increase the use of robots where conditions are not certain such as security operations, robots are made such that it will follow the instruction of human operator and perform the task. Smart Robotic Vehicle(RV) will help human being a lot in multiple ways and operates on human voice commands and gestures commands, given remotely by using an Android platform based smart IoT device like smart phone. The voice and gesture commands are converted to text form and is the communicated to the Robotic Vehicle over a Wi Fi network. An Arduino microcontroller based platform is used to develop this smart RV. The RV is able to perform different operations like start/stop, move left/right, forward/backward. These peculiarities are really helpful for humans especially for elderly people. The applications of robotic assistant including homes, hospitals, industries, Military etc.

**Key Words:** smart robotic vehicle, voice commands, gesture commands, Wi Fi network, Android based smart IoT devices.

## 1. INTRODUCTION

A robot is usually programmed with computer and controlled with remote or a console but these controls are not user friendly and difficult for user to observe the movement of robot and controlling remote at same time.

The main purpose of using hand gestures and voice control is that it provides a more natural way of controlling the robot and with

this feature robot can be used as a wheelchair or as a spy robot or for vigilance. As human hand gestures are natural, with the help of wireless communication, it is easier to interact with the robot in a more-friendly way.

## 2. PROPOSED METHOD

Robotic Vehicle helps human beings in reducing the manual efforts in day-to-day tasks and the risk to precious human lives in hazardous situations. In this paper, we discuss about a smart robotic vehicle that operates on human voice and gesture commands, given remotely by using an Android platform based smart IoT device. The real-time signal processing of the voice commands is carried out . The speech command signal converted to text form is then communicated to the robotic assistant over a Wi-Fi network. The robotic assistant is developed on an Arduino micro-controller based platform.

### 2.1 Microcontroller

NodeMCU is an open source LUA based firmware developed for ESP8266 wifi chip. By exploring functionality with ESP8266 chip, NodeMCU firmware comes with ESP8266 Development board/kit i.e. NodeMCU Development board. NodeMCU Dev Kit/board consist of ESP8266 wifi enabled chip. The **ESP8266** is a low-cost Wi-Fi chip developed by Espressif Systems with TCP/IP protocol. NodeMCU Dev Kit has **Arduino like** Analog (i.e. A0) and Digital (D0-D8) pins on its board. It supports serial communication protocols i.e. UART, SPI, I2C etc. Using such serial protocols we can connect it with serial devices like I2C enabled LCD display, Magnetometer HMC5883, MPU-6050 Gyro

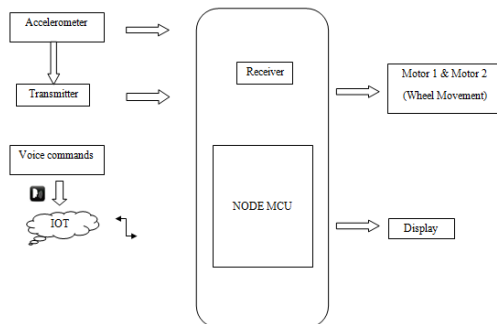
meter + Accelerometer, RTC chips, GPS modules, touch screen displays, SD cards etc.

### 3. WORKING

In this work, movements of the smart RV are controlled by voice and gesture commands given through a smart mobile phone using Android OS based platform.

The voice commands signal is converted to the text form. Using a smart IoT device, this text command is then transmitted to the Wi Fi module on-board the robot via MQTT server. The Wi Fi module receives the signal and then sends commands to the micro-controller, on-board the RV's body. The micro-controller in turn processes the commands movements. Voice commands make the control of RV easier for the humans, thus providing a better and user friendly interface. The accuracy of voice to text transformation depends upon the distance between the mouth and the smart IoT device, and the signal strength.

The schematic block diagram of the operation of RV is shown in Fig. 1, with the movements of RV's body, hands and arms. Human voice or gesture commands are given using an android based smart IoT device using Google's voice and phone accelerometer system.



**Fig -1:** Schematic block diagram of *smart robotic assistant (RV)*

Smart IoT device is used here for wireless communication. A smart phone is used as an IoT device that uses Wi Fi. In the receiver side, the micro-controller ports are used as interface between the Wi Fi receiver and the RA. The movements of the RA's body, hands and arm are independent of each other and all can be controlled at the same time, since each function

is controlled by motors. The main modules in the voice recognition system are:

**GUI:** It is used for interacting with the user. Basic structure of application is reflected in GUI.

**Voice Recognition:** Voice Controlled sections can be controlled by the user by giving specific voice commands. The speech is received by a microphone and processed by the voice module. When a command for the robot is recognized, then voice module sends a command message to the robot's microcontroller. The microcontroller analyzes the message and takes appropriate actions.. When any commands are given on the transmitter, the mobile module will take the voice commands and convert the voice commands into digital signals. Then these digital signals are transmitted via NodeMCU module to the robot. On the receiver side the other Node MCU module receives the command from the transmitter side and then performs the respective operations

### 4. RESULT

From the observation, the working of RA depends upon:

- The bandwidth of Wi Fi module.
- Accuracy of Google's speech to text conversion.

The Smart RV has a wide range of applications in: Helping elderly people, Peoples having severe disabilities.

### 5. CONCLUSION

In our proposed system, we are using a smart robotic assistant that will work according to voice command and gesture commands. The voice and gesture commands are converted to text form and are transmitted to the board. From there it is moved to the corresponding motors. Thus, the wheels are rotated. The RA will perform movement operation like move right, left, forward, and backward. The arm will move up and down also able to pick and release objects.

### 6. FUTURE WORKS

Future works that can exploit are the effect of the distance between the mouth and the smart IoT device on the performance of the robot,

and the effect of noise on the speech to text conversion. The cost of the RV can possibly be reduced by using renewable source of energy. The RA provides for more development of applications based on android operating system. Such as, Application based on sensors. This opens door for wide range of possible similar applications such as automation of household tasks and remote starter for car, military applications, dangerous exploration environments. The weight carrying capacity of the robot can be increased by using a stronger metal of the arms, and the motors with higher torque. Also precision of its movement can be improved by using encoders in the error feedback path.

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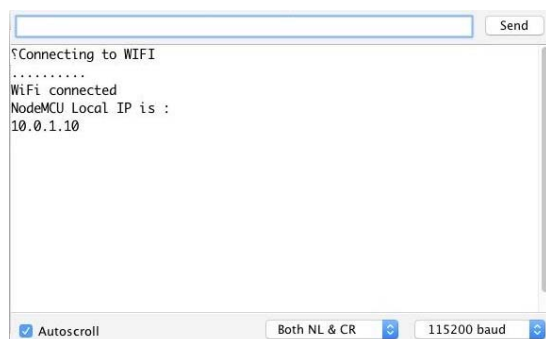
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**7. RESULTS**

**Fig -2:** Gesture and Voice Controlled Robotic Vehicle interfacing



Fig 3 connecting Node MCU to local wifi and obtaining IP address on Arduino IDE serial monitor



**8. REFERENCES**

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