

# PERFORMANCE ANALYSIS OF GESTURE CONTROLLED ROBOTIC CAR

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## Abstract

“ROBOT” is any automatically operated machine or a device that reduces human effort, though it may not look much like a human being or function in a humanlike manner. Advanced, high-performance robots are used today in automobile manufacturing and aircraft assembly, and electronics firms use robotic devices together with other computerized instruments to sort or test finished products. Due to the demand of intelligent systems in every field of technology, automated systems are preferred much for the betterment of the society. The main objective of designing this robo car is to make the world work with more comfort and more easier way with the way they use today, as in the recent era there were too many research in the field of robotics and communication has happened, so we tried to focus both robotics as by designing a small robocar and controlling over RF frequency wirelessly for communication as the ease of access is our main priority we tried to focus also the comfort ability and design a gesture based robotic car. This car not only detects the motion of a human hand but also reacts according to the gesture, the main purpose of the bot is to make the world work with more ease or where the work of precision or accuracy is needed it can also be used for the spying and for the field observation or in the industries where the work precision is made with the use of human hand but it's not comfortable due to hazardous object, we can have example of industries where furnace temperature or a pressure is controlled through the accuracy of a knob controlled with human hand but working beside the boiler or a furnace is always a risk task hence it is not possible so can be operated through gesture at a distance and operated can operate knob by simply sitting in the cabin and through gesture of the hand just like virtually adjusting the knob or the control of the robotic car.

**Keywords:** Gesture Based Robotic Car, Robotic Car, Robocar,

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## 1. INTRODUCTION

In this latest era of robotics the world need to be more advance and to fulfill the robots should understand the human in every aspect here the interface is gesture through which the car is being controlled over RF module. The assigned gesture movement to make the robot locomotive, the gesture of the human is recognized using MPU-6050 module which is an accelerometer/gyroscope which detects the gesture of human as its position varies with hand movement which is an analog signal and then is being converted to a 4 bit digital pulse using a microcontroller ARDUINO UNO. The flow diagram for the project is as shown in fig 1

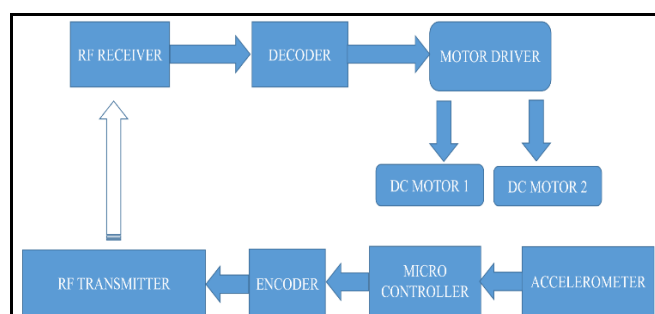


Figure.1

The overall prototype can be divided into two part:

(i) Transmitter section and (ii) Receiver section.

## 2. BLOCK DIAGRAM OF TRANSMITTER

It is the part of the project which makes the interface of hand gesture with digital world and transmits to the robo car the section is divided in three part:

- TRANSDUCER
- CONVERTER
- TRANSMITTER

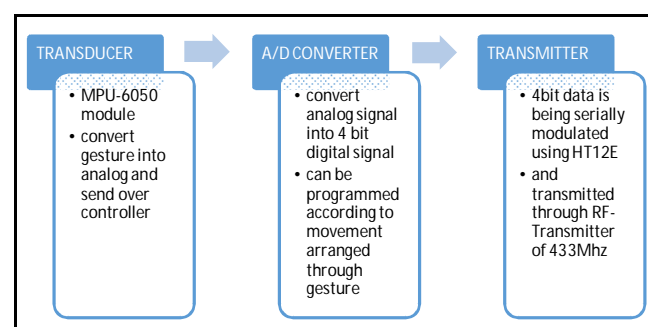


Figure. 2

### 2.1. Transmitter: MPU-6050 Module

We interface or control the machine with our hand movements and if such movement is done to make understand the particular work it termed to be the gesture. If we want digital world to understand this gesture we need to interface this gesture into a form of signal may analog or digital.

So the observation says the movement of hand actually makes the change in position of it with reference to the ground so something which can give electrical signal according to the change in its position which is perfectly done by the module MPU-6050 (as shown in fig.2) Which is a 5pin i2c compatible module with 6 dof makes recognize its position perfectly, the module is being attached to the palm of the hand which detects the wrist movement and gives electrical signal accordingly

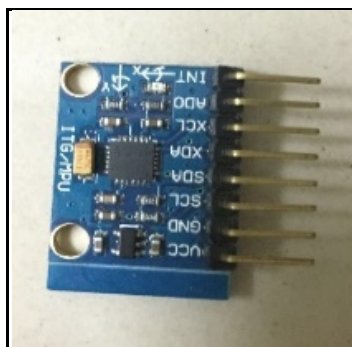


Figure 3

According to the InvenSense MPU-6050 datasheet, this chip contains a 3-axis gyroscope and a 3-axis accelerometer. This makes it a “6 degrees of freedom inertial measurement unit” or 6DOF IMU, for short. Other features include a built in 16-bit analog to digital conversion on each channel and a proprietary Digital Motion Processor™ (DMP) unit.

### 2.2. A/D Converter

This section is done by converting the analog signal to the digital form using microcontroller Arduino UNO, this controller works on atmega-32 and is being programmed to interface with the GY-251 module with i2c interfacing, here the sensor signal is converted into four bit data (here only 4 different output is taken for locomotion of the bot) that is the conversion of analog signal to the digital ones. the connection of the module is given in the picture below:

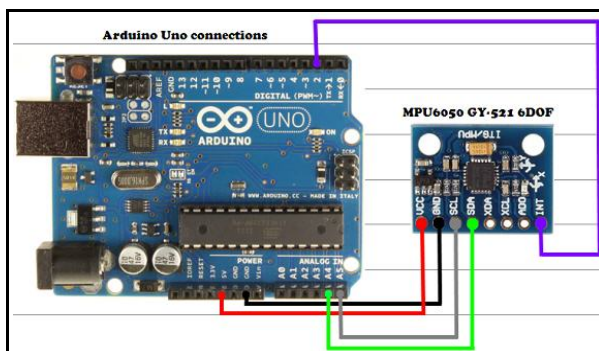


Figure 4

Picture courtesy: <http://42bots.com/tutorials/arduino-uno-and-the-invensense-mpu-6050-6dof-imu/>

### 2.3 Transmitter

Here the four bit parallel data is being converted into 12bit serial data with 8bit addressing mode using the IC HT12E which has a internal crystal and converts the parallel data in serial data with the 8bit address here the modulation of the signal is done the it is being transmitted to the air using RF-Transmitter of 433Mhz. the circuit diagram is given here

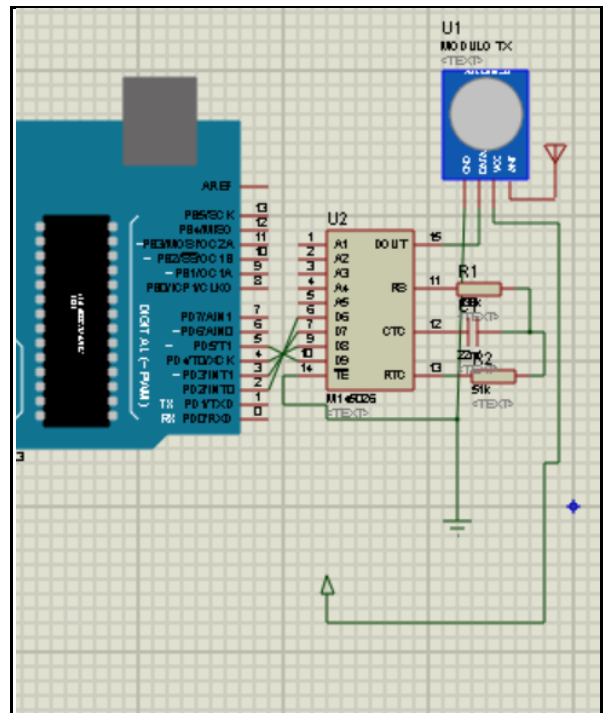


Figure.5

In the figure.5 above the 4bit data from Arduino is send over to HT12E with 8 bit address then the output is send to the RF-Transmitter to the open air the transmitter works with the ASK modulation for signal transmission.

The complete transmitter which can detects the gesture of the hand and transmit it over RF signal to the receiver Prototype is given above

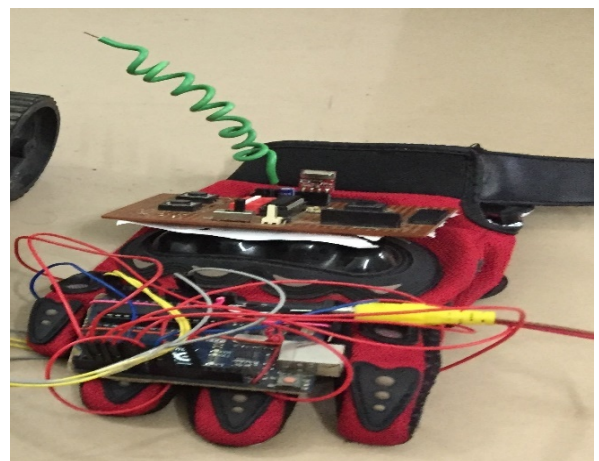


Figure 6. Prototype of a Transmitter

### 3. RECEIVER SECTION

Here the overall circuitry can be explained in the three part where the bot receives the signal decodes and make the suitable power and control the correct motor or actuator, which can be wide explained by the flow below.

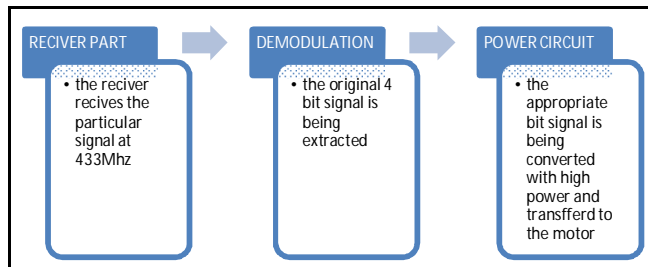


Figure 7

This is the interesting part of the project where the gesture motion is actually being transmitted to a robo car which perform its locomotion according to the gesture signal assigned in transmitter section, here the RF-receiver is used take the signal transmitted and it passes over to the HT12D decoder ic which actually being addressed to the same as of the transmitter to reconstruct the original signal, here after the 4bit data is retrieved is passed with the buffer and relay for the high power response of the battery to actuator.

Table 1: Configuration of actuators

Receiver side gesture	Bit 1	Bit 2	Bit 3	Bit 4	Condition of motor
Supine position	0	0	0	0	No movement
Wrist tilt UP	1	0	1	0	Forward movement
Wrist tilt DOWN	0	1	0	1	Backward movement
Wrist tilt RIGHT	1	0	0	0	Right turn
Wrist tilt LEFT	0	0	1	0	Left turn

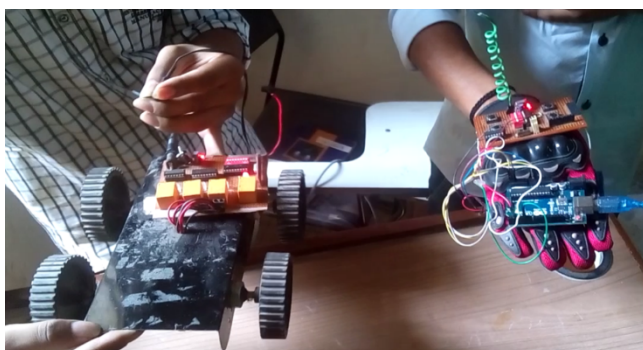


Figure 8. Complete image of the project.

### 4. FUTURE SCOPE

As the project is concern with the work on the basis of gesture of hand or arm it is the new era of advance

automation to control robotic machine more precisely upto the level of human hand movement, and the project can also be used for the disabled person who can't able to move will be useful for operating or observing the machine through its gesture may the hand, neck or any other part of the body movement. Till now the car is designed for the four channel working and can be advance upto 16 channel by just advancing the digital circuit in the receiver and coding at the transmitter.

### 5. CONCLUSION

The overall effort is design to reduce the effort of human not only in the field of machine by automation but also to designing the project for the same with the most simplest way by simply replacing the receiver section with totally digital one. Hence the project can be expanded further to achieve a new height of automation in terms of gesture of the human body or can be designed shadow robot.

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### BIOGRAPHIES



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