# Hand Gesture Controlled Robot using Arduino and MPU6050

**Syambabu Vadlamudi,  D. Naresh Kumar, G. Shravan kumar**

*Abstract***:** *As the use of robots in different fields has been increasing day by day in doing different types works. To make some complicated works easy in industrial areas, military purpose and in any places where human can't go, the gesture controlled robot are used in which the motion of robot is dependent on the human hand. We are using the MPU6050 sensor which has 6-axis of motion tracking device in which accelerometer has 3-axis, gyroscope has the other 3-axis and it also has an additional feature like temperature sensor. Where the acceleration is a keyword of an Inertial Measurement Unit. Accelerometer meter is a device used to sense acceleration off gravity of directions like forward, backward, left and right. The movement of the robot has been controlled by the accelerometer. By which the information from RF Transmitter to the RF Receiver has been pass through wireless communication system. The other parts are control Arduino in which the code is dumped.*

*Keywords* **:** *Accelerometer, MPU6050, Gyroscope, RF Transmitter, RF Receiver, Arduino Nano, Robot, Hand gesture.*

## I. INTRODUCTION

In earlier methods the robots has been controlled by remote, buttons and wires. As the technology has increased day by day from generation to generation the human efforts of doing work are been reduced because of advance in technology. In this system, we are going to develop a Hand Gestures Analyzer Robot Using Arduino where the complete locomotion of the robot is controlled by our hand gestures and signs. Most of the autonomous industrial Robots are highly reliable and with high gain. But some applications require human controlled robots and work accordingly. The controller part is ArduinoNano. This system is mainly developed to reduce the rise for humans where the area is not suitable for them like high temperature area in industry's to pick up and placing. It can also be used

to help army personals to infiltrate into enemy territories to gather the information. To get the operation of Hand Gesture Controlled Robot, there are three major divisions of the system.[1] Firstly data is sensed from the MPU6050 Accelerometer, Gyrosensor used by the Arduino. The Arduino serially receives the signal from the Accelerometer and later it sends the data to RF transceiver. Next the Communication through air occursfrom the RF Transceiver in transmitter mode to RF transceiver in Receiver mode. The RF Transceiver, after receiving data from Arduino, transmits it into free space and that is received by the RF transceiver.[2] Finally, the data received by the RF transceiver is send to the ArduinoNano and from there the Information signals is sent to the Motor Driver IC,[3] that can make the moment the wheel motors of the robot start. The movement of robot is forward, backward, left, right according to the tilt of the Hands motion given to the RF transceiver.

## II. PROPOSED APPRAOCH

### A. MPU 6050

It is introduced to the world for the first time and only 6-axis moment tracking and analysing device designed for low power consumption, low cost and high performance. It has an inbuilt accelerometer and a gyroscope along with a temperature sensor.It has three axis of MEMS gyroscope and three axis of MEMS accelerometer. It is compatible with 3.3v to 5v power supply and is very useful in motion tracking.[4]

### B. Accelerometer:-

An Accelerometer is a three dimensional device from whichwe get an binary datain X, Y, Z directions. ConceptuallyMPU6050 behaves as a heavy mass on a spring. When the accelerometer gets the signal, then it accelerates and the mass which acts on it displaced to the point where spring is to accelerate  It is device that measures proper acceleration. It has 6 pins. 3 pins are for X, Y, Z axis. They are used as one  for Power supply, another pin for ground and the Third for self-test.

### C. Gyroscope:

It is known as angular rate sensor or angular velocity sensor which senses change in rotational motion or orientation. Spinning wheel or disc present in Gyroscope rotates freely in its axis to assume any orientation by itself. It is used in inertial navigation system, such has Hubble telescope. It also has 3 axis like spin axis, input axis, output axis.

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### D. Arduino Nano:

The ArduinoNano is a minute, less complex, and PCB-easily handled based on the ATmega328PArchitecture. It is very similar to that as the Arduino Uno, but in a different way. It is insufficient of only a DC power jack, and easily works with a USB cable so there is no need of using standard one. It has 14 digital pins and 8 analog pins. It takes hardly take 5-10 minutes to upload you first program to ArduinoNano. Powering pins are 1)USB Jack 2)Vin pin 3)+5vpin[5]
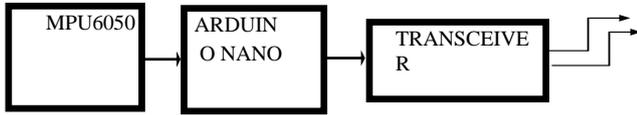
**Fig 1: Transmitter Block Diagram**
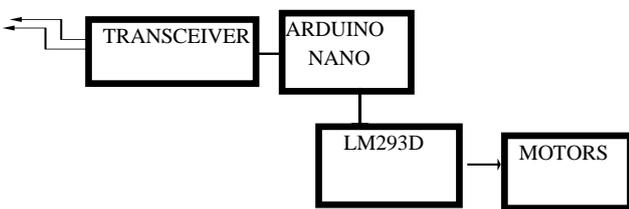
**Fig 2: Receiver block diagram**

### E. Transceiver:

Transceiver is a device which has both transmitter and receiver in it. RF transceiver the receiver has a feature of being silenced while transmitting the data. An electronic switch here used connection establishment from the transmitter to receiver to the antenna and prevents the transmitting signal from damaging the receiver. It works in half duplex mode. Some transceivers works in full duplex mode also.

### F. Working:

As we know that signal analysed robot is a sensor controlled robot .It has two parts: Transmitter section and Receiver section. When the robot is switched on, the transmitter used to monitor the MPU6050 sensor serially transmitting the data. This data is noted and stored by the Arduino, which then in turn gives the corresponding data to the transceiver, depends on the orientation of the MPU6050 Sensor. The transceiver transmits the data into the free space.[6]

At the receiver part, the RF transceiver is used to receive the data and again transmits it to the Arduino. At the Arduino the data will be converted that is received from the transceiver and gives signal to the motor driver IC. Based on the data received the locomotion of the motors are controlled by LM293D. The movement of the robot is only to move front,back,Left, Right and stop.[7]

### III. RESULT ANALYSIS

| . DIRECTION | X-AXIS | Y-AXIS | Z-AXIS |
|---|---|---|---|
| LEFT | a>9 & a<17 | - | - |
| RIGHT | x>-8 & x<-17 | - | - |
| FROUNT | y>-9 && y<-17 | - | - |
| BACK | y>9 && y<17 | - | - |
| STOP | - | - | z>11 & z<15 |
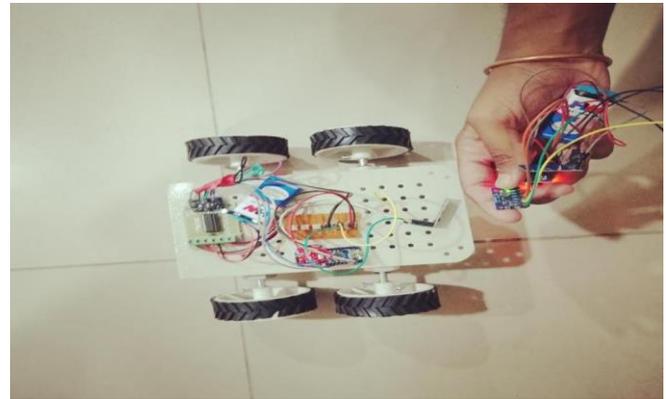


**Fig 3:Hand gesture control robot**
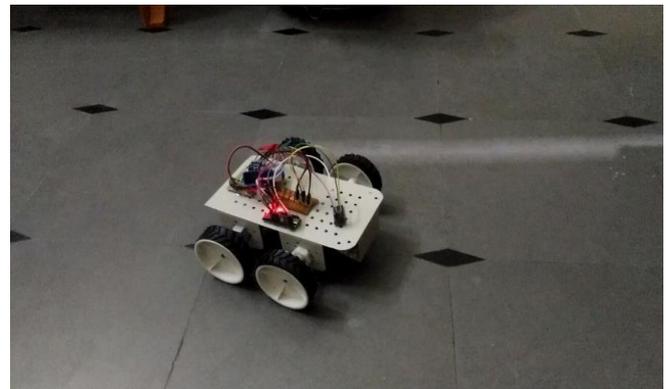


**Fig 4: Hand gesture control robot without transmission section**

### IV. CONCLUSION

In this paper, the robot has been analyse and worked by hand gesture. It can be moved according to the hand gesture of the user .The RF module is working at a frequency of 434MHZ and had a range of 100meters.This are also used to protect the human life during earthquakes and also landslides .Also used to detaching the bombs in military purpose .we can also track the robot using GPS technology . The main applications is used in used in military purpose to destroy the bombs which saves the human life. Also it helps for surgery in medical field. It is used in industry's where the temperature is high and places where human can't work. In future We can also control the robot by voice. Also detect the place where it has been present.

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