

# Design and Development of Gesture Controlled Robot

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**Abstract** - Basically robots are manufactured to perform specific tasks which human cannot perform. We can make use of robots where conditions are quite certain like rescue operations, fire fighting. Robots follow the instruction of human and can perform task on that basis. In this way, human can instruct the robot to perform specific task in certain situation. Hence we can make use of robots for those tasks which are harmful for humans. This paper describes about hand gesture robot which can be controlled by normal hand gestures. Mainly it consists of two parts transmitter and receiver. Transmitter will transmit the signal according to the position of accelerometer and receiver will receive the signal. Here the program is designed by Arduino uno.

breadboard and place it on chassis. We placed the arduino on chassis. The analog output values from 3 axis accelerometer are read and converted to digital values by arduino. Then these digital values by arduino. Then these digital values are sent to the radio frequency transmitter and from RF transmitter to RF receiver. So according to the signal received at RF receiver robot moves to a particular direction.

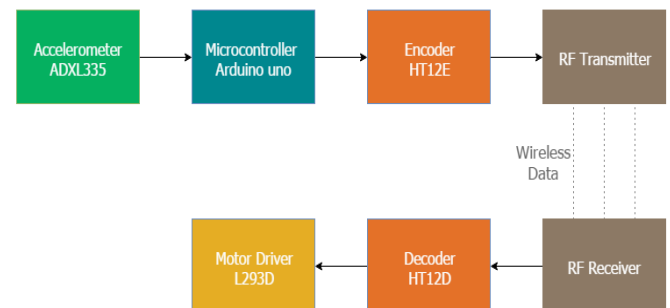
## 1. Introduction

Now a days robotics is a emerging technology in the field of science. Various universities in the world are inventing new things in the field. There are two types of robots viz. wireless and wired and both need controller device. Compared to the methods of controlling robots by means of physical devices, the method of gesture control is becoming very popular in recent years. Gesture means movement of hand and gesture control means recognizing and interpreting these movements controlling a robotic system without any physical system. By using this technology human machine interaction is becoming easy. Basically it is wireless type of robotic system. Objective of this project is to develop a gesture controlled robot. Components used are Arduino uno mini, accelerometer sensor ADXL335, RF module transmitter and receiver, encoder, decoder, etc.

At first stage we design the circuit for transmitter and receiver and wrote the codes for arduino boards of transmitter and receiver and for stage two we embedded these programs on arduino boards using arduino software and mounting camera and the metal detector circuit on our robot.

## 2. Proposed Work:

The whole project is separated into two parts viz. transmitter and receiver circuit. Transmitter circuit consists Arduino uno mini, ADXL335(3 axis accelerometer), RF receiver module, antenna, motor drive, Ht12E, two DC motors. We fixed the wheels on the chassis and mounted the Dc motors on the back wheels and use dummy wheels for the front. Mounted the L293DIC on



Block Diagram

## 3. Hardware used:

### 3.1 Arduino Nano

Arduino nano is a small microcontroller board. It is based on ATmega328P. It has some functionality as the Arduino uno. It works with Mini B USB cable.

Specifications:

Architecture	AVR
Operating voltage	5V
Digital i/o pins	22(6 of which are PWM)
PWM output	6
Analog IN pin	8
DC current per I/O pins	4amp
Input voltage	7-12 V

It has 32kb flash memory. Every pin from the 14 pins can be used as an input or output. It's operating voltage is 5V. every pin can provide or receive upto 40 mA. Also, it has internal pull up resistor of 20k ohms. Nano has 8 analog

inputs, these provide 10 bits of resolution. It is very flexible and also easy to use hardware.

### 3.2 Accelerometer

We have used accelerometer sensor ADXL335, which is 3-axis viz. x-axis, Y-axis and z-axis. It is really compact in structure. Because of its small size it is suitable for hand gesture. Also it requires low power to operate. It operates on 3.3V from Arduino board. ADXL335 has 6 pins, 3 pins for x, y, z axis and other three are for power supply (VCC), ground (GND) and self test (ST). ADXL335 has many advantages such as low cost, compact size. Also it has very good temperature stability.

### 3.3 Encoder

We have used HT12E encoder. It has 18 pins. We use encoder for standardization purpose. It converts information from one format to another required standard format. HT12E is 2 raised to 12<sup>th</sup> series encoder IC. The main purpose of HT12E is, it converts parallel input into serial output and then transmission through RF module takes place i.e. signal is sent to RF transmitter. Through RF transmitter it is then transferred to RF receiver. There is need to decode this signal in receiver circuit. So we use decoder. Its operating voltage is 5V.

### 3.4 Decoder

Decoder we use should be of same series. HT12D is the decoder. It also consists of 18 pins.

### 3.5 RF Transmitter and Receiver

RF module has one transmitter and receiver. RF module is used for transfer of radio signal in between two devices. Each of module has different operating frequency. We have used 443 MHz RF, as it is most suitable for our project. There is need to use encoder and decoder to encode information before transmission through RF transmitter and decode information after receiving through RF receiver. It operates on 5V power supply.

### 3.6 Motor drive

It is used for controlling speed of motor. Motor drive we used is L293D. It has total 16 pins among these 16 pins 4 are input pins, 4 are output pins, 4 are VCC pins and 4 are ground pins. The main purpose of motor drive in our project is to control two DC motor simultaneously in one direction.

## 4. Working

The robot is wireless. It works on radio signal transfer through radio module. The gesture controlled robot is the robot which moves according to hand gestures. It consists of two sections mainly i.e. transmitter circuit and receiver

circuit. Transmitter circuit consists of accelerometer sensor which senses it in all three directions and passes signal to Arduino. Arduino reads analog output values from accelerometer and convert it into digital values. Then this signal is encoded within the encoder for standardization purpose and sent via radio frequency transmitter to receiver circuit is fitted on a hand glove. So, controller can wear this glove and control robot according to his hand movements.

## 5. Receiver circuit & Transmitter Circuit

Now, the receiver circuit consists of antenna, RF receiver, decoder, motor drive, signal transferred by RF transmitter is caught by antenna and then sent to radio frequency receiver. This signal needs to be decoded, which is done by the decoder and then transferred to motor drive. According to this signal motor drive controls the direction of DC motor on robot and finally according to signal our robot moves in that specific direction.

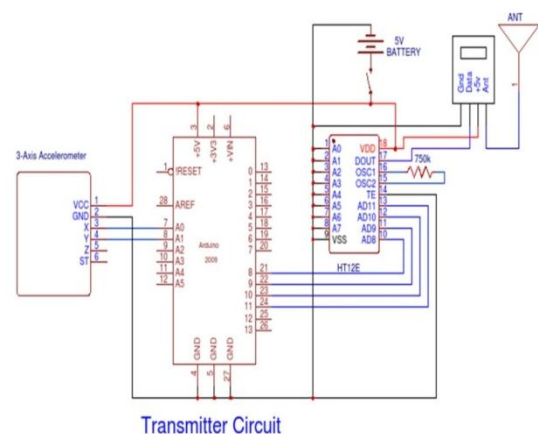


Fig:-Transmitter Circuit

We have introduced a metal detector kit in this robot. This metal detector can detect metal from distance. It is non-contact type metal detector we have used here. After some more enhancement in the robot we can use the robot for landmine detection in military. Also, we have used camera for surveillance purpose.

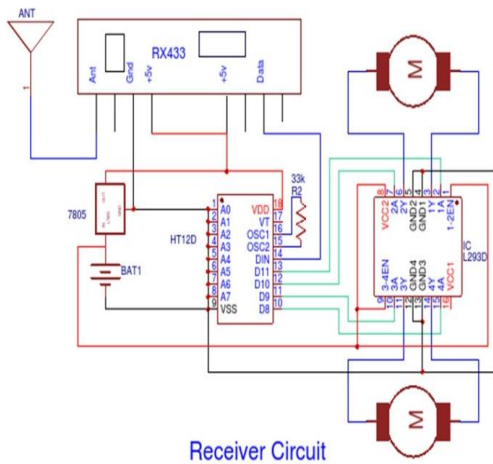


Fig:-Receiver circuit

## 6. Conclusion

In this paper, the robot which works on hand gestures has been developed. The robot is wireless and moves according to movements of hands. This is possible because we have used RF module which transmits and receives the radio signals between two devices. RF module used is operating at 433 MHz. the range of our robot is between 50-80 meters. We added metal detector circuit. So that after some more evolution it can be used for landmine detection. Also camera has been used for surveillance purpose.

## 7. Future scope

It can also be upgraded to bomb detecting robot as it has robotic arm it can also lift the bomb. GPS system can be added to the robot by the help of which its location can be tracked.

## 8. Acknowledgement

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## 9. References

- [1] RiyazMansuri, SandeshVakale, AshishShinde, Tanveer Patel, "Hand Gesture Control Robot Vechile", IJECT, Vol-4, Issue SPL-2, PP. 77-80, JAN-MARCH 2013.
- [2] Recimoto, J. GestureWrist and GesturePad:"Unobtrusive Wearable Interaction Devices", Paper..Tokyo: Sony Computer Science Laboratories, Inc,(2001)

[3] Zimmerman, T., Smith, J.R., Paradiso, J.A.Allport,D., Gershenfeld, N. "Applying Electric FieldSensing to Human-Computer Interfaces", Denver:ACM Press, (1995)

[4] Mitsubishi Electric Research Laboratories. MERL (23.01.2007) "Television Set Controlled by Hand Gestures".