GESTURE CONTROLLED ROBOT CAR

Project By

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Introduction:

This is a Radio Frequency transmitted gesture-controlled Robot car that is controlled by a controller placed at hand. The controller is the Transmitter circuit that sends the gestures as signals that are received by the car that moves accordingly. The car is the receiver circuit.

Internet of Things, or IoT, refers to the expansion of the capabilities of physical devices. In order to enable the items to sense their surroundings with the least amount of human involvement, they are connected to the Internet. With the use of wireless networks, these devices gather, distribute, and utilise data to get the desired results. By fusing the digital and physical worlds, the Internet of Things is making the environment around us smarter and more responsive. The term "gesture" refers to human hand and face motion. The primary goal of this project is to control the car using hand gestures. An accelerometer is used to detect human hand motions. The necessary activities for the human gesture are performed as a result of the coding. These sensed signals are analysed, and then using an RF transceiver module, they are sent to the robotic car at the receiving portion. The vehicle therefore makes the necessary movement.

Objectives:

- **Connect and communicate with physical devices:** The Internet of Things (IoT) makes it easier for humans and machines to communicate.
- **Smarter and quicker invention**: Any tool's speed is a highly important component. IoT devices are able to provide the required output with excellent speed and precision thanks to the utilization of sensors.
- **Smart detecting abilities:** Sensors like accelerometers can detect extremely small movements, such a tiny vibration, that humans are unable to even notice. Its tolerance ranges from 5 to 10%. As a result, the tool operates very precisely and can be used for tasks where errors must be kept to a minimum.
- **Convenience:** On a very large scale, we can manifest very little movement. We can accomplish the most with the least amount of human energy in this way.

Motivation:

The inspiration for this concept originated from a disabled guy who was struggling to drive his wheelchair by hand. Therefore, the concept of creating a device that would enable such persons to operate their chairs without even having to touch the wheels of their chairs.

Required Components:

1. 1HT12D IC

2. LM7805 Voltage Regulator

3. RF 433 Transmitter Receiver Module

4. Resistor – 100 ohm

5. Resistor – 33k ohm

6. Resistor – 680k ohm

7. Resistor – 100k ohm

8. L293D Motor Driver IC

9. 6V DC TT motors yellow

10. Yellow Wheels

11. 6DOF MPU6050

12. Arduino Pro mini

13. HT12E IC

14. High quality 9v battery

15. 9v Battery Connector

16. 18650 3.7V 5200mah li-ion rechargeable battery

17. 18650 Battery holder

18. li-ion bat universal charger

19. Breadboard - Large

20. Breadboard - Small

21. 2pin Rocker Switch

22. LED – Green

23. LED – Blue

24. Breadboard wires 80

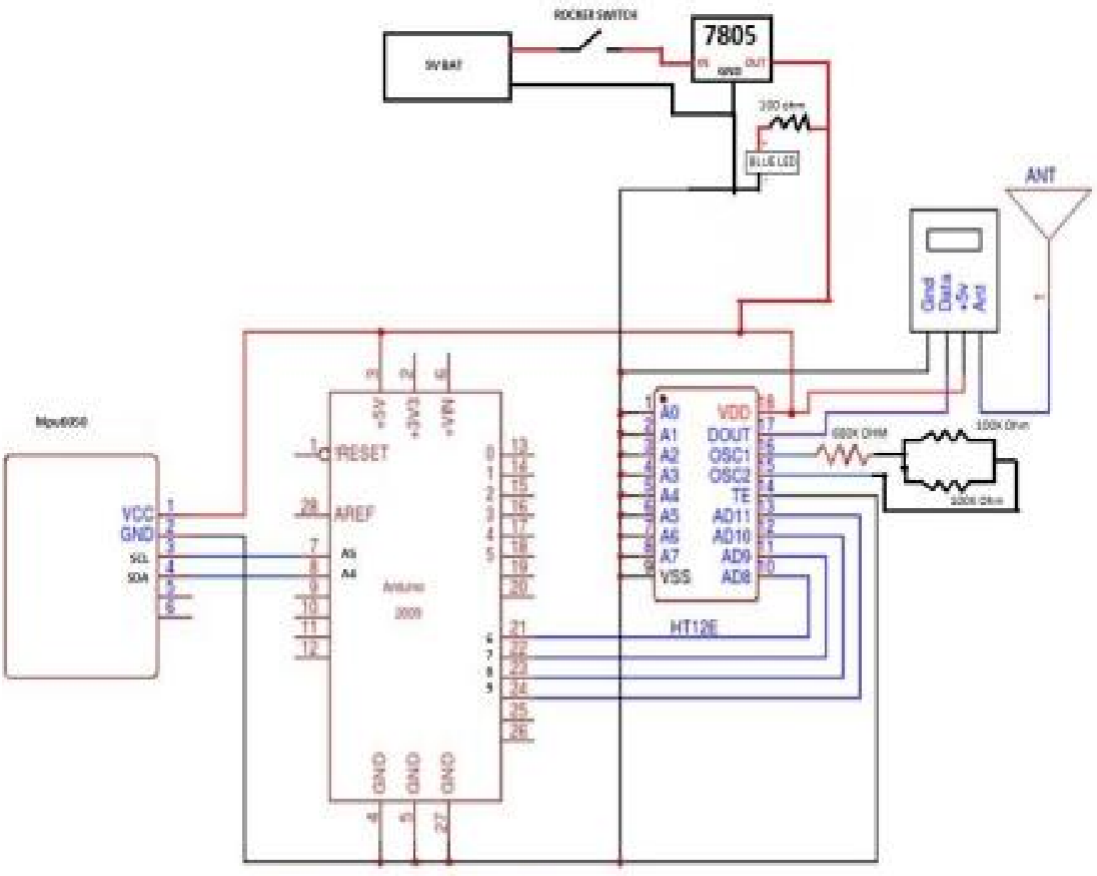
25. Red-Black Wire (5 Feet required)

26. Jumper Wires (M-F | M-F | F-F)

27. Non texture matte black PVC

28. Tape – Soldering – ZipTie – Hot Glue

TRANSMITTER CIRCUIT:



Transmitter Circuit

This is the transmitter circuit that stays at the hand.

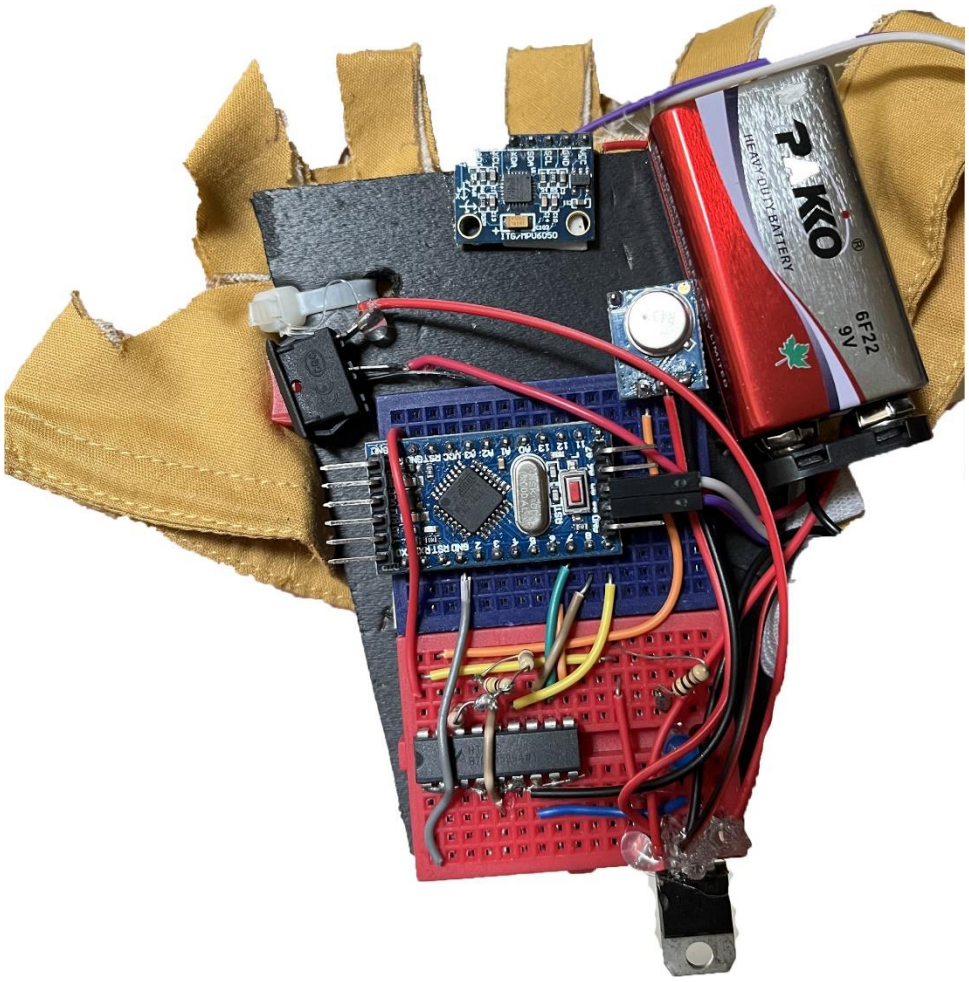
● Here the circuit is powered by a 9V DC battery. The 9V is converted to 5V by a 7805 Voltage regulator IC. That 5v Supply is connected to power the Arduino pro mini, gyro-acc, RF module , and HT12E.

Caution: 9V is not connected Directly to the system

● A rocker switch is connected to the 9V Battery to control the power flow to the system.

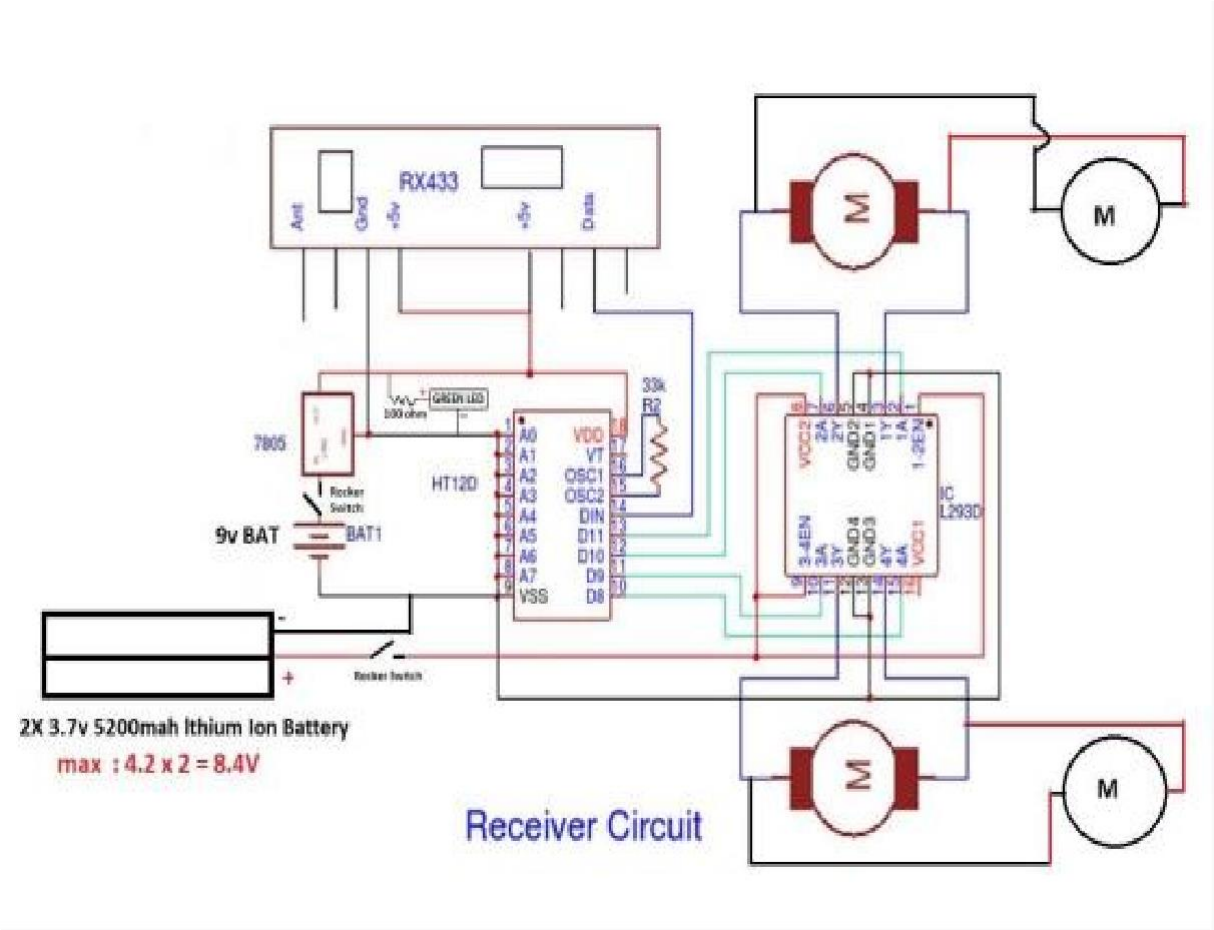
● A blue led is connected to signal the proper power supply to the system.

● The gyro-acc measures the hand's acceleration (left-right-Forward-Backward) and sends signals to the receiver circuit accordingly.



Picture: Transmitter Circuit on Gloves

RECEIVER CIRCUIT:



This is the Receiver circuit that is the robot car itself.

● 4 DC motors are used. 2 motors on each side are connected within themselves as shown in figure.

● Here the circuit is powered by a 9V DC battery. The 9V is converted to 5V by a 7805 Voltage regulator IC. That 5v Supply is connected to power the HT12D, RF Module,L293D, LEDs.

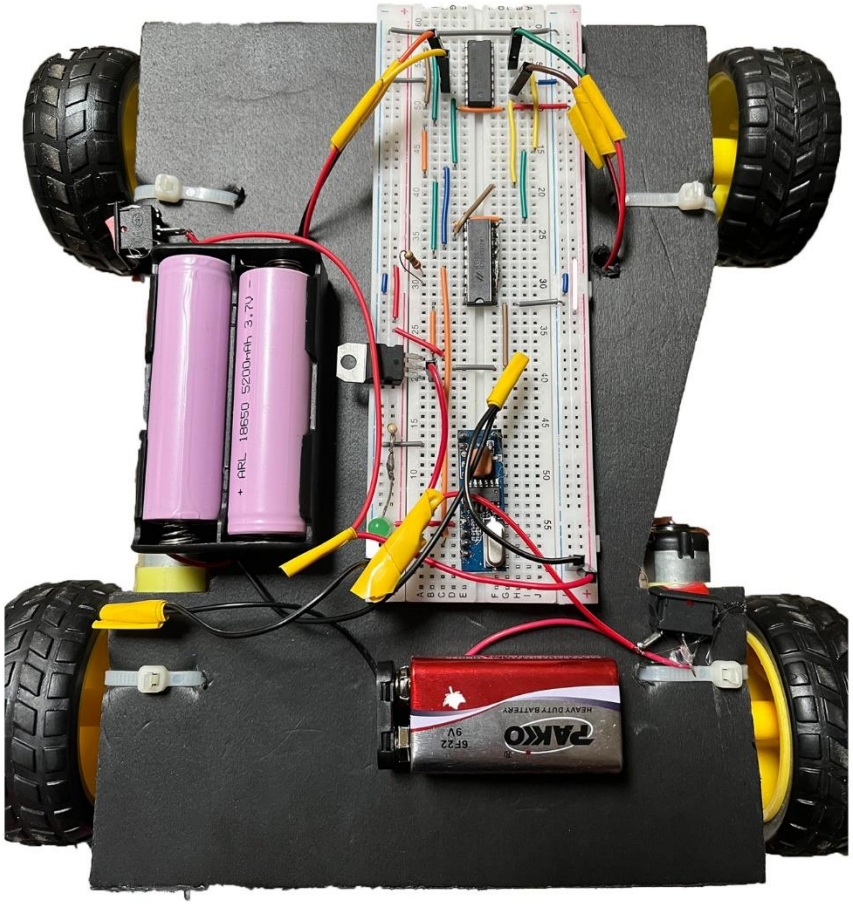
● *Caution: 9V is not connected Directly to the system*

● Again, 2 3.7V li-ion is used to directly power the motors and is connected to the L293D IC.

● Two rocker switches connected to the 9V Battery and Li-ion Battery to control the power flow to each of the systems.

● A Green led is connected to signal the proper power supply to the system.

● The signal sent by the transmitter is received and the car moves accordingly.



Picture: Receiver Circuit on Car body

SYSTEM ARCHITECTURE

1**. The MPU-6050(x1)** is a module that combines a 3-axis accelerometer (AX, AY, AZ) and a 3-axis gyroscope (GX, GY GZ). We have only used the accelerometer in this experiment.

2. **Chassis(x1):** This is the robotic car's frame.

3. **Arduino Pro Mini (x2):** This is the transmitter and receiver's brain. One Arduino is used for transmitting data, and the other Arduino is utilized for data reception.

4. **433Mhz TX RX Module: This** module will be used for transmitting and receiving the data from MPU-6050.

5. **Additional Required Components:** Right Hand Glove, Mini Breadboard, Wheels, and Jumper Wires.

6. **L293D:** This is the Motor Driver to drive the motors of the Car.

IMPLEMENTATION

An accelerometer mounted on the hand provides the measurements (hand movement). The Arduino mini receives these readings.

HT12E uses Arduino to encode the readings. These readings are transmitted from the encoder to the receiver mounted on the automobile via an RF transmitter.

The HT12D decodes these readings before sending them to the receiver. Following decoding, the readings are sent to the L293D motor driver, who then moves the motors. Thus, the car's movement is accomplished.

Working:

Five hand motions can be recognized by the car. They are STOP, RIGHT,LEFT,BACKWARD, ,FORWARD.

Code:

```
#include  "Wire.h"
#include <MPU6050_light.h>

int out1 = 6;   //output1 for HT12E IC
int out2 = 7;   //output1 for HT12E IC
int out3 = 8;  //output1 for HT12E IC
int out4 = 9;  //output1 for HT12E IC

int xval;
int yval;
unsigned long timer = 0;

MPU6050 mpu(Wire);



void setup() {
  pinMode(out1, OUTPUT);
  pinMode(out2, OUTPUT);
  pinMode(out3, OUTPUT);
  pinMode(out4, OUTPUT);

  Serial.begin(9600);
  Wire.begin();
  byte status = mpu.begin();
  Serial.print(F("MPU6050 status: "));
  Serial.println(status);
  while (status != 0) { } // stop everything if could not connect to
MPU6050
  Serial.println(F("Calculating offsets, do not move MPU6050"));
  delay(1000);
  mpu.calcOffsets(); // gyro and accelero
  Serial.println("Done!\n");
}
void loop() {
  mpu.update();
  xval = mpu.getAngleX();
  yval = mpu.getAngleY();
 /*
  if ((millis() - timer) > 10) { // print data every 10ms
    Serial.print("X : ");
    // xval = mpu.getAngleX();
    Serial.print(xval);
    Serial.print("\tY : ");
    // yval = mpu.getAngleY();
    Serial.print(yval);
    Serial.print("\tZ : ");
    Serial.println(mpu.getAngleZ());
```

```
timer = millis();
    } */

  //timer = millis();

    if ((xval > -17 && xval < 17) && (yval > -17 && yval < 17)) //stop
    {
      digitalWrite(out1, LOW);
      digitalWrite(out2, LOW);
      digitalWrite(out3, LOW);
      digitalWrite(out4, LOW);
      Serial.println("S");
    }

    else
    {
      if ((xval > -1 && xval < 10) && (yval > -35 && yval < -8))
//forward
      {
        digitalWrite(out1, HIGH);
        digitalWrite(out2, LOW);
        digitalWrite(out3, HIGH);
        digitalWrite(out4, LOW);
        Serial.println("F");

      }
      if ((xval > -5 && xval < 15) && (yval > 22 && yval < 35))
//backward
      {
        digitalWrite(out1, LOW);
        digitalWrite(out2, HIGH);
        digitalWrite(out3, LOW);
        digitalWrite(out4, HIGH);
        Serial.println("B");

      }
      if ((xval < -25 && xval > -40) && (yval < 6 && yval > -6))
//right
      {


 digitalWrite(out1, HIGH);
        digitalWrite(out2, LOW);
        digitalWrite(out3, LOW);
        digitalWrite(out4, LOW);
        Serial.println("R");
      }

      if ((xval > 28 && xval < 30) && (yval > -8 && yval < 3)) //left
      {
       digitalWrite(out1, LOW);
        digitalWrite(out2, LOW);
        digitalWrite(out3, HIGH);
        digitalWrite(out4, LOW);
Serial.println("L");
      }
```

```
    }
}
```

Cost:

SL. No.	Product Name	Unit Price	Qty	Total
1.	1HT12D IC	128	1	128
2.	LM7805 Voltage Regulator	35	2	70
3.	RF 433 Transmitter Receiver Module	490	1	490
4.	Resistor – 100 ohm	1.25	2	2.5
5.	Resistor – 33k ohm	1.25	1	1.25
6.	Resistor – 680k ohm	1.25	1	1.25
7.	Resistor – 100k ohm	1.25	2	2.5
8.	L293D Motor Driver IC	116	1	116
9.	6V DC TT motors yellow	93	4	372
10.	Yellow Wheels	62	4	248
	. 6DOF MPU6050	295	1	295
	. Arduino Pro mini	580	1	580
13.	HT12E IC	170	1	10
14.	High quality 9v battery	45	3	135
15.	9v Battery Connector	15	2	30
16.	18650 3.7V 5200mah li-ion rechargeable battery	300	2	600
17.	18650 Battery holder 2s	48	1	48
18.	li-ion bat universal charger	295	1	295
19.	Breadboard - Large	159	1	159
20.	Breadboard - Small	64	2	128
21.	2pin Rocker Switch	12	3	36
22.	LED – Green	1.5	1	1.5
23.	LED – Blue	1.5	1	1.5
24.	Breadboard wires	80	As req.	80
25.	Red-Black Wire (5 Feet required)	20tk / Feet	4 feet	80
	. Jumper Wires (M-F | M-F | F-F)	2.25	12	27
27.	Non texture matte black PVC (1.3sq feet(apprx.) required)	85tk/sq ft	1.3 sq.ft	110.5
	. Tape – Soldering – ZipTie – Hot Glue	As Required	As req.	190

Advantages

- The system is simple to use.
- The robot has a very low cost of production and requires little maintenance.
- Operation Is Completely Wireless

Applications

- For quick, easy, and simple installations Robots that can be controlled wirelessly are particularly useful for a variety of tasks, such as military remote surveillance and robots that disperse bombs.
- Physically disabled people in wheelchairs can employ robots that are controlled by hand gestures.
- It is possible to create industrial-grade robotic arms controlled by hand gestures.
- These robots can be utilized in civil engineering and construction fields.

CONCLUSION AND FUTURE WORK

The goal of employing gestures to control a robot was successfully accomplished. When the hands are tilted, the robot responds appropriately. The on-board batteries take up a lot of room and weigh a lot. You might utilize a different power source for the batteries or swap out the current DC motors for ones that use less energy. Second, because RF is used for wireless communication, the range is only about 50–80 m. Using a GSM module for wireless transmission can fix this issue. Nearly every country in the world has GSM infrastructure deployed. In addition to wireless connectivity, GSM offers a considerable range.

The adoption of IoT also drastically reduces the amount of time needed to accomplish jobs. Additionally, there is a significant decrease in human error and excellent precision in the data. The usage of powerful batteries and low power consumption sensors helps get around restrictions like high power consumptions. Although the human hand can move in a variety of directions, the automobile can only detect five of them. The project's next step will therefore be to add the ability to recognize other hand motions and have the car respond in accordance.

Thirdly, an on-board camera can be added to allow remote observers to keep an eye on the robot. The only equipment required is a wireless camera that can broadcast and a receiver module that can stream live video.