

GE107 : Tinkering Lab Summer Session

SMART GESTURE CONTROLLER



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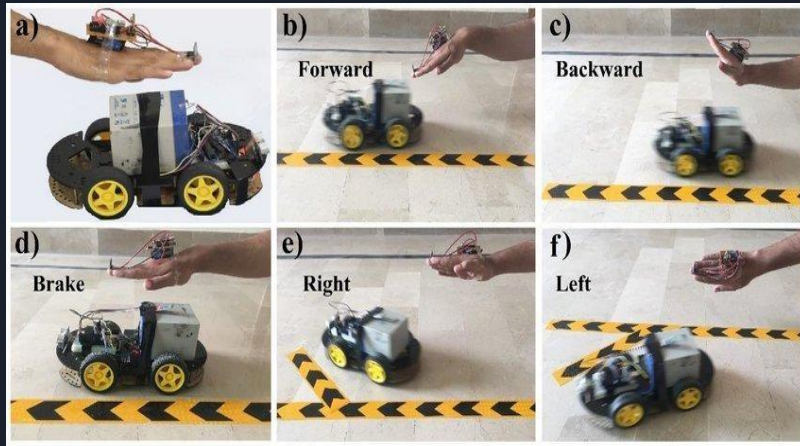
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Proposal :

- The proposed control of a machine through hand gestures is a mathematical process of data acquisition.
- This process focuses on capturing hand movements ,which will be determined as static and dynamic movements.
- In order to be able to control a machine,the specific tasks that it performs must be completed,and in this area, automatic learning algorithms are investigated.



Hand gesture recognition is of great importance for human computer interaction because of its extensive applications in virtual reality and sign language recognition.



Brief Understanding of our Project

- Our gesture- controlled robot works based on accelerometer outputs, which corresponds to hand movements and sends the data to a comparator which assigns specific voltage level to the movements.
- This information is transferred to an encoder which encodes it before RF transmission.
- On the other end, the information is received wirelessly via RF. These decisions are sent to the motor driver, which triggers the motors in specific configurations to make the robot move in different directions.



Objectives

- To develop a car that can be controlled by moving hand in the direction we want and the car will follow .
- The car moves backward,forward , left and right when we tilt our hand to backward,forward,left and right respectively and stops when our palm is parallel to the ground .Each movement generates the value in its axis .
- The project has two parts : 1. Transmission station placed on the hand 2. Reception one is the car
- Connect and Communicate with physical devices: To facilitate a wireless communication between human and machine.
- A hand gesture control car is a kind of robot which is capable of carrying complex actions automatically or under human supervision. These can be used in various fields such as industries, research, military and healthcare.
- Smart sensing capabilities: Sensors such as accelerometer can sense very minute movement ,for instance a little vibration , which humans cannot even recognize. It has tolerance just about 5 -10%. So the device works very precisely and can be used for such works where errors must be minimized



Hardware requirements

1. Arduino UNO.
2. ADXL335 accelerometer.
3. RF Module.
4. L293d Motor driver.
5. Batteries.

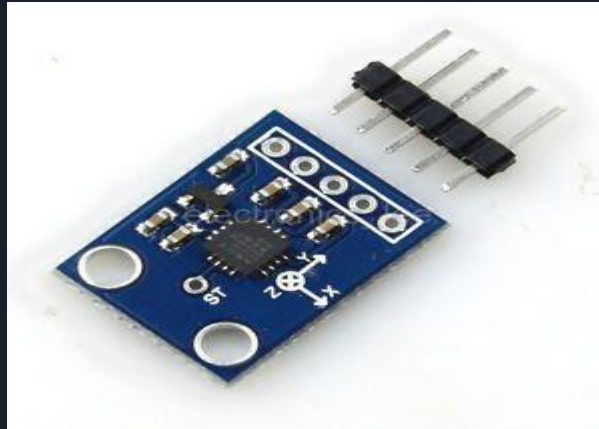
Arduino UNO

Arduino UNO is an open source types microcontroller which uses abilities of AtMega328 AVR Microcontroller which is removable and dual inline microcontroller to work flexibility, compact and provides desired function. Arduino UNO contains 14 I/O pins with 6 PWM pins. It can be interfaced with any any type of electronic types to design embedded system and IOT projects. It is cheaper module which is easily available and easy to interact for the beginner to work on.



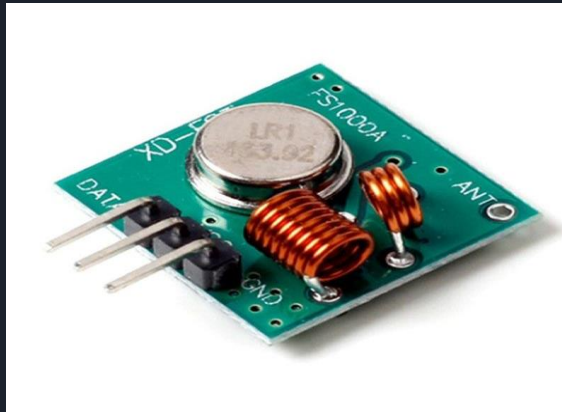
ADXL335 accelerometer

- At the heart of the Hand Gesture Controller is a low-power three-axis accelerometer ADXL335.
- It can measure the static acceleration due to gravity in tilt-sensing applications. ADXL335 is a three axis sensing accelerometer.
- The accelerometer is calibrated to detect the position of our arm. The human hand movement is consolidated at three main positions. They are upright position, down position and slant position.



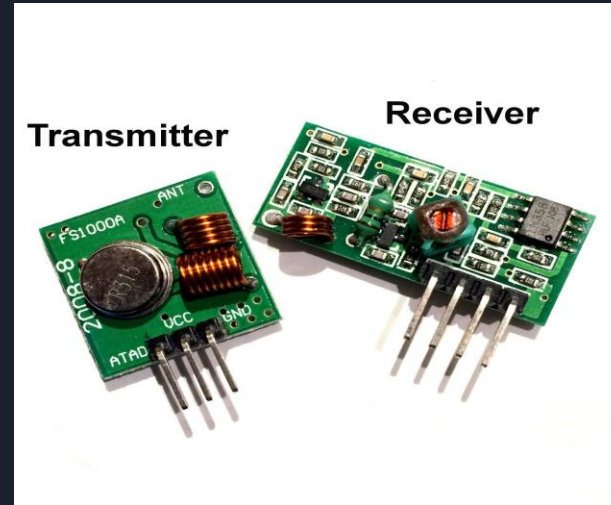
RF Transmitter

The transmitter is an electronic device which converts measurements from a sensor into a signal, and sends it, via wired or wireless, to be received by a control device. The transmitter(Tx) operates at 434 MHz frequency which receives serial data and transmits it wirelessly through RF antenna. This transmission occurs at the rate of 1kbps-10kbps.

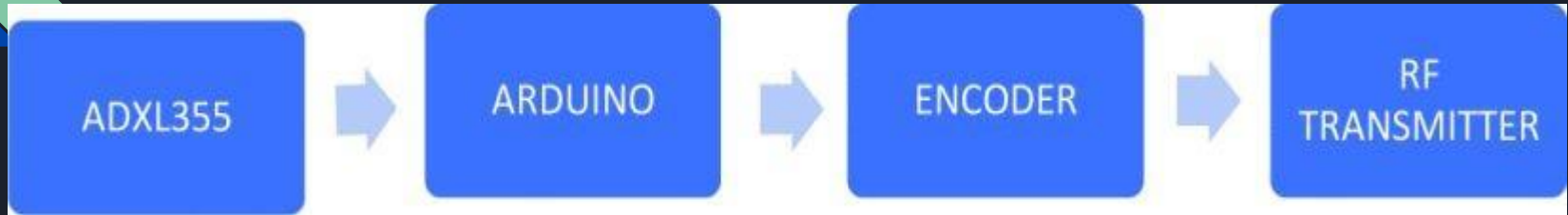


RF Receiver

RF receivers are one of the easiest ways to add wireless control. It receives the data sent by gesture device whose working is similar to the transmitter. The data pin is connected to HT12D decoder.



Transmitter block diagram

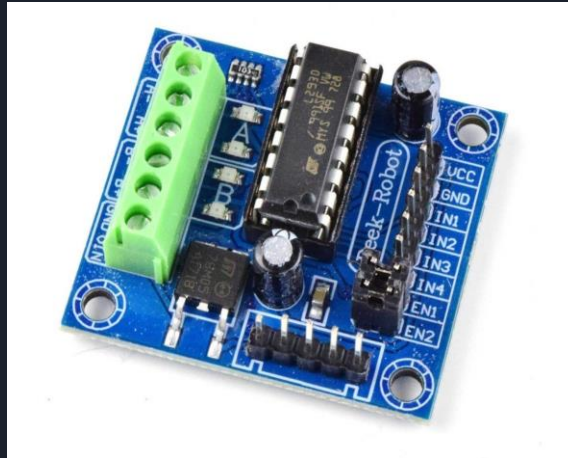


Receiver block diagram



L293D Motor driver Module

As the name suggests, this module is a kind of drive of the project. It is quadrupled high current $\frac{1}{2}$ H driver which drives the two DC motor or stepper motor in same or different direction independently. It is medium power motor driver having a operating voltage of 4.5 to 36 volts having the current of 600mA. The transaction time of motor driver is 300ns. This module consists of 16 pins with DIP, TSSOP, SOIC packages. It is used in various to digital circuits to drive high current motors or latching relay.



Battery

There is need of two Zinc Carbon batteries which are used to supply the DC power of 9 volts to the circuits. Out the two, one is used to provide power to the transmitter circuit i.e Arduino UNO and ADXL335 accelerometer. Second battery is used to provide the power to the receiver unit i.e Arduino UNO, motor driver.



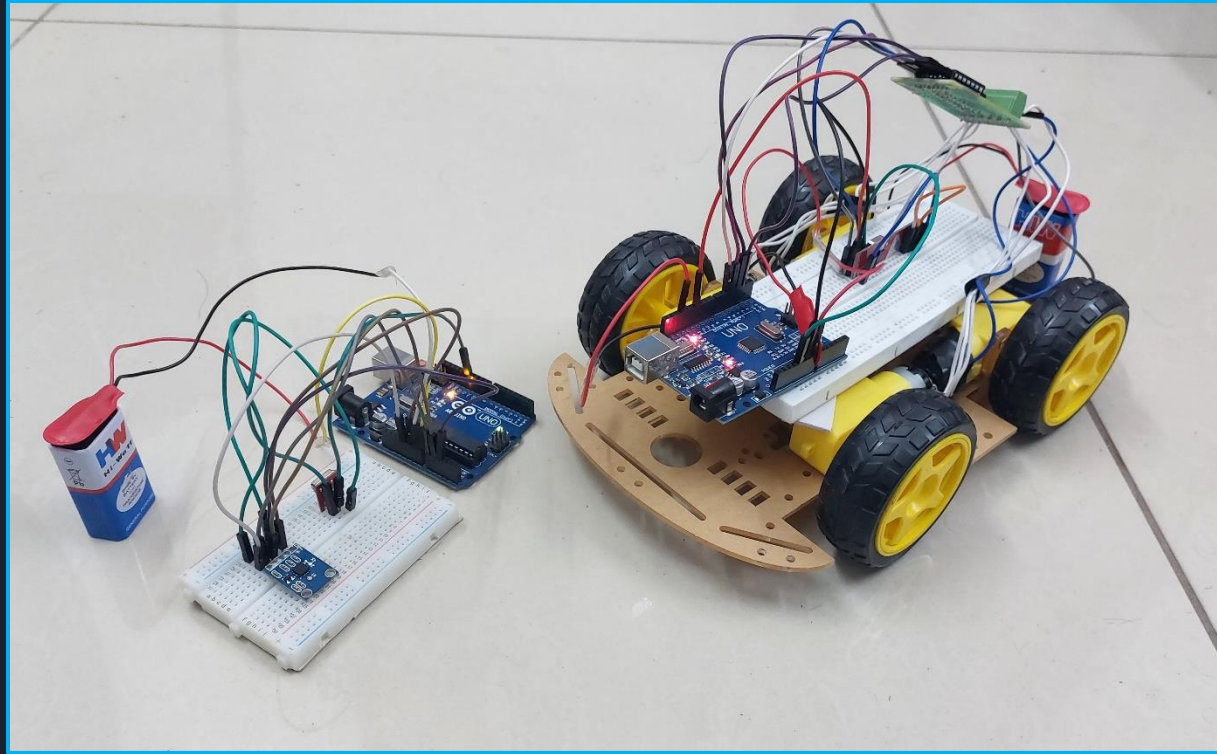


Methodology

Firstly, we have fit the transmitting part on our hand using gloves or anything ,then there are certain gestures or action that can be to perform the task like-

- Tilt the hand to right side to move robot to right side
- Tilt hand towards left to move robot to left.
- Tilt the hand down from front side to move the robot in forward direction.
- Tilt the hand in down from backend to reverse the robot.

Our Project





Future Scope

- In future we can design a wireless robot which can sense hand gesture by using wireless technologies.
- It can be used in military applications as a robotic vehicle which can be handled by a soldier to avoid casualties.
- Our system has shown the possibility that interaction with machines through gestures is a feasible task and the set of detected gestures could be enhanced to more commands by implementing a more complex model of an advanced vehicle for not only in limited space while also in the broader area as in the roads too.
- In the future, service robot executing many different tasks from private movement to a full-fledged advanced automotive that can make disabled to able in all sense.
- The devices which are controlled by hand gestures will work efficiently in the field of defense, industry, medial etc...



Conclusion

A Gesture Controlled robot with Arduino Uno microcontroller has been designed during this work, which may be controlled by human hand gestures. this needs to wear a little transmitting device on our hand included an accelerometer, which transmits particular commands to the robot to maneuver consistent with the users hand gesture and one receiver at the robot. The RF module usually works at a frequency of 434MHZ and also it has a range of 100 meters. The transmission occurs at the rate of 1Kbps-10Kbps. The transmitted data is received by the RF receiver operated at the same frequency as that of the transmitter. Transmission through RF(Radio frequency) is always better than IR(Infrared) .This project can be beneficial where the humans are not able to perform any task but can be defined or the task with some device using hand gestures,



Thank You!