CHAPTER-1

INTRODUCTION

The term IoT i.e. Internet of Things extends capabilities of real world objects. The objects are connected to Internet so as to make them capable of sensing the environment around them with least human intervention. These devices collect, share and use the data to give suitable output using wireless networks. The Internet of Things is making the world around us smarter and more responsive, merging the digital and physical universes. Gesture means the movement of hand and face of humans. The main objective of this project is to control the car using human hand gestures. The human hand gestures are sensed with the help of an accelerometer. It is coded in such a way that the required actions for the human gesture are done. These sensed signals are processed and then transmitted to the robotic arm at the receiver section using RF transceiver module. Thus the car performs the required movement. This system is also using an RF transceiver. module for the wireless communication. The model can be constructed and the required work can be done.

The user just needs to wear a gesture device in which a sensor is included. The sensor will record the movement of hand in a specific direction which will result in the motion of the robot in the respective directions. The robot and the Gesture instrument are connected wirelessly through radio waves.

CHAPTER-2

PROPOSED WORK

2.1 BLOCK DIAGRAM

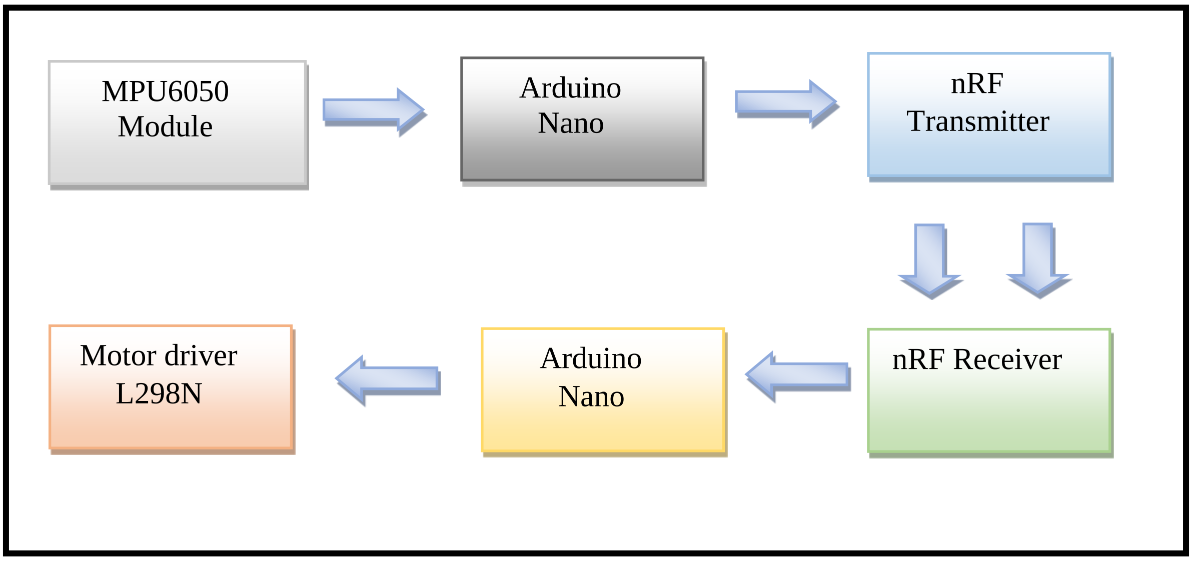

Fig 2.1.1 Block Diagram

The first part is the transmitter part (remote) in which the MPU6050 Accelerometer sensor continuously sends signals to the receiver (Robot) through Arduino and nRF transmitter.

The second part is the Receiver part (Robot car) in which the nRF receiver receives the transmitted data and sends it to Arduino, which further processes them and move the robot accordingly.The MPU6050 Accelerometer sensor reads the X Y Z coordinates and sends the coordinates to the Arduino. For this project, we need only X and Y coordinates. Arduino then checks the values of coordinates and sends the data to the nRF Transmitter. The transmitted data is received by the nRF Receiver. The receiver sends the data to the receiver side's Arduino. Arduino passes the data to the Motor Driver IC and the motor driver turns the motors in the required direction.This transmitted signal is received by the RF receiver, demodulated and then passed onto the decoder IC. The decoder IC decodes the coded waveform and the original data bits are recovered. The input is a serial coded modulated waveform while the output is parallel.

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2.2 CIRCUIT DIAGRAM

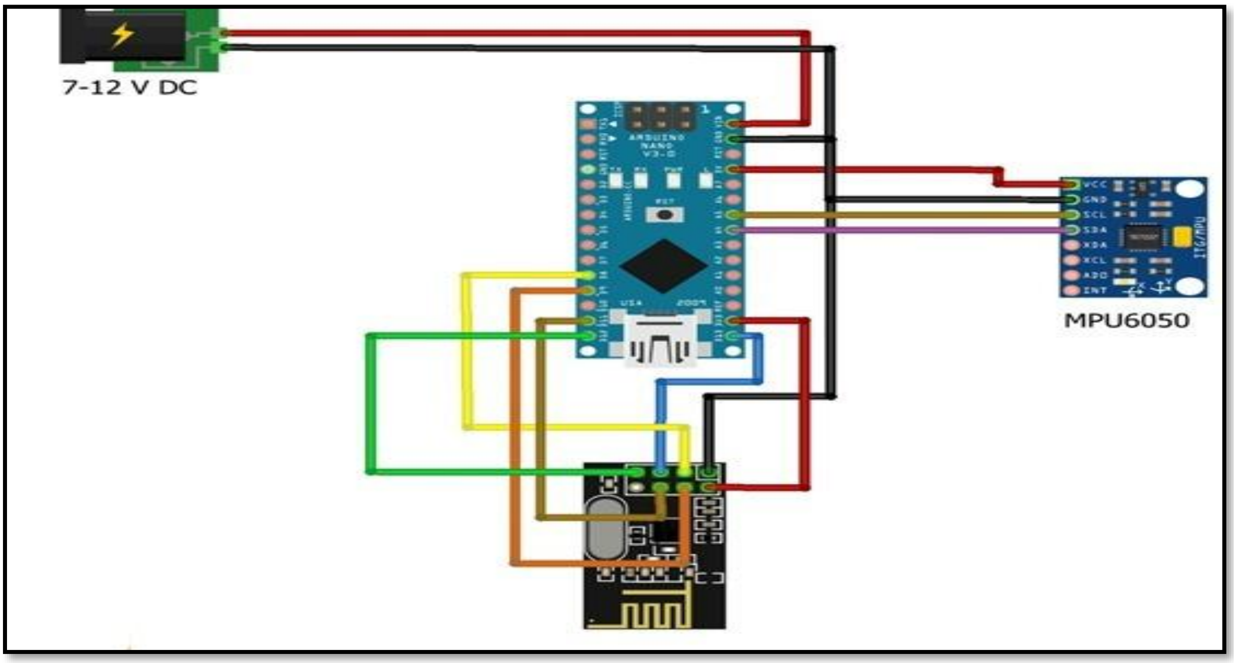

Fig 2.2.1 Transmitter circuit

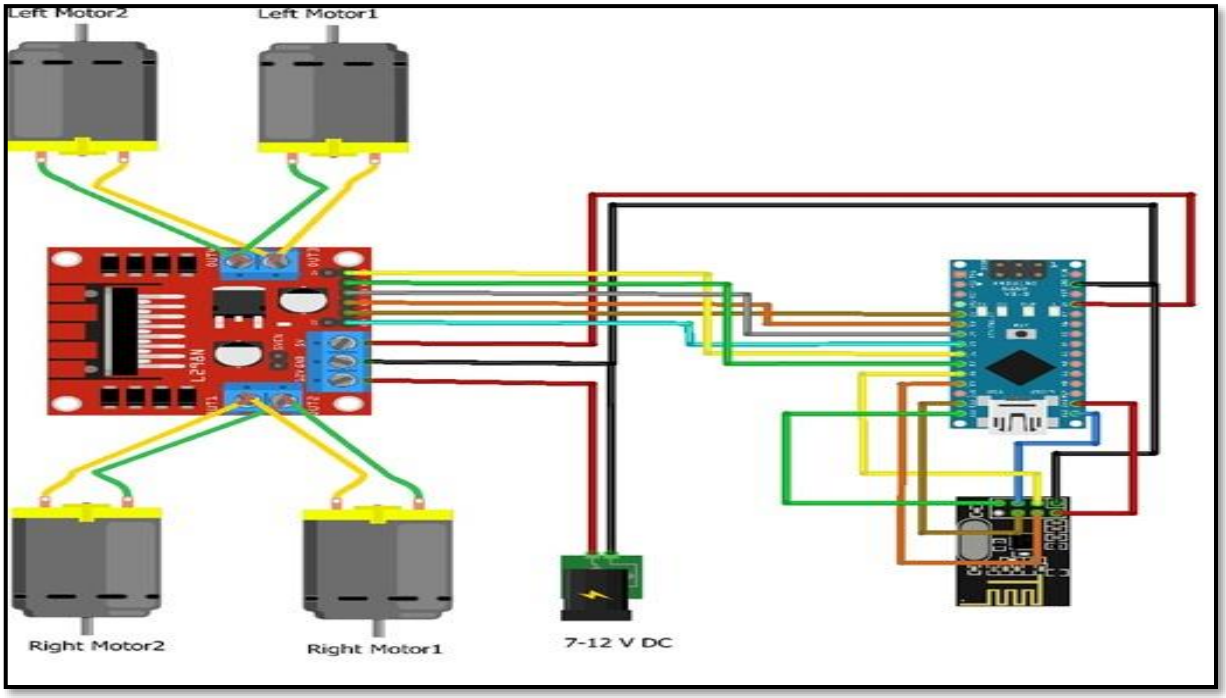

Fig 2.2.2 Receiver circuit

2.3 CIRCUIT EXPLANATION

Gesture control car with Arduino totally controlled by the Arduino which gets the instruction by another Arduino with serial communication. there are two parts in this project one is known as the transmitter and another is known as the receiver. The transmitter in this project the master circuit which will transfer the data to another module. we make the system master-slave communication. Transmitter will work as a master and receiver will work as a slave. So the master will give instruction to the slave and the slave receive the instruction from the master and send all instruction to the Arduino attached.The accelerometer detects the variation in the acceleration on all axis. so, we put the accelerometer on our hands and then relate it to the gestures to make the **gesture control car**. There will many reading changes in each direction and we will use these readings to make the condition in the Arduino to take a decision. Gesture control car robot using Arduino is very simple. For example, if you tilt your hand in the right direction the Arduino sends left to the slave device and the slave will start to move in the right direction. All the directions in the robot will define the same**.** The receiver is the most important part of the **Gesture control car using Arduino**.so there is an L293D motor driver connected to the Arduino which converts the low output signal into the high voltage signal so that the driver can drive the motors. in this receiver, the receiver works as a slave and follows the instruction of the master.There are five hand gestures which can be recognized by the car. They are stop, right, left, backward, forward. The following are the hand gestures used in controlling the car.

Fig 2.3.1 Gesture to move left

Fig 2.3.2 Gesture to move right

Fig 2.3.3 Gesture to stop

Fig 2.3.4 Gesture to move forward

Fig 2.3.5 Gesture to move backward

2.4 HARDWARE DESCRIPTION

2.4.1 MOTION SENSOR MPU6050

MPU6050 sensor module is complete 6-axis Motion Tracking Device. It combines 3-axis Gyroscope, 3-axis Accelerometer and Digital Motion Processor all in small package. Also, it has additional feature of on-chip Temperature sensor. It has I2C bus interface to communicate with the microcontrollers.It has Auxiliary I2C bus to communicate with other sensor devices like 3-axis Magnetometer,Pressure sensor etc. If 3-axis Magnetometer is connected to auxiliary I2C bus, then MPU6050 can provide complete 9-axis Motion Fusion output.

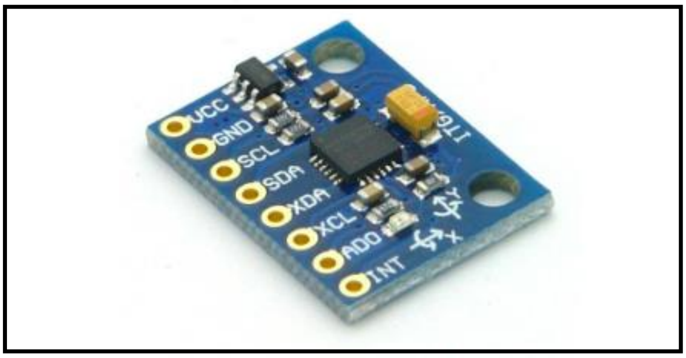

Fig 3.4.1 Motion sensor MPU6050

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2.4.2 TRANSMITTER NRF24L01

The nRF24L01 is a single chip 2.4GHz transceiver with an embedded baseband protocol engine designed for ultra low power wireless applications. The nRF24L01 is designed for operation in the world wide ISM frequency band at 2.400 - 2.4835GHz. An MCU (microcontroller) and very few external passive components are needed to design a radio system with the nRF24L01.The embedded baseband protocol engine (Enhanced ShockBurstTM) is based on packet communication and supports various modes from manual operation to advanced autonomous protocol operation. Internal FIFOs ensure a smooth data flow between the radio front end and the system’s MCU. Enhanced Shock- BurstTM reduces system cost by handling all the high-speed link layer operations. The radio front end uses GFSK modulation. It has user configurable parameters like frequency channel, output power and air data rate.

Fig 3.4.2 Transmitter nRF24l01

2.4.3 BATTERY 7-12 V DC

Battery is a device consisting of one or more electrochemical cells with external connections for powering electrical devices such as flashlights, mobile phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode.The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load, a redox reaction converts highenergy reactants to lower-energy products, and the free-energy difference is delivered to the external circuit as electrical energy. Historically the term "battery" specifically referred to a device composed of multiple cells, however the usage has evolved to include devices composed of a single cell.

Fig 3.4.3 Battery

2.4.4 NRF ADAPTER

NRF24L01 adapter allows you to use 24L01 NRF transceiver module to use on 5V system. It regulates the 5V input to 1.9~3.3V DC and incorporates bypass caapcitors for reliable operation. The NRF24L01 utilizes Enhanced ShockBurst (ESD) protocol to support two-way data packet communication with packet buffering, packet acknowledgement and automatic retransmission of lost packets.

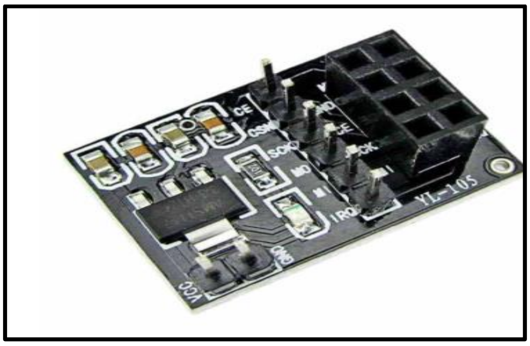

Fig 3.4.4 nRF Adapter

2.4.5 ARDUINO NANO

The **Arduino Nano** is a small, complete, and breadboard-friendly board based on the ATmega328P released in 2008. It offers the same connectivity and specs of the Arduino Uno board in a smaller form factor. The Arduino Nano is equipped with 30 male I/O headers, in a DIP-30-like configuration, which can be programmed using the Arduino Software integrated development environment (IDE), which is common to all Arduino boards and running both online and offline. The board can be powered through a type-B mini-USB cable or from a 9 V battery.

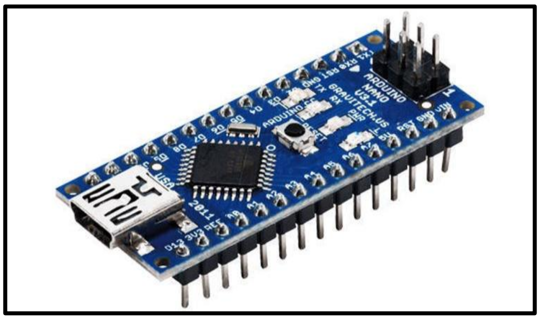

Fig 3.4.5 Arduino Nano

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2.4.6 BREAD BOARD

A breadboard, solderless breadboard, or protoboard is a construction base used to build semi-permanent prototypes of electronic circuits. Unlike a perfboard or stripboard, breadboards do not require soldering or destruction of tracks and are hence reusable. For this reason, breadboards are also popular with students and in technological education. A variety of electronic systems may be prototyped by using breadboards, from small analog and digital circuits to complete central processing units (CPUs).

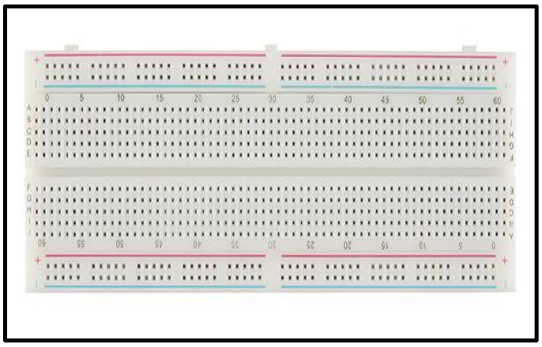

Fig 3.4.6 Breadboard

2.4.7 JUMPER WIRES

A jumper wire is an electric wire that connects remote electric circuits used for printed circuit boards. By attaching a jumper wire on the circuit, it can be short-circuited and short-cut (jump) to the electric circuit. By placing the jumper wire on the circuit, it becomes possible to control the electricity, stop the operation of the circuit, and operate a circuit that does not operate with ordinary wiring.

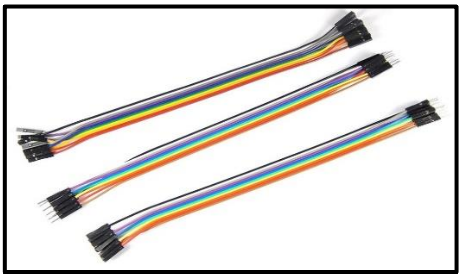

Fig 3.4.7 Jumper Wires

2.4.8 MOTOR DRIVER L298N

The L298N is an integrated monolithic circuit in a 15- lead Multi watt and PowerSO20 packages. It is a high voltage, high current dual full-bridge driver de-signed to accept standard TTL logic level sand drive inductive loads such as relays, solenoids, DC and stepping motors. Two enable inputs are provided to enable or disable the device independently of the in-put signals. The emitters of the lower transistors of each bridge are connected together rand the corresponding external terminal can be used for the connection of an external sensing resistor. An additional Supply input is provided so that the logic works at a lower voltage.

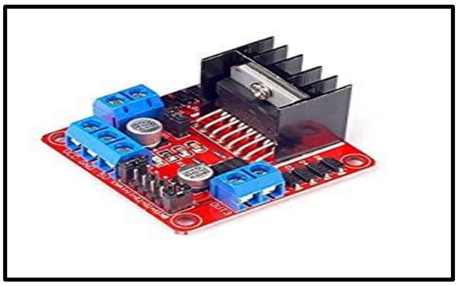

Fig 3.4.8 Motor Driver L298N

2.4.9 CHASSIS

"Chassis" is a term that should be used to refer to the load-bearing part of a car's frame. It is the horizontal section of the vehicle that connects other components of the structure together. The chassis is a set of mechanical components that make it possible to transfer power from the drive unit to the wheels. Moreover, the components used in this part of the vehicle's design have quite an impact on the car's driving behavior.

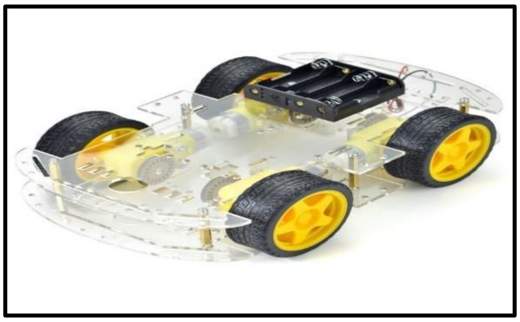

Fig 3.4.9 Car Chassis

CHAPTER-3

RESULT ANALYSIS

3.1 HARDWARE IMPLEMENTATION

Below image represents the hardware implementation of Transmitter circuit

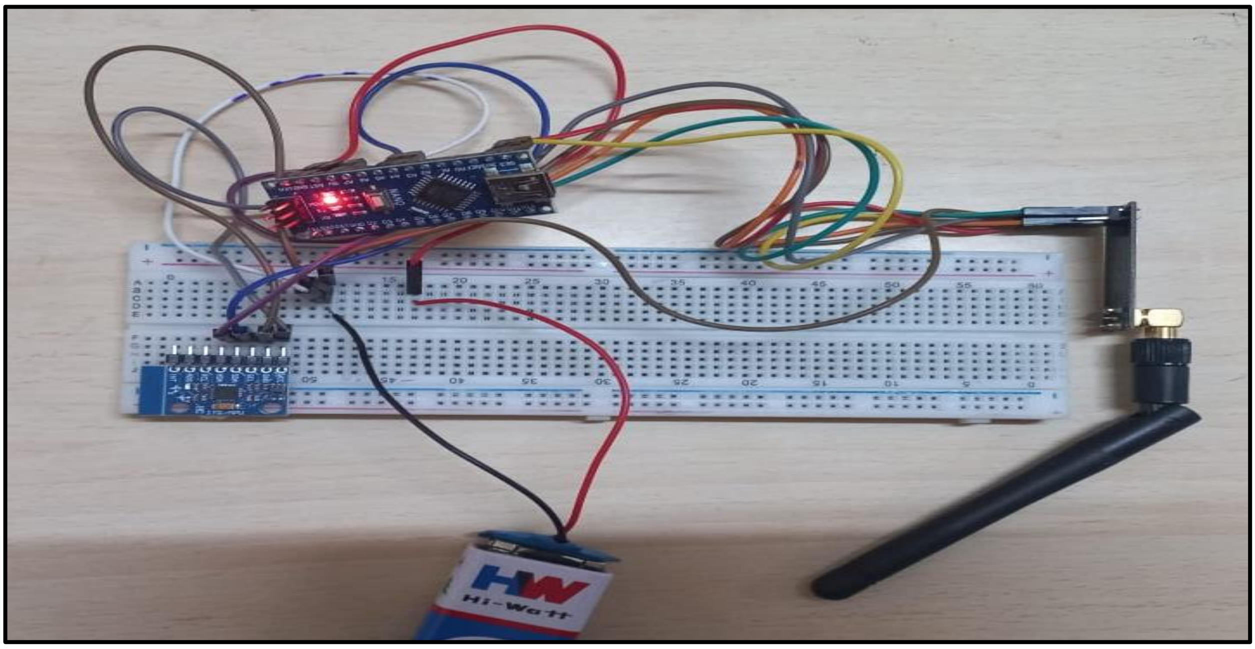

Fig 431.1 Hardware implementation of Transmitter circuit

We can see in the above image that the transmitting model has been built and is fully functional. This transmitting model is used to drive the car forward, to move the car backward, to steer the car left, to steer the robot right. The battery that powers the hand gloves is visible. The signals from the flex sensors are received by the Arduino Nano and transmitted to the receiver part.

Gesture controlled robot moves according to hand movement as we place transmitter in our hand. When we tilt hand in front side, robot start to moving forward and continues moving forward until next command is given. When we tilt hand in backward side, robot change its state and start moving in backwards direction until other command is given. When we tilt it in left side car get turn left till next command. When we tilt hand in right side robot turned to right. And for stopping robot we keep hand in stable.

Below image indicates that hardware implementation of Receiver

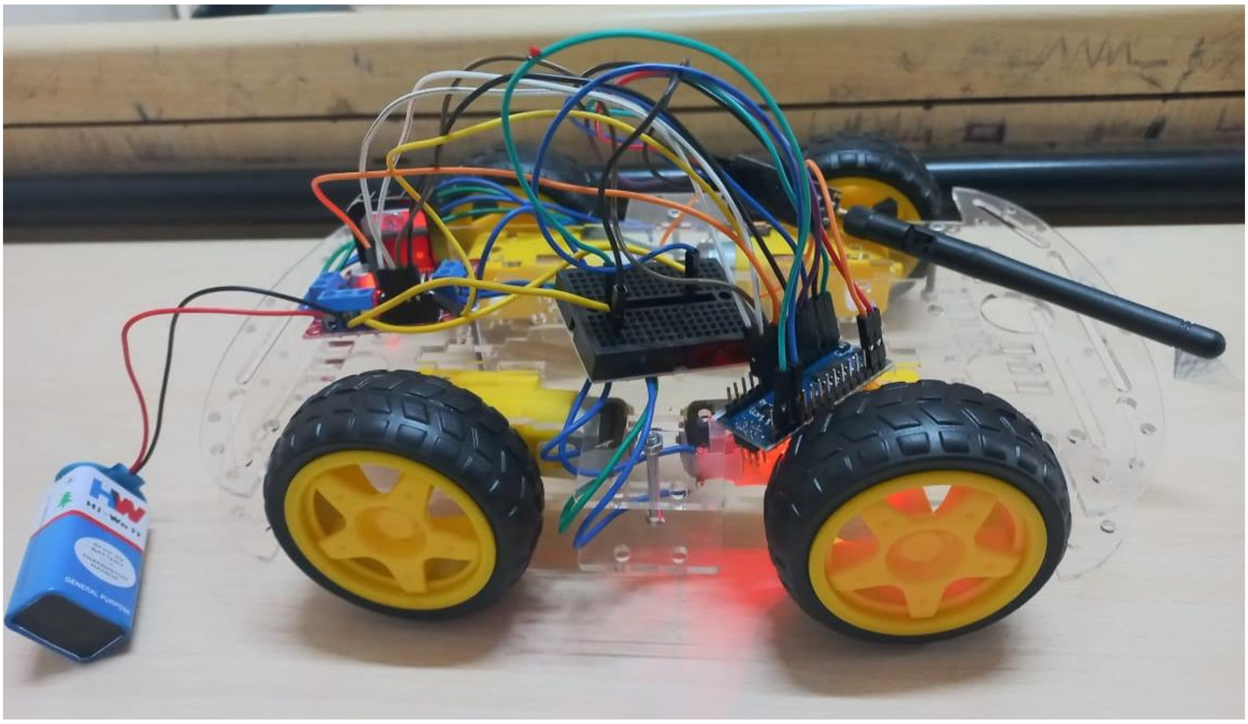

Fig 3.1.2 Hardware implementation of Receiver circuit

The functioning model of the receiver section, which consists mostly of Arduino Nano,MPU 6050 and motor driver are installed to the chassis, is shown above. As shown, we have a chassis with four wheels at each corner.

The five movements of the hand as backward, forward, left, right and stop. The transmitter is placed on hand and receiver on the car. The car is moved by the hand gesture. Based on tilt of the human hand and its acceleration calculated using accelerometer sensor the values is passed to the Arduino board and respective actions are formed. Then the signal is transmitted through the transceiver to the receiving block of the robot.At the receiving end the data signal is decoded and respective pins are made high using the code written in Arduino IDE. The result of motion of the hand the digital signals from Arduino is given to the motor driver for respective movement of the DC motors for movement of wheelchair in a desired direction of the hand gesture.

CHAPTER-4

CONCLUSION

The technology advances in computing, sensor devices, materials and processing/ classification techniques will make the next generation of this devices cheaper, more powerful, versatile and more ubiquitous. The gesture controlled robot system gives an alternative way of controlling robots. Gesture control being a more natural way of controlling devices makes control of robots more efficient and easier.

The main objective of the project was to build a robot-car that would run with the help of the hand gestures obtained from the Accelerometer MPU 6050 using wireless RF communication. Arduino Nano was used as a microcontroller. The car is showing proper movements for the pre-determined and calibrated different hand gestures. The data from the hand movements with the help of the accelerometer are fed into the Transmitter through Arduino Nano. Receiver receives the values in the receiver part, where it is sent to the motor driver L293D.Thus motors are controlled with the data obtained from the motor driver. The car only moves when the accelerometer is moved in a specific direction as per the given calibrated values of the accelerometer.

The movement of hand fully controls the car and the response of car towards hand gesture is satisfactory. The car robot follows the signals properly and responses in left, right, forward and backward directions very well. The acceleration of the Car can also be monitored.

4.1 ADVANTAGES

- Speed and sufficient for recognition system.
- Good performance with complex background.
- System is static with dynamic gestures.
- No training required.

4.2 DISADVANTAGES

- Performance algorithm decreases when distance is greater than 200m.
- The on board batteries occupy a lot of space and are also quite heavy. We can either use some alternate power source for the batteries or replace the current DC Motors with ones which require less power.
- This system can also be employed in medical field where miniature robot are created that can help doctors for efficient surgery operations For more efficient response, threshold values can be used to detect gesture and advanced features such as finger counts that provide different functional commands can be used.

4.3 APPLICATIONS

- Enabling very young children to interact with computers.
- Navigating and/or manipulating in virtual environments: Gestures can be used to control interactions for entertainment purposes such as gaming to make the game player's experience more interactive or immersive.
- Public Display Screens: Information display screens in Supermarkets, Post Offices, Banks that allows control without having to touch the device.
- Robots: Controlling robots without any physical contact between human and computer.
- Military applications to control robotics.
- It can be used as an autonomous for physically challenged people.

4.4 FUTURE SCOPE

- The on board batteries occupy a lot of space and are also quite heavy. We can either use some alternate power source for the batteries or replace the current DC Motors with ones which require less power
- This system can also be employed in medical field where miniature robot are created that can help doctors for efficient surgery operations For more efficient response, threshold values can be used to detect gesture and advanced features such as finger counts that provide different functional commands can be used.
- The proposed system is applicable in hazardous environment where a camera can be attached to the robot and can be viewed by the user who is in his station.