A PROJECT REPORT ON

"GESTURE CONTROL ROBOT"

Submitted in the fulfillment of the requirement for the

Diploma

In

Electronics and Telecommunication

By

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NAVI-MUMBAI

MAHARASTRA STATE BOARD OF TECHNICAL EDUCATION

2018-19

CERTIFICATE

Project Entitled: "GESTURE CONTROL ROBOT"

Submitted by

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This is to certify that the above mentioned students have successfully completed the Project required in the fulfillment of Diploma in Electronics and Telecommunication Engineering from Maharashtra State Board of Technical Education (M.S.B.T.E.) during the academic year 2018-19.

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NAVI-MUMBAI

ACKNOWLEDGEMENT

It is indeed a matter of great pleasure and proud privilege to be able to present this project on **“Gesture Control Robot".**

The completion of the project work is a milestone in student life and its execution is inevitable in the hands of guide. We are highly indebted to the project guide **Mrs. Deepali Patil** for her invaluable guidance and appreciation for giving form and substance to this report. It is due to her enduring efforts, patience and enthusiasm, which has given a sense of direction and purposefulness to this project and ultimately made it a success. We would like to tender our sincere thanks to the staff members for their co-operation.

We would also like to express our deep regards and gratitude to the **Principal Dr. D. G. Borse, Dean Dr. M. M. Deshpande** and **H.O.D. Prof. Umar Masumdar,** We would wish to thank the non - teaching staff and our friends who have helped us all the time in one way or the other.

Really it is highly impossible to repay the debt of all the people who have directly or indirectly helped us for performing the project.

ABSTRACT

Generally, robots are programmed to perform specific tasks which humans cannot. To increase the use of robots where conditions are not certain such as firefighting or rescue operations, robots can be made which follow the instruction of human operator and perform the task. In this way decisions are taken according to the working conditions by the operator and the task is performed by the robots. Thus, we can use these robots to perform those tasks that may be harmful for humans. This project describes about the gesture control robot which can be controlled by your normal hand gesture. It consists of mainly two parts, one is transmitter part and another is receiver part. The transmitter will transmit the signal according to the position of accelerometer and your hand gesture and the receiver will receive the signal and make the robot move in respective direction. Here, the program is designed by using Arduino IDE.

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CHAPTER 1

INTRODUCTION

INTRODUCTION

1.1 INTRODUCTION:

I wish I could control everything with my hands! Sitting in my chair and controlling things like a BOSS. I'd love it! This is a thinking of handicapped person. So to fulfill the dreams of a handicapped person, this project is to be built. In this project the robot follow the commands made by hand gestures. Making a gesture control robot is actually very simple. And easily used to handicapped person.

Here, the robot is divided into two parts, transmitter and receiver. We need to program the transmitter circuit. So I will be using an Arduino as the programming platform. To recognize the gestures made I will be using an accelerometer sensor. So let’s get building!

1.2 OBJECTIVE:

Following are the objectives of the project

- To make easy life for physically challenge people
- For Military applications
- For Industrial applications
- In Fire brigade

CHAPTER 2

LITERATURE SURVEY

LITERATURE SURVEY

In this project the main advantage of this system over other system is that it provides real time palm gesture recognition, leading to an effective and natural way of controlling robots. Many existing system have used such as a Bluetooth wireless control but in this project are Bluetooth wireless control is replace by RF module, because the RF module due to the range has been more as compare to Bluetooth.

2.2 Comparison between Bluetooth and RF module:

Table No. 2.1: Bluetooth and RF module

Bluetooth	RF module
a) Cost of Bluetooth is more than RF module.	a) Cost of the RF module is less than Bluetooth.
b) Setup of Bluetooth is harder than RF module.	b) Setup RF module is easy than Bluetooth.
c) Range of the Bluetooth up to 30m.	c) Range of the RF module up to 100m.

CHAPTER 3

ANALYSIS AND DESIGN

ANALYSIS AND DESIGN

This chapter discusses the block diagram and Circuit Diagram of our project and its explanation.

3.1 Block Diagram:

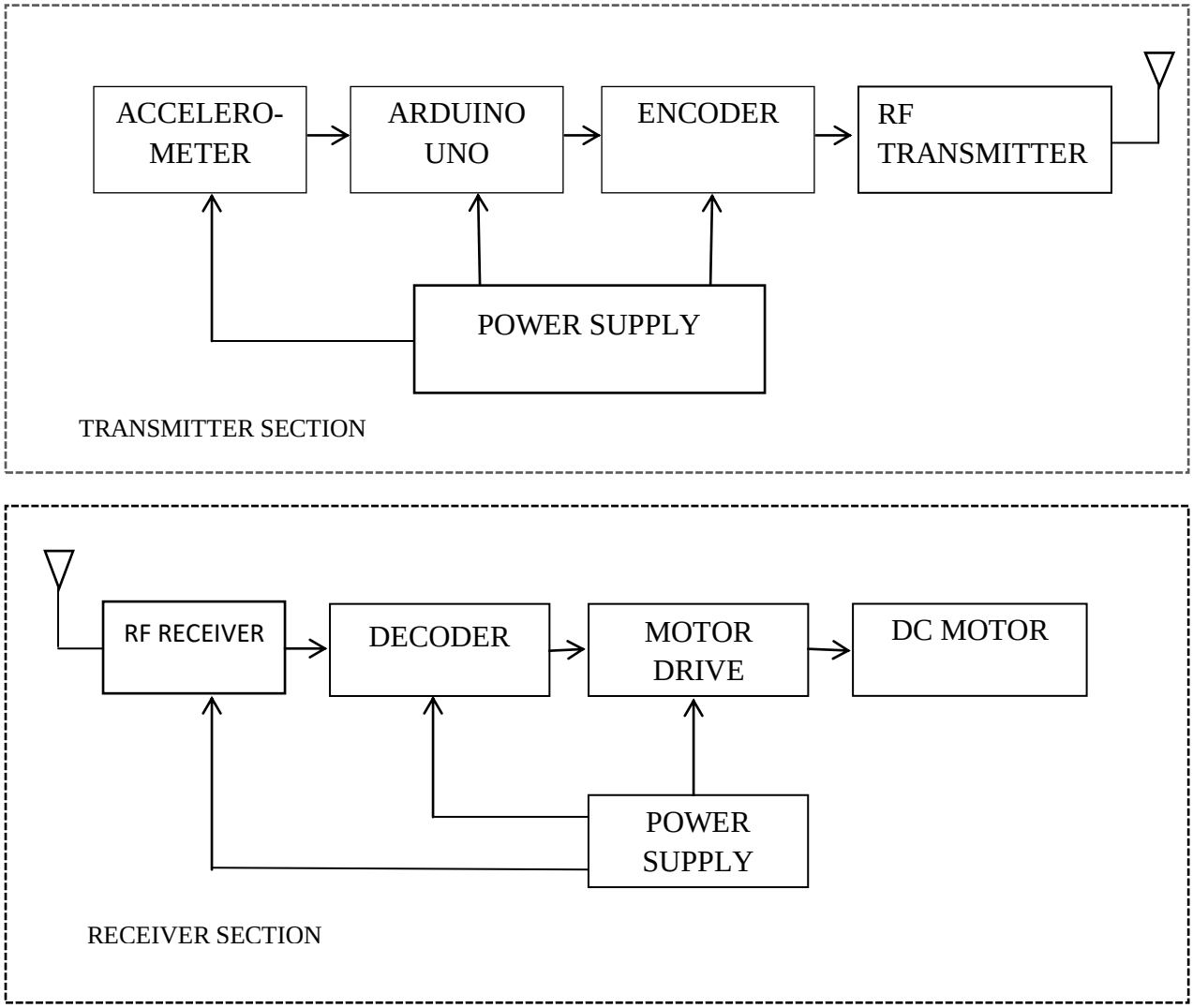

Fig.3.1 block diagram of gesture control robot

3.2 Block Diagram Explanation:

Accelerometer

An accelerometer is a device that converts physical movement into electrical motion.

Arduino Uno

Arduino is used to run the all-electronic application. Arduino is an open-source electronics platform based on easy-to-use hardware and software. It is a small computer that we can program it and control the electrical component connects to it.

Encoder IC (HT12E)

Encoder is 12 bit parallel date convert into series output.

RF Transmission

Transmitter module is then used to transmit serial data to the robot car at the frequency of 433 MHz Vcc pin is connected to the + terminal. The data pin is connected to the pin no-1 of encoder (encoded data). GND is connected to the ground terminal. ANT is connected to a small wire as an antenna.

RF Receiver

The data transmitted from remote is then received from this module in the form of serial order +Vcc pin is connected to the dc power supply of 5 volt. Ground pin is connected to the ground .data collected is then provided to pin-2 of decoder (HT12D),so that it can be decoded into four bit data for controller(atmel89c52).

Decoder IC (HT12D)

It converts the serial data into parallel data of 4 bit which is further accessed by microcontroller atmel89c52.it only works when there is no error or faulty data provided by RF receiver module successful encoding is depicted by pin-1 of decoder .after successful decoding pin-1 is high.

Motor Drive and DC Motor

Motor driver has built-in protection from under/lower voltage. Motor driver can be interfaced with 3.3v and 5v logic level. Motor driver is use to drive the two DC

motor for the wheel chair movement the output controller is given to input of motor driver and depending upon the input given to the motor driver. The motor output pin rotates the motor by which the wheel chair moves. DC motor is used for the conversion of direct current into mechanical motion. The mechanical motion could be rotary or linear.

3.3 CIRCUIT DIAGRAM:

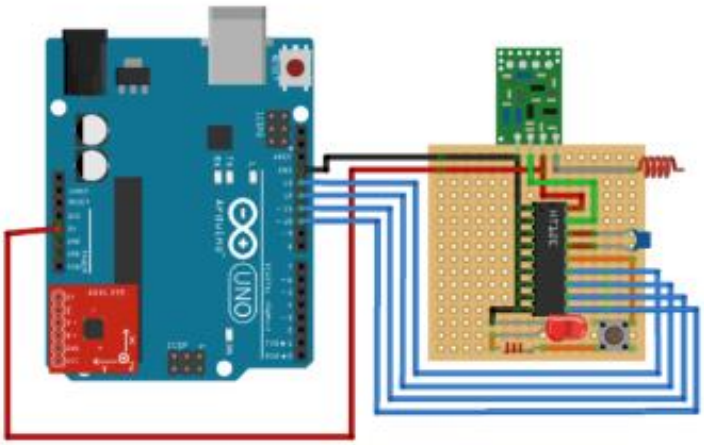

Fig. 3.2 Transmitter Section

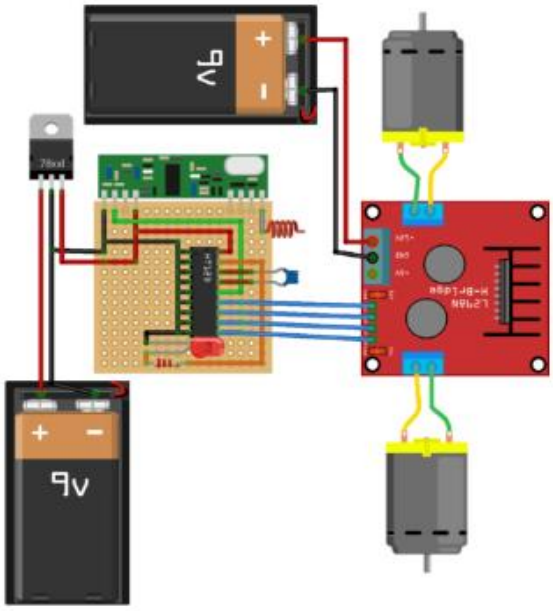

Fig.3.3 Receiver Section

3.4 Circuit Diagram Explanation:

The whole project is divided into two sections one is transmitter section and other is receiver section. The transmitter section consists of an Arduino Uno, 3-axis accelerometer, encoder and RF transmitter module. The receiver section consists of a RF receiver module, decoder, motor driver IC, two DC motor and two wheels. Here, two separate 5 volt power supply is applied to both the sections. Here, the Arduino Uno reads the analog output values i.e., x-axis and y-axis values from the 3 axis accelerometer and converts the analog value to respective digital value. The digital values are processed by the Arduino Uno and send to the encoder IC which generates a coded signal for RF transmitter. RF transmitter sends signal to RF receiver on robot which is further processed by decoder IC and given to motor driver. According to the signal received motor driver drives the motor of robot to a particular direction. The robot moves forward, backward, right and left when there is a tilt in the palm of user in forward, backward, right and left directions respectively.

CHAPTER 4

SYSTEM REQUIREMENTS

SYSTEM REQUIREMENTS

This chapter discusses the hardware and software requirements of the project

4.1 HARDWARE REQUIREMENTS

This section discusses the hardware requirements of the gesture control robot.

Table No. 4.1: Model No. of Hardware used

Sr. No.	COMPONENT'S	Model No./ Item No.
1	ARDUINO BOARD	ATmega328P
2	ACCELEROMETER	ADXL335
3	RF MODULE(Tx/Rx)	434MHz
4	ENCODER IC	HT12E
5	DECODER IC	HT12D
6	LINEAR REGULATOR	7805
7	MOTOR DRIVE	L298N
8	DC MOTOR	---

4.1.1 Arduino

Fig. 4.1 Arduino Uno Board

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments. A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

Arduino was born at the Ire Interaction Design Institute as an easy tool for fast prototyping, aimed at students without a background in electronics and programming. As soon as it reached a wider community, the Arduino board started changing to adapt to new needs and challenges, differentiating its offer from simple 8-bit boards to products for IOT applications, wearable, 3D printing, and embedded environments. All Arduino boards are completely open-source, empowering users to build them independently and eventually adapt them to their particular needs. The software, too, is open-source, and it is growing through the contributions of users worldwide.

Arduino is fast becoming one of the most popular microcontrollers used in robotics. There are many different types of Arduino microcontrollers which differ not only in design and features, but also in size and processing capabilities. In this article, you'll understand the differences between the Arduino Microcontrollers (as of 2012). There are many features that are common to all Arduino boards, making them very versatile. All Arduino boards are based around the ATMEGA AVR series microcontrollers from ATMEL which feature both analog and digital pins. Arduino also created software which is compatible with all Arduino microcontrollers. The software, also called "Arduino", can be used to program any of the Arduino microcontrollers by selecting them from a drop-down menu. Being open source, and based around C, Arduino users are not necessarily restricted to this software, and can use a variety of other software to program the microcontrollers. There are many additional manufacturers who use the open-source schematics provided by Arduino to make their own boards (either identical to the original, or with variations to add to the functionality).

Arduino system

Thanks to its simple and accessible user experience, Arduino has been used in thousands of different projects and applications. The Arduino software is easy-to-use for beginners, yet flexible enough for advanced users. It runs on Mac, Windows, and Linux. Teachers and students use it to build low cost scientific instruments, to prove chemistry and physics principles, or to get started with programming and robotics. Designers and architects build interactive prototypes, musicians and artists use it for installations and to experiment with new musical instruments. Makers, of course, use it to build many of the projects exhibited at the Maker Faire, for example. Arduino is a key tool to learn new things. Anyone - children, hobbyists, artists, programmers - can start tinkering just following the step by step instructions of a kit, or sharing ideas online with other members of the Arduino community. There are many other microcontrollers and microcontroller platforms available for physical computing. Parallax Basic Stamp, Net media's BX-24, Phi gets, MIT's Handy board, and many others offer similar functionality. All of these tools take the messy details of microcontroller programming and wrap it up in an easy-to-use package. Arduino also

simplifies the process of working with microcontrollers, but it offers some advantage for teachers, students, and interested amateurs over other systems:

- **Inexpensive** - Arduino boards are relatively inexpensive compared to other microcontroller platforms. The least expensive version of the Arduino module can be assembled by hand, and even the pre-assembled Arduino modules cost less than $50
- **Cross-platform** - The Arduino Software (IDE) runs on Windows, Macintosh OSX, and Linux operating systems. Most microcontroller systems are limited to Windows.
- **Simple, clear programming environment** - The Arduino Software (IDE) is easy-to-use for beginners, yet flexible enough for advanced users to take advantage of as well. For teachers, it's conveniently based on the Processing programming environment, so students learning to program in that environment will be familiar with how the Arduino IDE works.
- **Open source and extensible software** - The Arduino software is published as open source tools, available for extension by experienced programmers. The language can be expanded through C++ libraries, and people wanting to understand the technical details can make the leap from Arduino to the AVR C programming language on which it's based. Similarly, you can add AVR-C code directly into your Arduino programs if you want to.
- **Open source and extensible hardware** - The plans of the Arduino boards are published under a Creative Commons license, so experienced circuit designers can make their own version of the module, extending it and improving it. Even relatively inexperienced users can build the breadboard version of the module in order to understand how it works and save money.

Features:

- Microcontroller ATmega168 or 328
- Operating Voltage 5V
- Input Voltage (recommended) 7-12V
- Input Voltage (limits) 6-20V
- Digital I/O Pins 14 (of which 6 provide PWM output)
- Analog Input Pins 6
- DC Current per I/O Pin 40mA

- DC Current for 3.3V Pin 50mA
- Flash Memory 16 KB (ATmega168) or 32 KB (ATmega328)

On one side of the board there are 14 digital input/output pins as well as a ground pin and a reference pin which acts as voltage reference for the Analog pins. Pin zero doubles as serial input, and pin 1 doubles for serial output. On the other side of the board, you'll find 6 Analog pins, as well as a voltage input pin, two ground pins and a reset pin. The board also has both a 3.3V and 5V output pins.

You can power the board any of three ways: directly via the USB port, using the power connector, or the Vin and ground pins. The ATMEGA chip is removable from the board. This is especially useful if you have fried the processor and need to replace it, or you can use the board alone as a USB to serial interface.

4.1.2 ACCELEROMETER

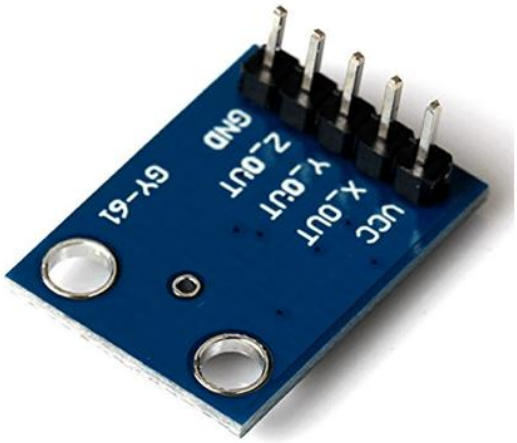

Fig. 4.2 Accelerometer

This is a breakout board for Analog Devices analog 3 axis accelerometer. The ADXL335 is a small, thin, low power, complete 3-axis accelerometer with signal conditioned voltage outputs. It has 6 pins. 3 pins are X, Y, Z axis. First pin for power supply (VCC), second pin for ground (GND) and the last one for self-test (ST). It operates on 3.3V from the Arduino Uno board. X and Y axis pins are connected to A0 and A1 pin of Arduino Uno board respectively. It can measure the static acceleration of gravity from tilt sensing applications as well as dynamic acceleration resulting from motion, shock or vibration and gives corresponding analog values through X, Y, Z axis pins. The ADXL335 is available in a small, low profile, 4mm x 4mm x 1.45 mm, 16-lead, plastic lead frame chip scale package. The low cost and small size of 3-axis accelerometer are the two factors that make it effective to detect the hand gesture.

Features:

- Small, low profile package.
- 4 mm × 4 mm × 1.45 mm LFCSP
- full-scale range of ±3 g
- Low power : 350μA (typical)
- Single-supply operation: 1.8 V to 3.6 V
- 10,000 g shock survival
- Excellent temperature stability
- BW adjustment with a single capacitor per axis

4.1.3 RF MODULE

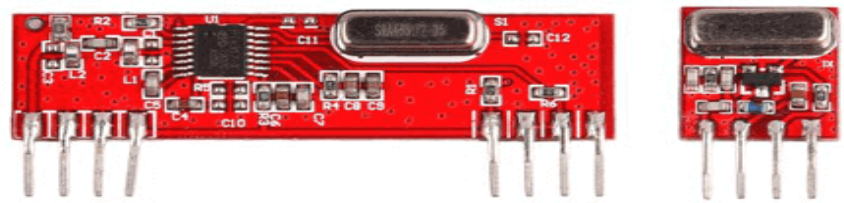

Fig4.3 RF Module

The RF module, as the name suggests, operates at Radio Frequency. The corresponding frequency range varies between 30 kHz & 300 GHz. In this RF system, the digital data is represented as variations in the amplitude of carrier wave. This kind of modulation is known as Amplitude Shift Keying (ASK).Transmission through RF is better than IR (infrared) because of many reasons. Firstly, signals through RF can travel through larger distances making it suitable for long range applications. Also, while IR mostly operates in line-of-sight mode, RF signals can travel even when there is an obstruction between transmitter & receiver. Next, RF Transmission is more strong and reliable than IR transmission. RF communication uses a specific frequency unlike IR signals which are affected by other IR emitting source This RF module comprises of an RF Transmitter and an RF Receiver. The transmitter/receiver (Tx/Rx) pair operates at a frequency of 434 MHz an RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4. The transmission occurs at the rate of 1Kbps - 10Kbps.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter. The RF module is often used along with a pair of encoder/decoder. The encoder is used for encoding parallel data for transmission feed while reception is decoded by a decoder. HT12E-HT12D, HT640-HT648, etc. are some commonly used encoder/decoder pair ICs.

Features:

- Easy to use.

TX:

- Power supply and/or modulation input voltage : 2.2 to 5.5v.
- Operating temperature: -40 to +80C.

RX:

- Power supply and/or modulation input voltage :.5v.
- Operating temperature: -20 to +80C.

4.1.4 ENCODER IC

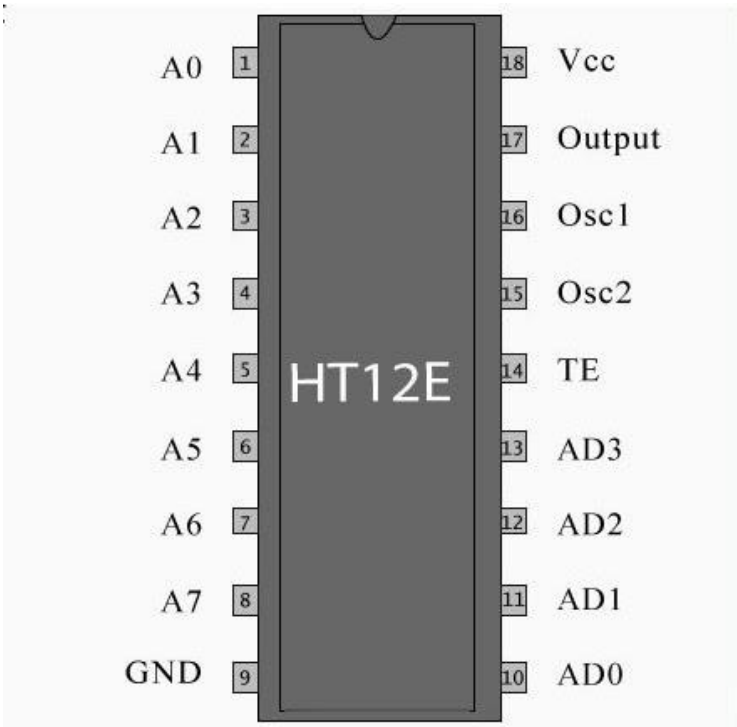

Fig 4.4 Encoder IC

HT12E is an encoder integrated circuit of 2^{12} series of encoders. They are paired with 2^{12} series of decoders for use in remote control system applications. It is mainly used in interfacing RF and infrared circuits. The chosen pair of encoder/decoder should have same number of addresses and data format.

Simply put, HT12E converts the parallel inputs into serial output. It encodes the 12 bit parallel data into serial for transmission through an RF transmitter. These 12 bits are divided into 8 address bits and 4 data bits.

HT12E has a transmission enable pin which is active low. When a trigger signal is received on TE pin, the programmed addresses/data are transmitted together with the header bits via an RF or an infrared transmission medium. HT12E begins a 4-word transmission cycle upon receipt of a transmission enable. This cycle is repeated as long as TE is kept low. As soon as TE returns to high, the encoder output completes its final cycle and then stops.

Features:

- Operating voltage

  - 2.4V~12V for the HT12E
- Low power and high noise immunity CMOS technology
- Low standby current: 0.1uA (typ.) at V_{DD}=5V
- HT12A with a 38kHz carrier for infrared transmission medium
- Minimum transmission word

  - Four words for the HT12E
- Built-in oscillator needs only 5% resistor
- Data code has positive polarity
- Minimal external components
- 18-pin DIP, 20-pin SOP package

4.1.5 DECODER IC

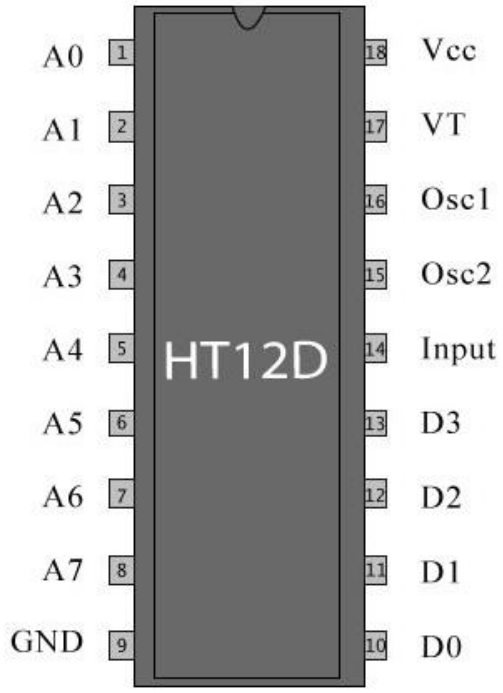

Fig 4.5 Decoder IC

HT12D is a decoder integrated circuit that belongs to 2^{12} series of decoders. This series of decoders are mainly used for remote control system applications, like burglar alarm, car door controller, security systematic. It is mainly provided to interface RF and infrared circuits. They are paired with 2^{12} series of encoders. The chosen pair of encoder/decoder should have same number of addresses and data format. In simple terms, HT12D converts the serial input into parallel outputs. It decodes the serial addresses and data received by, say, an RF receiver, into parallel data and sends them to output data pins. The serial input data is compared with the local addresses three times continuously. The input data code is decoded when no error or unmatched codes are found. A valid transmission in indicated by a high signal at VT pin.HT12D is capable of decoding 12 bits, of which 8 are address bits and 4 are data bits. The data on 4 bit latch type output pins remain unchanged until new is received.

Features:

- Operating voltage: 2.4V~12V
- Low power and high noise immunity CMOS technology
- Low standby current
- Capable of decoding 12 bits of information
- Binary address setting
- Received codes are checked 3 times
- Address/Data number combination
- HT12D: 8 address bits and 4 data bits.

4.1.6 LINEAR REGULATOR

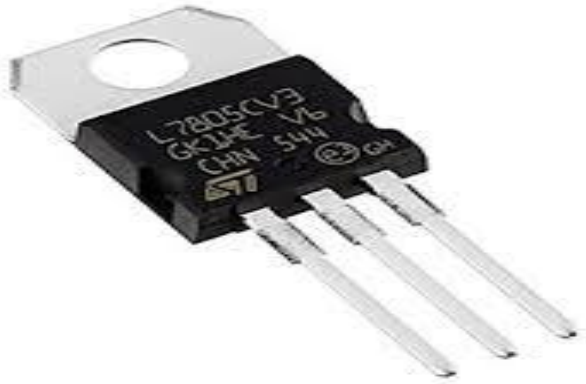

Fig 4.6 Linear regulator

IC 7805 which regulates the 12V supply to 5V (if you can't get a 12V supply you can use a 9V supply) 0.1uf and 470uf capacitor 1k resistor for status LED

NOTE: Use heat sink for 7805 because we are dropping 7V (12-5) so lots of heat will be produced to burn the regulator so usage of heat sink is recommended.

Features:

- 5V Positive Voltage Regulator
- Minimum Input Voltage is 7V
- Maximum Input Voltage is 25V
- Operating current(I_Q) is 5mA
- Internal Thermal Overload and Short circuit current limiting protection is available.
- Junction Temperature maximum 125 degree Celsius

4.1.7 MOTOR DRIVE

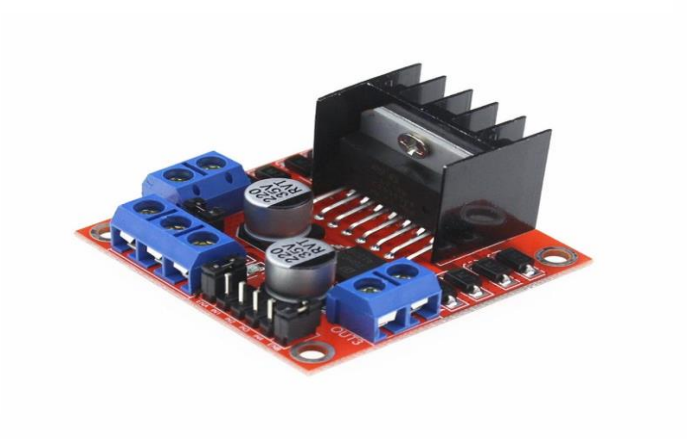

Fig 4.7 Motor drive

46V, 2A Stepper Motor / Dual DC Motor Driver module can drive bipolar stepper motor or Two DC motors at the same time. Each L298 has two H-Bridges. Each H-Bridge can supply 2Amp.Current. L298 has heat sink for better heat dissipation and fly back diodes for protection from back EMF (Electromotive Force). For higher current rating these H-Bridges can be connected in parallel. For easier mounting board have four mounting holes. Board has 2pin Terminal Block (Phoenix Connector) for high power connections. Board is made of double sided PTH PCB for giving better strength to the connectors.

Feature:

- Operating supply voltage up to 46V
- Total DC current up to 4A
- Over temperature protection
- Two motor direction indicator LED's
- Logical "0" input voltage up to 1.5V
- An onboard user-accessible 5v low-dropout regulator.

4.1.8 DC MOTOR

Fig. 4.8 DC Motor

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic; to periodically change the direction of current flow in part of the motor.

DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

4.2.9Arduino IDE 1.8.5:

The Arduino Uno can be programmed with the Arduino software (download). Select "Arduino Uno from the Tools > Board menu (according to the microcontroller on your board). For details, see their reference and tutorials. The ATmega328 on the Arduino Uno come pre burned with a boot loader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the originalSTK500 protocol (reference, C header files).You can also bypass the boot loader and programs the microcontroller through the ICSP (In-Circuit Serial Programming) header; see these instructions for details. The ATmega16U2 (or 8U2 in the rev1 and rev2 boards) firmware source code is available. TheATmega16U2/8U2 is loaded with a DFU boot loader, which can be activated by:

- On Rev1 boards: connecting the solder jumper on the back of the board (near the map of Italy) and then resetting the 8U2.
- On Rev2 or later boards: there is a resistor that pulling the 8U2/16U2 HWB line to ground, making it easier to put into DFU mode. You can then use Atmel's FLIP software (Windows) or the DFU programmer (Mac OS X and Linux) to load a new firmware. Or you can use the ISP header with an external programmer (overwriting the DFU boot loader). See this user-contributed tutorial for more information.

CHAPTER 5

ADVANTAGES

5.1 Advantages:

- It is easy to design and manufacture as all the components are easily available.
- It is portable and hence can place anywhere.
- It has low cost of manufacturing
- The microcontroller can be reprogrammed if any modification is required.
- Due to Wireless communication data rate is faster.
- Wireless makes ease of operation.
- No need of lengthy Wires.

CHAPTER 6

APPLICATIONS

6.1 Application

- For handicap persons.
- Medical application.
- Useful for moving heavy load from one place to another place.

CHAPTER 7

CONCLUSION AND FUTURE SCOPE

7.1 CONCLUSION:

An automated robot has been developed which works according to your hand gesture. The robot moves wirelessly according to palm gesture. The RF module is working on the frequency of 433 MHz and has a range of 50-100 meters. This robot can be upgraded to detect human life in earthquake and landslide by implementing the sensor accordingly. GPS system can be added to the robot by the help of which its location can be tracked.

7.2 FUTURE SCOPE:

- Instead of using acceleration motion we can use eye retina using optical sensor to move wheel chair accordingly.
- Controlling wheel chair of handicap using nervous system of human.
- Controlling wheel chair of handicap using tilt of the head.

CHAPTER 8

PROTOTYPE AND COST

PROTOTYPE

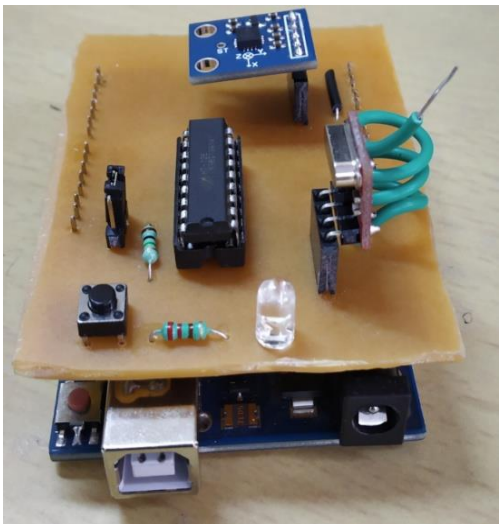

Fig.8.1. Transmitter Section

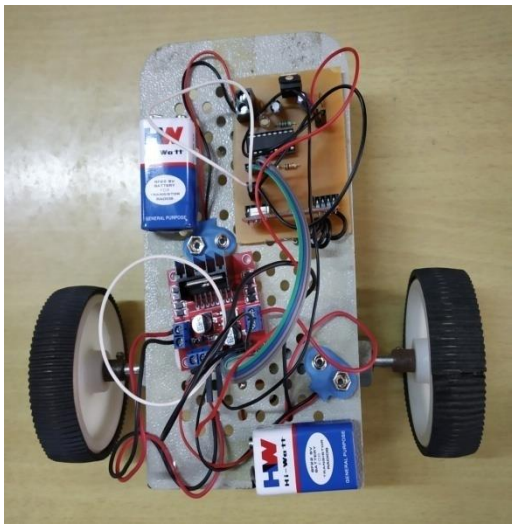

Fig.8.2. Receiver Section

COSTING OF PROJECT

Table No. 8.1: Components Costing

SR.NO.	PRODUCT	COSTING
1.	Chassis	200
2.	Motors	150
3.	Encoder	40
4.	Decoder	40
5.	Motor Driver IC	175
6.	Arduino	450
7.	RF Module	150
8.	Miscellaneous	500
	TOTAL	**1700**

CHAPTER 9

REFERENCES

To make this project, here we referred some Website & IEEE papers, which are as follows-

1. Swarna Prabha Jena, Sworaj Kumar Nayak, Saroj Kumar Sahoo, Sibu Ranjan Sahoo, Saraswata Dash, Sunil Kumar Sahoo," ACCELEROMETER BASED GESTURE CONTROLLED ROBOT USING ARDUINO", IJESRT, ISSN: 2277-9655, April,2015.
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