VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Jnana Sangama, BELAGAVI

"SHUI: SMART HOVERBOARD USING IOT"

Mini Project Synopsis report submitted in partial fulfillment of the requirements for the award of

BACHELOR OF ENGINEERING
In
ELECTRICAL & ELECTRONICS ENGINEERING

Submitted by

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CERTIFICATE

Certified that the Mini Project Work entitled **"SHUI: SMART HOVER BOARD USING IOT"** is bonafide work carried out by **Ms. Ananya Shekar** (1DT20EE003), **Ms. Annapurna** (1DT20EE004), **Ms Goutami V Naik** (1DT20EE012) and **Ms. Vaishnavi H.M**(1DT20EE031) in partial fulfillment for the award of Bachelor of Engineering in **Electrical & Electronics** Engineering of the Visvesvaraya Technological University, Belagavi during the year 2022-2023. It is certified that all the corrections/suggestions indicated for internal assessment have been incorporated in the report deposited in the departmental library. The Mini Project Report has been approved as it satisfies the academic requirements in respect to Mini Project Work prescribed for the said degree.

Signature of Guide	Signature of HOD	Signature of Principal
Prof. RENUKA PRASAD G	DR. K.SHANMUKHA SUNDAR	DR.M RAVISHANKAR

Name of the Examiners

1.

2.

DECLARATION

We, the undersigned solemnly declare that the Project work report entitled**,"SHUI: SMART HOVER BOARD USING IOT"** is based on our work carried out during the course of our study under the supervision of Prof. Renuka Prasad G Assistant Professor, Department of Electrical and Electronics, Dayananda Sagar Academy of Technology and Management. We assert that the statements made and conclusions drawn are an outcome of the Project work. We further declare that to the best of my knowledge and belief that the Project work report does not contain any part of any work which has been submitted for the award of any other degree in this University or any other University.

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ABSTRACT

The Internet of Things (IoT) is advancing quickly, opening up new opportunities for incorporating intelligent features into a variety of products, including personal transportation vehicles. In this abstract, a revolutionary idea for a smart hoverboard with Internet of Things (IoT) capabilities is presented. This device will revolutionise how people commute and engage with their surroundings.

The proposed smart hoverboard uses the Internet of Things to improve user experience, safety, and efficiency. To provide a seamless and intelligent transportation system, it makes use of a network of sensors, actuators, and communication modules. The hoverboard can adapt to changing environmental circumstances through the gathering and processing of real-time data, resulting in optimal performance and user safety.

Collision detection, self-balancing systems, and integrated navigation are some of the key characteristics of the smart hoverboard. In order to receive real-time traffic data, pedestrian data, and route optimisation services, the hoverboard may interface with other smart devices and systems by utilising IoT connection. Riders gain useful information and the capacity to make wise decisions as a result, thereby improving their commute experience.

Aside from that, the smart hoverboard supports sustainability by using energy-efficient parts and IoT-based energy management strategies. In addition to extending battery life and minimising environmental effect, it can automatically monitor and optimise power use.

In conclusion, a smart hoverboard that incorporates IoT technology is a game-changing advancement in personal mobility. The suggested approach will revolutionise how people commute and engage with their environment by enhancing safety, including intelligent navigation, and incorporating sustainable elements. The prospective uses of smart mobility technologies, like the IoT-enabled hoverboard, in urban transit, tourism, and recreation are tremendously bright..

CONTENTS

LIST OF FIGURES

CHAPTER-1

INTRODUCTION

1.1 .Intention of the Project:

The intention of the project "Smart Hoverboard Using IoT" is to design and develop a next generation hoverboard that incorporates IoT technologies to enhance safety, efficiency, and user experience. The project aims to revolutionize personal transportation by integrating intelligent features and connectivity capabilities into a traditional hoverboard design.

By leveraging IoT sensors, actuators, and connectivity modules, the smart hoverboard can collect real-time data about its surroundings, including traffic conditions, pedestrian information, and environmental factors. This data is then processed and analyzed to enable the hoverboard to adapt to changing conditions, ensuring optimal performance and rider safety.

The project also intends to incorporate collision detection mechanisms, self-balancing capabilities, and integrated navigation systems into the smart hoverboard. These features enable the hoverboard to navigate through complex environments, avoid obstacles, and provide riders with valuable insights and route optimization services.

Additionally, the project aims to address sustainability concerns by implementing energy-efficient components and IoT-based energy management techniques. This ensures that the smart hoverboard optimizes power consumption, extends battery life, and reduces its environmental impact.

Overall, the intention of the project is to create a smart hoverboard that not only offers an exciting and efficient mode of personal transportation but also prioritizes safety, convenience, and sustainability through the integration of IoT technologies.

1.2 List of components

1) Wooden Plank
2) Arduino Uno.
3) L293D Motor Driver
4) Ultrasonic sensor.
5) Servo Motor
6) 12V,30 RPM,DC Geared Motor
7) 70MM White Wheels
8) 12V-9V,Power Module Converter
9) 12V,2A Adaptor
10) Connecting Wires

1.3 SPECIFICATION OF THE COMPONENTS

1.3.1 ARDUINO UNO:

Figure 1.3.1

- Arduino Uno is a microcontroller based on ATmega328P.
- It has 14 digital input/output pins, 6 analog input, 16MHz quartz crystal, an usb connection, a power jack, an ICSP header and a reset button.
- It contains everything needed to support microcontroller simply connected to computer with a USB cable or power it with an AC to DC adaptor or battery to get started.

1.3.2 L293D Motor Driver:

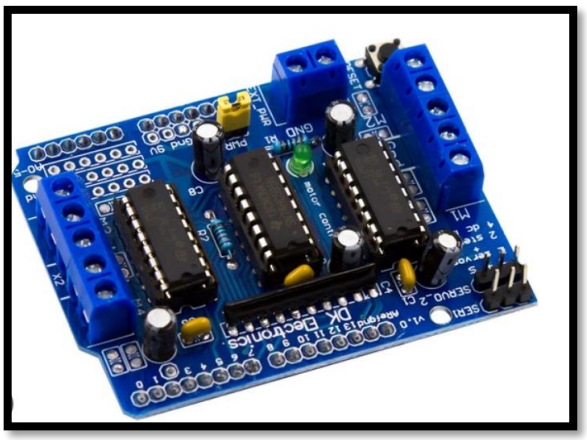


Figure 1.3.2

- A motor driver is an integrated circuit chip which is usually used to control motors in autonomous robots.
- Motor driver act as an interface between Arduino and the motors . The most commonly used motor driver IC's are from the L293 series such as L293D, L293NE, etc.
- Dual H-Bridge Configuration: The L293D has two H-bridges, enabling independent control of two DC motors or a single stepper motor.
- Built-in Protection: The IC incorporates diodes to protect against voltage spikes and back EMF, preventing damage to the motors and the driver.
- Logic Compatibility: The L293D is compatible with both TTL and CMOS logic levels, making it suitable for a wide range of digital control systems.

1.3.3 ULTRASONIC SENSOR:

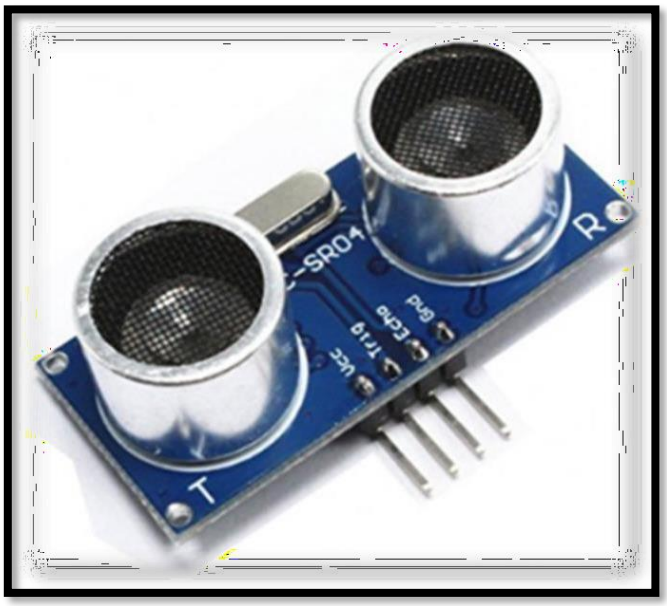


Figure 1.3.3

- Distance Measurement: Ultrasonic sensors use sound waves to measure the distance between the sensor and an object. They emit ultrasonic waves and measure the time it takes for the waves to bounce back after hitting an object. This enables precise distance measurements.
- Non-Contact Sensing: Ultrasonic sensors are non-contact sensors, meaning they do not need physical contact with the object being measured. This makes them ideal for applications where contact might not be feasible or desirable, such as in robotics or proximity detection systems.
- Versatile Applications: Ultrasonic sensors find applications in various fields, including robotics, automation, security systems, parking assistance, object detection, and even medical imaging. Their ability to provide accurate distance measurements in a non-contact manner makes them highly versatile for many different purposes.

1.3.4 SERVO MOTOR:

Figure 1.3.4

- Compact Size: The SG90 servo motor is a small-sized motor, making it suitable for projects with limited space or weight restrictions. Its compact design allows for easy integration into various applications.
- Precise Positioning: The SG90 servo motor offers precise positioning control. It can rotate to specific angles within its specified range, allowing for accurate and controlled movements.
- Low Cost: The SG90 servo motor is known for its affordability. It is widely available at a relatively low cost, making it a popular choice for hobbyists, beginners, and projects with budget constraints.
- Low Power Consumption: The SG90 servo motor operates on low power consumption, making it energy-efficient. This characteristic is advantageous for projects where power efficiency is important.
- Commonly Used: The SG90 servo motor is widely used and supported in the hobbyist and DIY community. It is compatible with various microcontrollers and development boards, making it easy to find resources, tutorials, and code examples for implementation in different projects.

1.3.5 12V, 30RPM,DC Geared Motor:

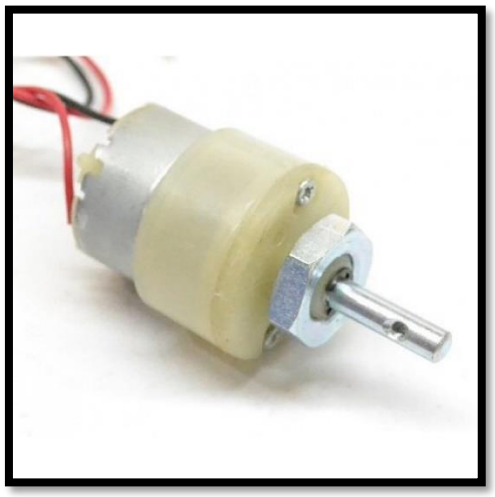


Figure 1.3.5

- Voltage and RPM: The motor operates at a voltage of 12V and has a rotational speed of 30 revolutions per minute (RPM). This specific combination of voltage and RPM determines its speed and torque characteristics.
- Geared Design: The motor is equipped with a gearbox that reduces the output speed while increasing torque. This geared design allows for more precise control and higher torque output compared to non-geared motors.
- Low-Speed Applications: The 30RPM speed of the motor makes it suitable for applications that require slower rotational speeds. It is commonly used in projects that involve robotics, automation, small vehicles, or machinery that require precise and controlled movements.
- 12V Power Supply: The motor requires a 12V power supply to operate efficiently. It is important to ensure the power source can provide a stable and regulated 12V DC voltage for optimal performance.
- Versatile Applications: The 12V, 30RPM DC geared motor finds applications in various projects, including robotics, automation, electric vehicles, solar tracking systems, conveyor belts, and other projects where low-speed and high-torque characteristics are desired.

1.3.6 <u>70 mm White Wheels:</u>

Figure 1.3.6

- Wheel Diameter: The 70mm measurement refers to the diameter of the wheels. These white wheels have a diameter of 70mm, which determines their size and overall dimensions.
- Material and Color: The wheels are made of white-colored material. The white color can provide a clean and aesthetic appearance, and the material used can vary depending on the specific product or manufacturer.
- Suitable for Various Applications: 70mm white wheels are commonly used in various applications such as robotics, small vehicles, DIY projects, and furniture. They can provide smooth movement and traction on different surfaces.
- Compatibility: It is important to ensure that the 70mm white wheels are compatible with the intended equipment or project. This includes checking the wheel's axle size,
- mounting options, load capacity, and other specifications to ensure proper fit and functionality.

1.3.7 12V,2A ADAPTER:

Fig 1.3.7.

- Voltage and Current: The adapter provides a constant output voltage of 12 volts (12V) and a maximum current of 2 amps (2A). This combination of voltage and current determines the power supply's capacity to deliver electrical energy to the connected device.

- Power Output: The adapter can deliver a maximum power output of 24 watts (12V * 2A = 24W). This power output is suitable for powering various electronic devices, such as small appliances, LED lights, routers, and other low-power devices.

- DC Output: The adapter provides a direct current (DC) output, which is typically required by most electronic devices. It is important to match the DC voltage and current requirements of the device being powered to ensure compatibility and safe operation.

- Plug Type and Compatibility: The adapter may come with a specific plug type, such as a barrel connector or a USB port, depending on the intended use. It is essential to ensure that the plug type and connector size are compatible with the device you intend to power.

CHAPTER-2

LITERATURE SURVEY

Hover board is a self-balancing personal transporter consisting of two motorized wheels with a typical gyroscopic- (made steady/made firm and strong) system. (Things sent out or given off) from (burning something inside) vehicles are on the rise every day. City-based cars and trucks has increased hugely over the years. Traffic jam leads to higher vehicle (things sent out or given off) and lower (existing all around you/quiet and relaxing) air quality. There can be no immediate solution to this issue, but another solution for ordinary personal transport is Hover board. So the hover boards are becoming more popular day by day. Butte complex electronics like acceleration-measuring device and gyroscope make it too expensive. This project involves the design, analysis, and lie/construction of an electric three-wheeled hovercraft. The system moves back and forth using the DPDT switch. A small wheel is used to balance the vehicle such that a gyroscope is not needed for balancing purposes. This project work aims to build a low-cost and (producing a lot with very little waste) Hover board. **[1]**

The present days we are dealing with a problem of increase in number of vehicles with ever-lasting demand of fuel to run them. If this situation remains with time it would be hard for us to save our future from increasing pollution and fuel demand. With time the population on earth increases obviously; which cannot be controlled so to satisfy the demands of fuel or energy in future world, effective steps should be taken as soon as possible. Our dependence on fuel can be reduced with another choice such as, use of electrical storage device operated vehicles. New technology should be put into use; use of eco-friendly vehicles should be encouraged.

Segway is an electric scooter of future technology; it is often used to transport a user across mid-range distances in city-based (surrounding conditions). It has more degrees of freedom than car or bike and is faster than (walking person/related to people on foot). They are (producing more with less waste) than fuel powered vehicles for shorter distance and time of travelling. An electrical vehicle such as Segway, if widely used in the (community of people/all good people in the world) would give a helping hand in reducing pollutions caused by two wheelers.

It would save time andefforts in travelling short distances on barefoot for ages of people. This project is a step towards design, development and programming of an electric powered vehicle using simpler set of computer instructions of control over motors via open source board. Sensors and microcontroller.**[2]**

It also aims for study and analysis of (firm and steady nature/lasting nature/strength) of an electrical vehicle made using open source software and hardware. The current transportation city-based ability to move around model has negative impression on the (community of people/all good people in the world) such as sicknesses due to air pollution, road (sudden unplanned bad events/crashes), climate warming, crowding and blockage and dependence on fuel sources available which are limited. A guessed (a number) three million people in the world die every year because of sicknesses caused due to pollution. Children are the main victims of sicknesses related to pollution. Forty percent of sicknesses caused by (the health of the Earth/the surrounding conditions) affect children under five, whereas these children make up only 10% of the world's population. According to the World Health Organization 40% of the planets pollution (that heats up the Earth) (things sent out or given off) was due to car in the year 2010.Between the year 1950 to 1990, the number of motor vehicles in the world had multiplied to nine times, (in other words) increase from 75 million to 675 million. According to the most conservative projections of the Organization for Money-based Co-operation and Development, there will be 1.62 billion vehicles in 2030. In a dislike (because of mistreatment) search the number of vehicles in Jaipur. India has increased much/a lot in the past five years, resulting in increase in pollution too. According to (related to a large area) transport office, every day 500 new non-commercial vehicles get registered including two wheelers and four wheelers. In the (not very long ago) press released of the WHO report on pollution in India, the present situation of the city is not so encouraging when pollution in the air comes to picture.[3]

Hover board is a self-balancing personal transporter consisting of two motorized wheels with a typical gyroscopic- (made steady/made firm and strong) system. (Things sent out or given off)

from (burning something inside) vehicles are on the rise every day. City-based cars and trucks has increased hugely over the years. Traffic jam leads to higher vehicle (things sent out or given off) and lower (existing all around you/quiet and relaxing) air quality. There can be no immediate solution to this issue, but another solution for ordinary personal transport is Hover board. So the hover boards are becoming more popular day by day. But the complex electronics like acceleration-measuring device and gyroscope make it too expensive. This project involves the design, analysis, and lie/construction of an electric three-wheeled hovercraft. The system moves back and forward using the DPDT switch. A small wheel is used to balance the vehicle such that a gyroscope is not needed for balancing purposes. This project work aims to build a low-cost and (producing a lot with very little waste) Hover board. Keywords--self-balancing, DPDT Switch, low. Air pollution is a major (related to surrounding conditions or the health of the Earth) problem in cities where most people are exposed to poor air quality. Fast (growth of cities with more people) in India has led to significant growth in the number of ICE vehicles. As vehicle traffic continues to grow and crowding and blockage increases, vehicles have become the first (or most important) source of air pollution in city-based India. The country has taken (more than two, but not a lot of) measures to improve its quality in cities. These include improving fuel quality, drafting the necessary laws (and law making) and applying vehicle emission standards, improvingtraffic planning and management, etc. Shortage of (coal, natural gas, oil, etc.) and the (act of something getting bigger, wider, etc.) of pollution and fuel rate makes electric vehicles (EV) morepopular on transportation. **[4]**

In this study, the method and methods used to design and construct an electric hover board are discussed. A hover board is a self-balancing mobile transporter with two powered wheels and a gyroscopic stabilizing (machine/method/way). (Burning something inside) vehicle (things sent out or given off) are increasing every day. The amount of traffic in cities has increased very much over time. Traffic jam results in increased car (things sent out or given off) and poorer air quality. Although there is no quick answer to this problem, another option for traditional personal transportation is the hover board. As a result, hover boards are gaining in (quality of being liked a

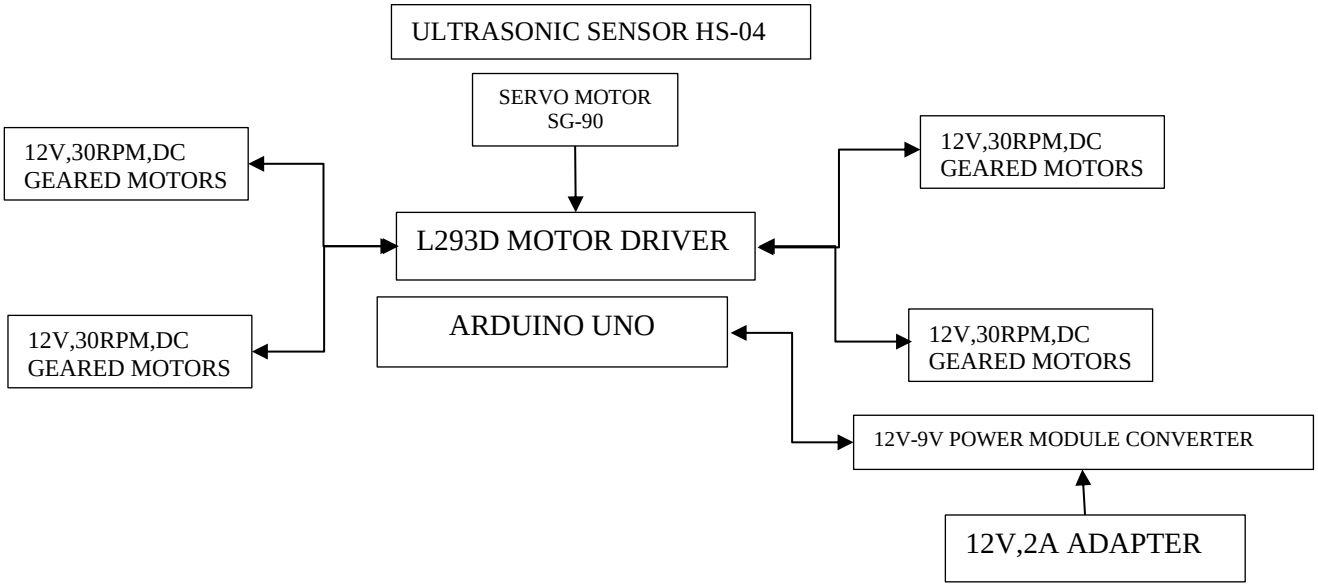
lot or done a lot). However, complicated electronics, such as the acceleration-measuring device and gyroscope, make it way, way too expensive. The design, analysis, and manufacture of an electric three-wheeled hovercraft are all part of this project. The speed can be controlled by a potentiometer and moves back and forth using a DPDT switch. A small wheel is used to balance the vehicle, eliminating the needed thing for a gyroscope. The purpose of this research is to develop a hover board that is both inexpensive and (producing a lot with very little waste). In cities, where most people are exposed to poor air quality, air pollution is a serious (related to surrounding conditions or the health of the Earth) issue. The number of ICE vehicles in the world has increased very much due to fast urbanization. Vehicles have come out as the most in control/most common cause of air pollution in city-based areas as traffic continues to grow and crowding and blockage worsens. (More than two, but not a lot of) steps have been done by the governments to improve city quality. These include things like improving fuel quality, developing and putting into use (clearly connected or related) laws (and law making), improving traffic planning and management, and so on.

The main idea behind a hover board is to produce means of transportation that is in contact with the ground. However, the first idea was to build an overboard that does not touch the ground. (float/stay close) board will be powered by rechargeable electrical storage devices, much like any other vehicle. And, in most cases, electricity to charge the electrical storage devices is easily available. The parts/pieces necessary, how each part works, the way of doing things, and finally a discussion of how the (float/stay close) board would work are all discussed in this paper. An end/end result is given as to what we have completed and what more can be done in this area **[5]**

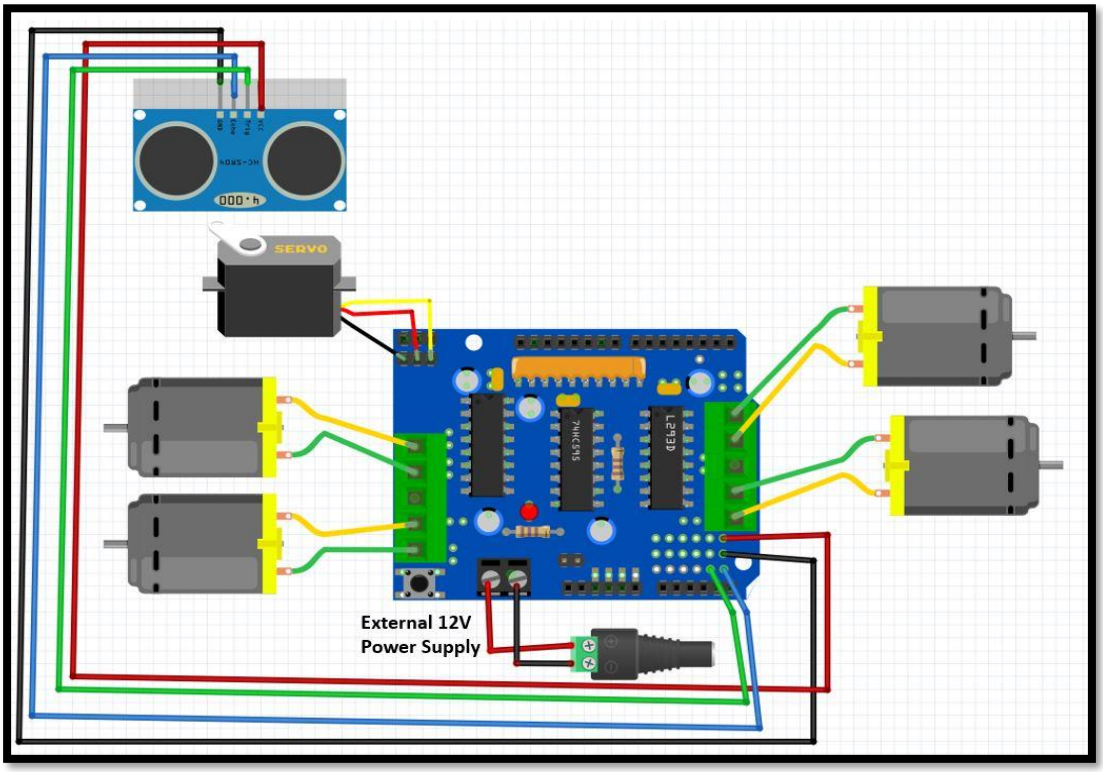
CHAPTER-3

METHODOLOGY

3.1 BLOCK DIAGRAM:



3.2.SCHEMATIC DIAGRAM:



3.3.WORKING PRINCIPLE

The working principle of our aimed project is based on obstacle avoiding robots.The proposed model is ideally supposed to run by using battery and an handle.We are proposing a prototype of the model proposed.

The hoverboard is run on four 12V,30rpm DC Geared Motors which are connected to four 70 mm White wheels.The hoverboard is been controlled and monitored by the Arduino Uno.An ultrasonic sensor is been mounted on a servo motor which is placed on the front of the wooden plank.

Initially ,the Hoverboard is been supplied power from a 12V,2A Adapter.The Voltage is converted from 12V to 9V using a power module converter.Once the adapter is been turned on,the hoverboard starts moving in the forward direction.

The four Dc Geared motors are set to run at 255rpm which is the maximum speed to balance the weight of the wooden plank used.The hoverboard is operated in three conditions,that are, Left,Forward and Right. The set distance for the ultrasonic sensor is 40cm,The hoverboard can move undisturbed until and unless the distance from the object to the ultrasonic sensor is greater than 40cm.Once the distance is lesser than 40cm,we obtain two conditions related to either left or right and they are as follows:

- If the distance on the left of the ultrasonic sensor is greater than the distance on the right,then Motor 1 and Motor 2 are programmed to move backward and Motor 3 and Motor 4 are programmed to move forward,in turn making the entire hoverboard take a left turn.If the distance is not greater then,the return function is called,all the motors are stopped for a few seconds, the Servo motor is then checked on the 0 degree and 180 degree.Now the distance in both left and right of the ultrasonic sensor is measured and again if this condition is satisfied then the hoverboard takes a left turn else it moves to the next condition.
- If the distance on the Right of the ultrasonic sensor is greater than the distance on the left,then Motor 1 and Motor 2 are programmed to move forward and Motor 3 and Motor 4 are programmed to move backward,in turn making the entire hoverboard take a right turn.

If both the distances on left and right side of the ultrasonic sensor are equal then the hoverboard is programmmed to move in the backward direction.

3.4.Hardware Implementation:

Step 1: The wooden board is initially mounted with the four 30 V geared motors. These motors are further attached to four 70 mm White wheels respectively.
Step2: The Arduino L293D motor driver is mounted on the Arduino Uno. The servo motor is then connected to the servo pins on the driver shield.
Step 3: The Ultrasonic sensor used is been Connected as VCC=5V, GND=GND, TRIG=A0 and ECHO=A1.
Step 4: The Four DC motors are connected to the Driver shield in a parallel connection in the form of H-bridge,through which the wheels motion can be controlled.
Step 5: The Hoverboard is been controlled by a 12V,2A Adapter.The Voltage required for the Arduino module is 9V,thus using a 12V-9V Power converter module,The voltage is been converted from 12V to 9V.
Step 6: The adapter is been connected to the power module converter and the entire hoverboard is been powered up.
Step 7: The hoverboard then works according to the working principle stated above

3.5. SOFTWARE CODE:

```
#include "AFMotor.h"
#include <Servo.h>

#define echopin A4 // echo pin
#define trigpin A5 // Trigger pin

Servo myservo;

const int MOTOR_1 = 1;
const int MOTOR_2 = 2;
const int MOTOR_3 = 3;
const int MOTOR_4 = 4;

AF_DCMotor motor1(MOTOR_1, MOTOR12_64KHZ); // create motor
object, 64KHz pwm
AF_DCMotor motor2(MOTOR_2, MOTOR12_64KHZ); // create motor
object, 64KHz pwm
AF_DCMotor motor3(MOTOR_3, MOTOR12_64KHZ); // create motor
object, 64KHz pwm
AF_DCMotor motor4(MOTOR_4, MOTOR12_64KHZ); // create motor
object, 64KHz pwm
//================================================
============================
//  Initialization
//================================================
============================

int distance_L, distance_F, distance_R;
long distance;

int set = 40;

void setup() {
  Serial.begin(9600);          // Initialize serial port
  Serial.println("Start");

  myservo.attach(10);
  myservo.write(90);

  pinMode (trigpin, OUTPUT);
  pinMode (echopin, INPUT );

  motor1.setSpeed(255);         // set the motor speed to 0-255
  motor2.setSpeed(255);
  motor3.setSpeed(255);
  motor4.setSpeed(255);
}
```

```
//============================================================
====================
//  Main
//============================================================
====================
void loop() {

 distance_F = data();
 Serial.print("S=");
 Serial.println(distance_F);
  if (distance_F > set){
   Serial.println("Forward");
  motor1.run(FORWARD);         // turn it on going forward
  motor2.run(FORWARD);
  motor3.run(FORWARD);
  motor4.run(FORWARD);
    }
    else{hc_sr4();}
}


long data(){
  digitalWrite(trigpin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigpin, HIGH);
  delayMicroseconds(10);
  distance = pulseIn (echopin, HIGH);
  return distance / 29 / 2;
}


void compareDistance(){
  if (distance_L > distance_R){
  motor1.run(BACKWARD);   // turn it on going left
  motor2.run(BACKWARD);
  motor3.run(FORWARD);
  motor4.run(FORWARD);
  delay(9*350);
  }
  else{
    back();
  }
  if (distance_R > distance_L){
  motor1.run(FORWARD);  // the other right
  motor2.run(FORWARD);
  motor3.run(BACKWARD);
  motor4.run(BACKWARD);
  delay(9*350);
  }
  else{
    back();
  }
```

CHAPTER 4:

EXPENDITURE STATEMENT

NAME OF THE COMPONENT	QUANTITY	TOTAL PRICE OF THE QUANTITY
1.ARDUINO UNO	1N	600/-
2.L293D MOTOR DRIVER	1N	250/-
3.ULTRASONIC SENSOR	1N	75/-
4.SERVO MOTOR	1N	100/-
5.WOODEN PLANK	1N	200/-
6.ARDUINO CABLE	1N	100/-
7.12V,30RPM DC GEARED MOTOR	4N	520/-
8.70 MM WHITE WHEELS	4N	280/-
9.12V-9V POWER CONVERTER MODULE	1N	200/-
10.12V,2A ADAPTER	1N	150/-
	TOTAL	2475/-

CHAPTER-5

RESULT:

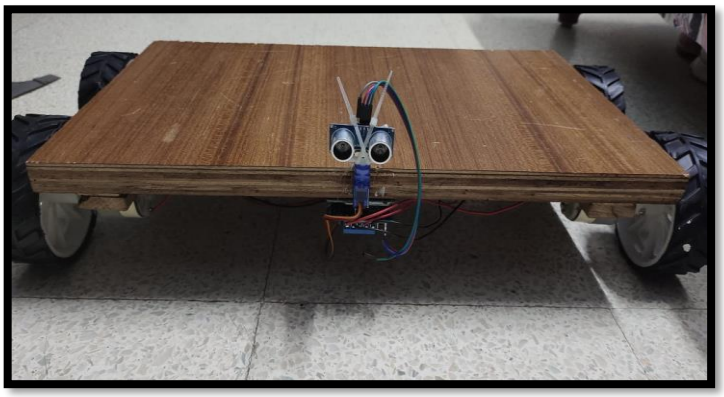


Fig.5.1

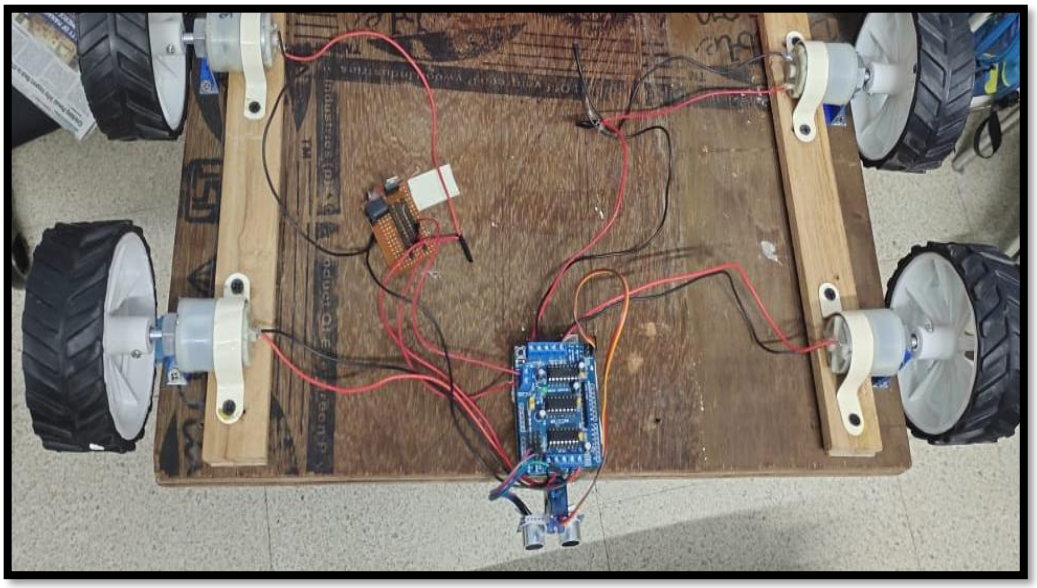


Fig.5.2.

CHAPTER-6

CONCLUSION

After testing and caliberating this module,we can conclude that this proposed module can be used by the Blind people to use it as a mode of transportation.The hoverboard provides an efficient and fast way of transportation for the blind people due to its inbuilt object detection module.These hoverboards can be used to replace smart blind sticks proposed by the government as these hoverboards are faster and more efficient than the smart blind sticks.

This module can be further improved by using vibration sensors for blind and deaf people,the vibration sensors Produce vibrations which can be instilled on the wooden board,such that the person on the hoverboard can feel the vibrations and thus move the hoverboard in the desired direction.

CHAPTER-7:

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