OBSTACLE AVOIDING BLUETOOTH CAR WITH GYROSCOPIC SENSOR AND VOICE CONTROL :-

A PROJECT REPORT

Submitted in partial fulfilment for the Mini Project – J Component

of

Measurement and Instrumentation (EEE 2004)

by

SL.No.	Register Number	Name of the Student
1.	18BEE0112	SOMDYUTI DAS ADHIKARY
2.	18BEE0122	MANDADI VENKAT ANVAY REDDY

Under the guidance of

Dr. P. Vijayapriya

Associate Professor / SELECT

VIT

VIT®

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

SCHOOL OF ELECTRIAL ENGINEERING

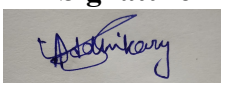
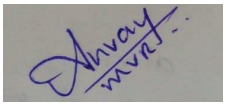
November, 2019

VIT®
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

SCHOOL OF ELECTRONICS ENGINEERING

CERTIFICATE

This is to certify that the project work entitled "**OBSTACLE AVOIDING BLUETOOTH CAR WITH GYROSCOPIC SENSOR AND VOICE CONTROL**" by **SOMDYUTI DAS ADHIKARY (18BEE0112), MANDADI VENKAT ANVAY REDDY (18BEE0122),** submitted to Vellore Institute of Technology University, Vellore, in partial fulfillment of the requirement for J component of the course titled Measurement and Instrumentation EEE 2004 is a work carried out by us under my supervision. The project fulfills the requirement for J component as per the regulations of this Institute and in my opinion meets the necessary standards for submission.

Sl. No	Name of the student	Register Number	Signature
1.	Somdyuti Das Adhikary	18BEE0112	
2.	Mandadi Venkat Anvay Reddy	18BEE0122	

Dr.P.Vijayapriya
Subject Faculty
Asso.Prof / SELECT
VIT

TABLE OF CONTENTS

ABSTRACT

Applications of automated robots in modern industries are reaching new heights every day. From automated guided vehicles to advanced assembly lines, new ideas are being integrated into industries using new technologies such as ultrasonic sensors, accelerometers, gyroscopic sensors, line followers, vision guidance and geoguidance systems.

An idea was proposed to integrate a few of these sensors such as accelerometer, gyroscope, and ultrasonic sensors into the making of a Bluetooth enabled Arduino powered car working through voice control. The primary objective of the robot is to detect objects in its path and avoiding it by changing its direction and orientating itself on command. This can be executed in the following method.

An ultrasonic sensor sends sound waves in the direction of the vehicle's motion. When an obstacle is within the range of the sensor, feedback is sent via Bluetooth to the user. Then the user uses voice control to command the vehicle to either decrease its speed or change its direction at a specific angle, if required, using the gyroscopic sensor.Using this project, we can apply the concept of Measurement and Instrumentation by the means of an accelerometer to measure speed and acceleration of the model, gyroscopic sensor to exactify the position of the vehicle in a 2D plane. And an ultrasonic sensor to measure the distance between the vehicle and obstacle in its path all driven using Arduino as the base.

Description about the project

INTRODUCTION :

The main objective behind the project is to create a working model of Arduino driven car that can be operated both directly(while connected to the laptop) and indirectly (via Bluetooth) and get back intended feedback in form of data such as distance from nearest object, speed and displacement as when compared to its initial conditions.

The model car contains an Arduino Uno microcontroller along with other devices such as motor driver and ultrasonic sensor to help it with its mobility. The project also tries to look into the possibility of controlling the model with voice commands using speech to text applications available in current era.

If model completed perfectly then we will be able to:

1. Remotely control the model car using laptop and voice commands.
2. Receive the data transmitted by the model for further interpretation.
3. Make the car automated as to let it avoid any obstacle in front of it without any command from the user.

MOTIVATION:

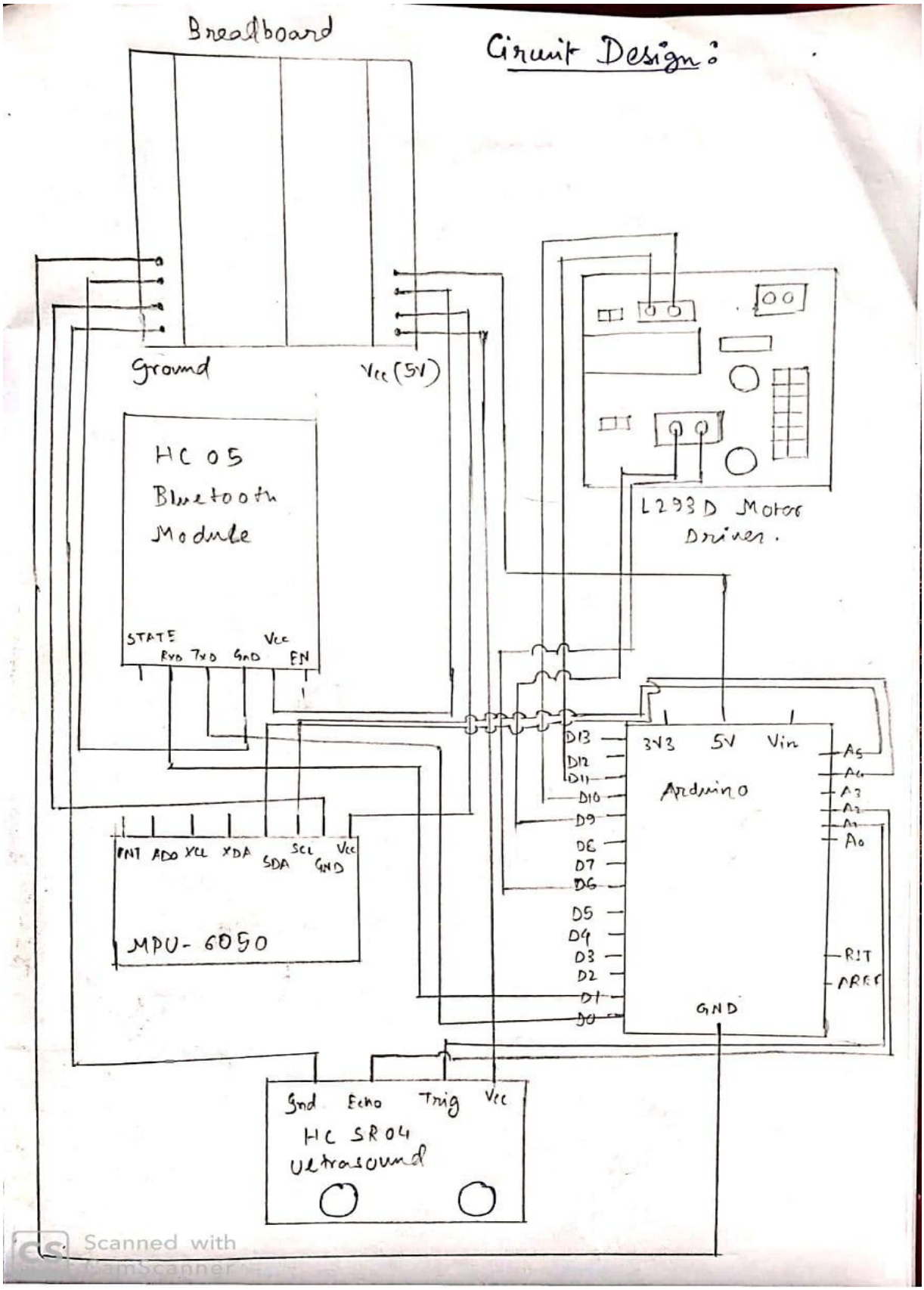
Automated vehicles and devices are the next big thing to revolutionize the industries. It is already happening in form of assembly robots, transporter vehicles etc as a part of industry 4.0.

Based on this concept, our group wanted to try and replicate some basic functions of these industrial devices and incorporate them in a small model car.

COMPONENT SPECIFICATION :

1. ARDUINO UNO
2. MPU6050- Accelerometer and Gyroscopic sensor
3. L293D - Motor Driver
4. HC05- Bluetooth module
5. HC-SR04 - Ultrasonic Sensor
6. Breadboard
7. 4 X DC Motors (2 x 150 rpm, 2 x 300 rpm)
8. Chasis and 4 Wheels
9. Jumper Wires

Circuit Diagram and Design



Working

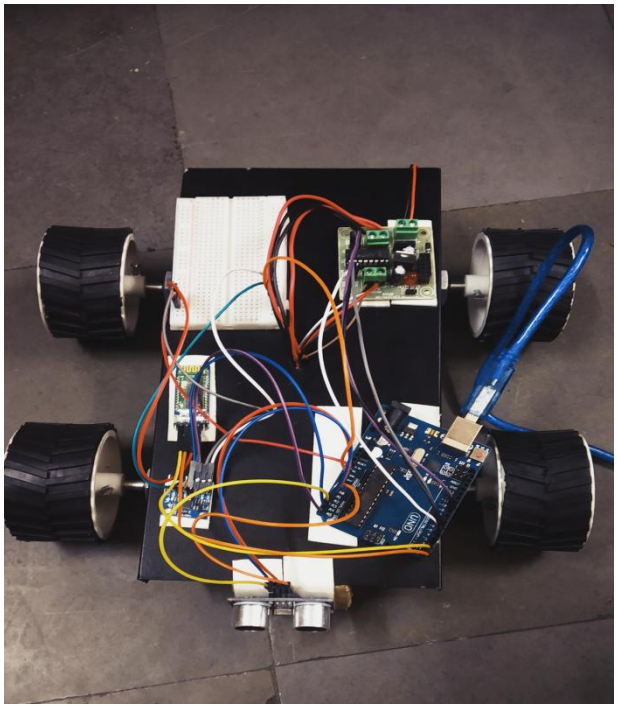
The model is based on basic model car design.

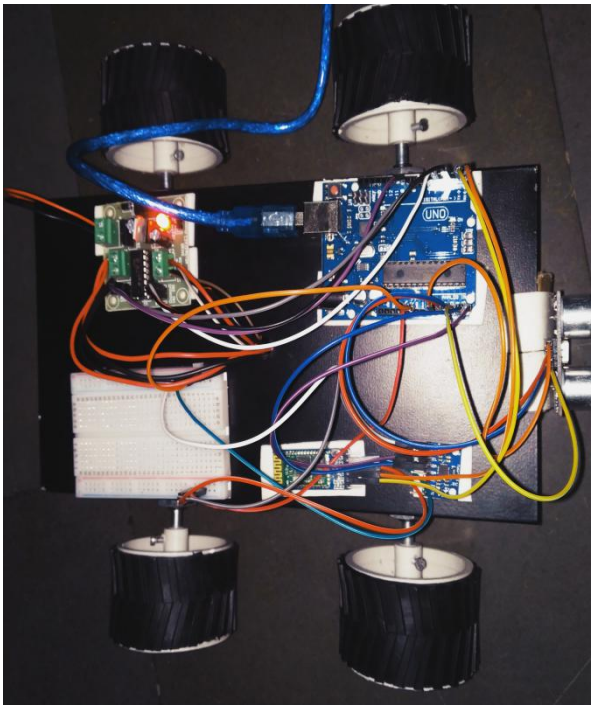
After uploading the Arduino code, the model is detached from the laptop and connected to external power source. The model is paired with mobile Bluetooth via an app that has a speech to text feature. When a voice command is given in the app, the model receives the input via HC05 Bluetooth module to the Arduino in the format of text.

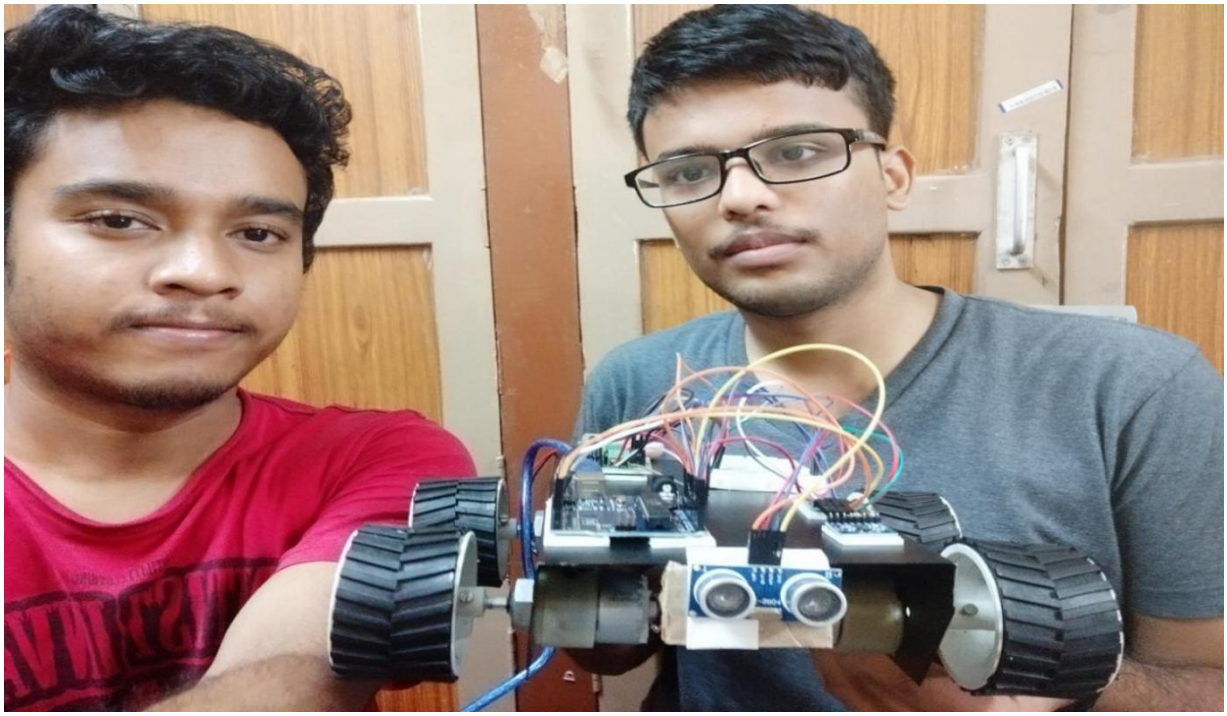
When the “forward” command is given, the Arduino reads it and runs the forward function already defined in the code and then sends output signals to the motor driver via digital pins in the format of HIGH and LOW. Then the dc motors start to rotate in a manner to move the model forward. When any other predefined function is inputted via speech, the Arduino interprets the signal to pass the command to the motor driver and hence we can control the model using our voice/speech. The model also records its position in the x and y plane and its current orientation with respect to its starting point as origin with the help of MPU6050. When the command “stop” is inputted , the serial monitor displays the above mentioned parameters. And finally, if any object is in the path of the model, the ultrasonic sensor detects the object using sound waves and sends the distance as an input to the Arduino. If the distance falls below the limit defined in the code, then the Arduino runs the “left” function without the need of interference of the user and the model turns left until no obstacle is in its path and then continues to move forward until another command is given.

In this manner we can use this model to measure distance and orientation of a moving object from its current position while avoiding any obstacles in its path.

Photo of the project along with group members







ARDUINO CODE :

```
int pin1=10;
int pin2=11;
int pin3=6;
int pin4=9;
const int trig = A2;
const int echo = A1;
int distance;
long duration;
#include <MPU6050.h>
#include <Wire.h>
#include <I2Cdev.h>
MPU6050 accel;
int16_t ax,ay,az,gx,gy,gz;
int16_t ax0,ay0,az0,gx0,gy0,gz0;
void setup()
{
  Serial.begin(9600);
  pinMode(pin1,OUTPUT);
  pinMode(pin2,OUTPUT);
  pinMode(pin3,OUTPUT);
  pinMode(pin4,OUTPUT);
  pinMode(trig,OUTPUT);
  pinMode(echo,INPUT);
  Serial.println("HEllo");
  accel.initialize();
  Serial.println(accel.testConnection()?"Connection successfull":"Connection failed");
    accel.getMotion6(&ax0,&ay0,&az0,&gx0,&gy0,&gz0);
  Serial.println("Initial values");
Serial.print("ax0=");Serial.print(ax0);Serial.print("\t");
Serial.print("ay0=");Serial.print(ay0);Serial.print("\t");
Serial.print("az0=");Serial.print(az0);Serial.print("\t");
Serial.print("gx0=");Serial.print(gx0);Serial.print("\t");
Serial.print("gy0=");Serial.print(gy0);Serial.print("\t");
Serial.print("gz0=");Serial.print(gz0);Serial.print("\t");
Serial.println("\n");
}
void loop()
{
  digitalWrite(trig,LOW);
  delayMicroseconds(2);
  digitalWrite(trig,HIGH);
  delayMicroseconds(10);
  digitalWrite(trig,LOW);
  duration=pulseIn(echo,HIGH);
  distance=duration*0.034/2;
  Serial.print("Distance: ");
  Serial.println(distance);
  accel.getMotion6(&ax,&ay,&az,&gx,&gy,&gz);
Serial.print("ax= ");Serial.print(ax); Serial.print("\t");
```

```
Serial.print("ay= ");Serial.print(ay); Serial.print("\t");
Serial.print("az= ");Serial.print(az); Serial.print("\t");
Serial.print("gx= ");Serial.print(gx); Serial.print("\t");
Serial.print("gy= ");Serial.print(gy); Serial.print("\t");
Serial.print("gz= ");Serial.print(gz); Serial.print("\t");
 if(distance<15)
 {
  left();
  Serial.println("Obstacle");
 }
 else
 {
  forward();
 }
 while(Serial.available()>0)
 {

  char input=Serial.read();
  if(input=='w'||input=='F')
  {
   forward();
   Serial.println("Forward");
  }
  else if(input=='a'||input=='L')
  {
   left();
   Serial.println("Leftward");
  }
  else if(input=='s'||input=='B')
  {
   backward();
   Serial.println("Backward");
  }
  else if(input=='d'||input=='R')
  {
   right();
   Serial.println("Rightward");
  }
  else if(input=='S'||input==' ')
  {
   finish();
   Serial.println("Stopped");
  }
 }
 delay(2000);
}
 void forward()
 {
  digitalWrite(pin1,LOW);
  digitalWrite(pin2,HIGH);
  analogWrite(pin3,128);
```

```
 analogWrite(pin4,0);
}
void backward()
{
 digitalWrite(pin1,HIGH);
 digitalWrite(pin2,LOW);
 analogWrite(pin3,0);
 analogWrite(pin4,128);
}
void left()
{
 digitalWrite(pin1,HIGH);
 digitalWrite(pin2,LOW);
 analogWrite(pin3,128);
 analogWrite(pin4,0);
}
void right()
{
 digitalWrite(pin1,LOW);
 digitalWrite(pin2,HIGH);
 analogWrite(pin3,0);
 analogWrite(pin4,128);
}
void finish()
{
 digitalWrite(pin1,LOW);
 digitalWrite(pin2,LOW);
 digitalWrite(pin3,LOW);
 digitalWrite(pin4,LOW);
}
```

END

TOTAL COST :

- MPU6050 - Rs.350
- HCO5 - Rs. 240
- Arduino UNO - Rs. 559
- L293D - Rs. 135
- 4 DC Motors - Rs 600

The total cost was Rs 2019

APPLICATIONS:

If the project is a success, by further improvements in the code and better quality in signal transmission, we can use the model to map out areas that are difficult for humans to reach like small caves.

This will be possible using the ultrasonic sensor to detect objects in front of it, the accelerometer and gyroscopic meter to measure the contour of the area such as slope by interpreting the speed variation and location variation data transmitted by the MPU6050 via the Arduino and Bluetooth module.

We can also implement this in automated and self-driving car. Automated cars are more efficient and are less prone to accidents than humans. Tesla is one such company which is currently working on this field and are setting up milestones for others to follow.

CONCLUSION :

The idea of the project was to implement the concept of Measurement and Instrumentation by using different sensors to measure and show the different physical characteristics of the vehicle and it's surroundings. We succeeded in this venture despite some initial drawbacks. Our subject faculty have been kind to us by allowing and encouraging us to do this project. Through this project we learned to work and operate with various sensors, Arduino and WiFi Module. This project was a success and we plan to further explore and work on the new aspects of this project.

References :

- https://www.arduino.cc/
- https://playground.arduino.cc/Main/MPU-6050/
- https://electronicshobbyists.com/hc-05-bluetoothmoduleinterfacing-with-arduino-arduino-bluetooth-module/
- https://howtomechatronics.com/tutorials/arduino/ultrasonic-sensorhc-sr04/
- https://dzone.com/articles/driving-a-dc-motor-with-an-arduino-andthe-l293d-m