Faculty of Engineering - Ainshams University

AIN SHAMS UNIVERSITY

Since 1839

كلية الهندسة - جامعة عين شمس

GROUP 16

project documentation

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INTRODUCTION

We are a group of Electrical engineering students at Ain Shams University and we were assigned to make a Smart Mobile Controlled Car Project, The project consists of three main phases which are :

Phase(1): Easy Driving Application

- User should press a button on car or submit special Bluetooth command to put the car in easy driving mode.
- User can control car movement using mobile.
- User can move the car forward, backward, left and right.
- The car should avoid obstacles.
- The minimum requirements of obstacle avoidance is stop to avoid collision.

Phase(2): Line Tracking Application

- User should press a button on car or submit special Bluetooth command to put the car in line tracking mode.
- When the car placed over the track it should follow the line.
- The minimum requirements is to use simple closed track.

Phase(3): Accurate Movement Application

- User should press a button on car or submit special Bluetooth command to put the car in accurate movement mode.
- Use can order the car to move forward or backward for certain length (EX 40 cm).
- Use can order the car to move right with proper angle (EX 30 degree).
- User orders is sent via the Blueooth module.
- While demo the car should move in infinity shape then rectangle shape then circle shape.
- The car should return to beginning point after finishing each shape.
- The car should stop for 25 seconds after finishing each shape.
- The shape size must be (2m x 2m) no more no less.

Our Team consists of 10 members, So we divided each phase to sub phases and we divided these sub phases among us, And we held a meeting every 2 weeks to discuss our progress in these phases.

INTRODUCTION

Team Members:

- ➢ Youssef Yasser Ibrahim
- ➢ Youssef Mohamed Moro
- ➢ Youssef Mohamed Abo Al Maaty
- ➢ Youssef Osama Abd Al Lateef
- ➢ Mohamed Aladdin Mohamed Mohamed
- ➢ Mostafa Mohamed Abd Al Mageed
- ➢ Mosatafa Mohamed Ali
- ➢ Mostafa Adel Mostafa
- ➢ Youssef Samir
- ➢ Youssef Refaat

COMPONENTS

4 wheeled Car mechanics kit.	
L298 Dual H-Bridge Motor Driver	
HC-05 bluetooth module	
Arduino uno board	
Ultrasonic Sensor	
IMU MPU6050 "3-Axis Acceleration Gyroscope 6DOF Module	
2- 9 volts lithium ion rechargeable batteries	

BASICS AND CONNECTION TO ARDUINO

L298 Dual H-Bridge Motor Driver

L298N H-bridge IC allows you to control the speed and direction of two DC motors, or control one bipolar stepper motor with ease.

The L298N H-bridge module can be used with motors that have a voltage of between 5 and 35V DC.
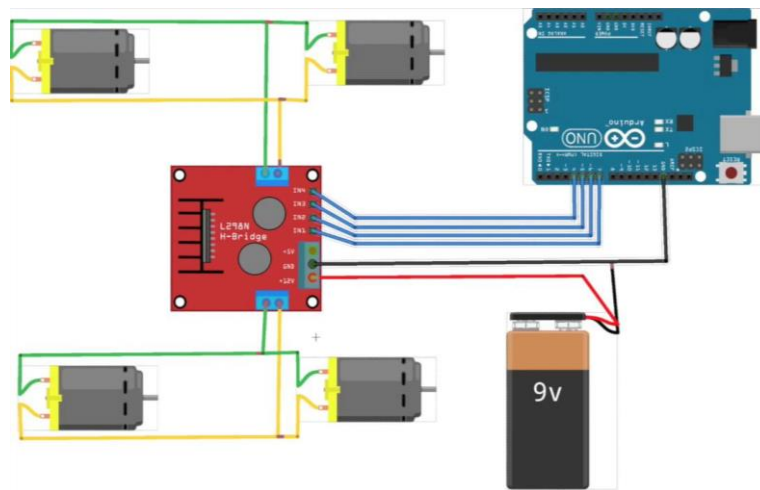

*Figure 1 Connection diagram to Arduino*

HC-05 Bluetooth Module

The HC-05 is a module which can add two-way wireless functionality to the project. You can use this module to communicate between two microcontrollers like Arduino or communicate with any device with Bluetooth functionality like a Phone or Laptop. The module communicates with the help of USART at 9600 baud rate hence it is easy to interface with any microcontroller that supports USART.
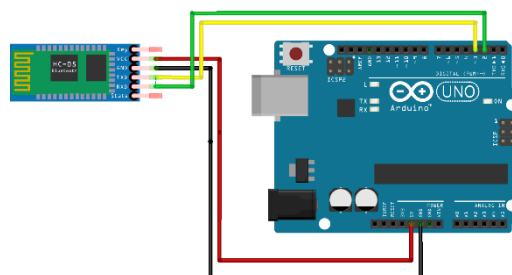
BASICS AND CONNECTION TO ARDUINO

Ultrasonic Sensor

ultrasonic sensors measure distance by using ultrasonic waves.The sensor head emits an ultrasonic wave and receives the wave reflected back from the target. Ultrasonic Sensors measure the distance to the target by measuring the time between the emission and reception .
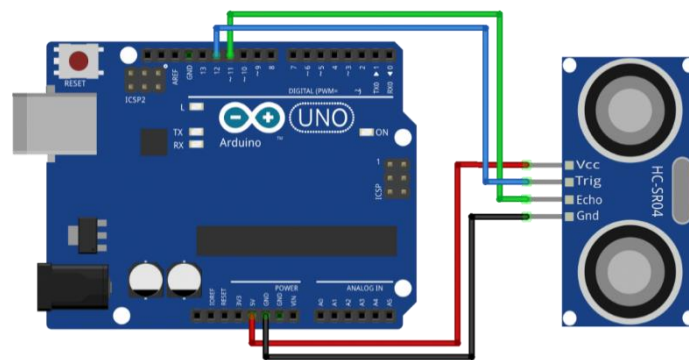
MPU6050 Gyroscope

The sensor contains a 3 axis MEMS accelerometer and a 3 axis MEMS gyro in a single chip. It is very accurate, since it contains 16-bits analog to digital conversion hardware for each channel. Therefore it captures the x, y, and z channel at the same time.
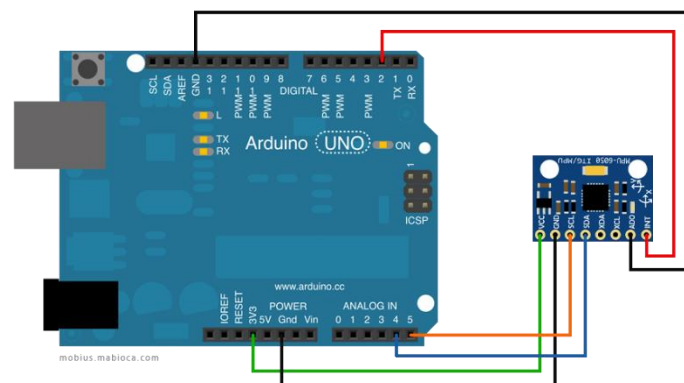
MIT APP INVENTOR

MIT App Inventor is an intuitive, visual programming environment that allows everyone to build fully functional apps for smartphones and tablets, We used MIT App Inventor to create our mobile phone application to control our smart car, We developed and designed the application so that it would have all the commands that we would need in our project.
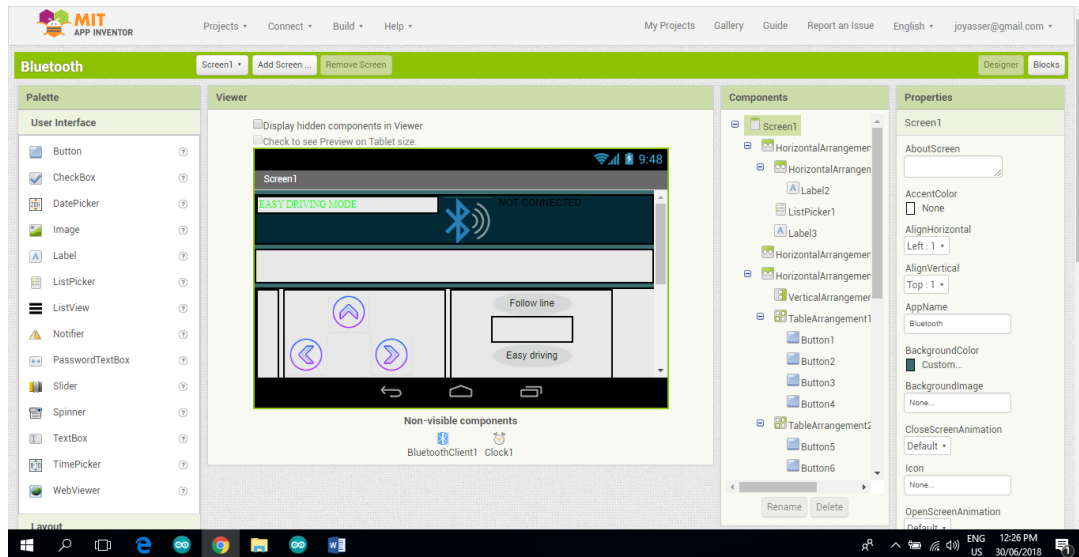

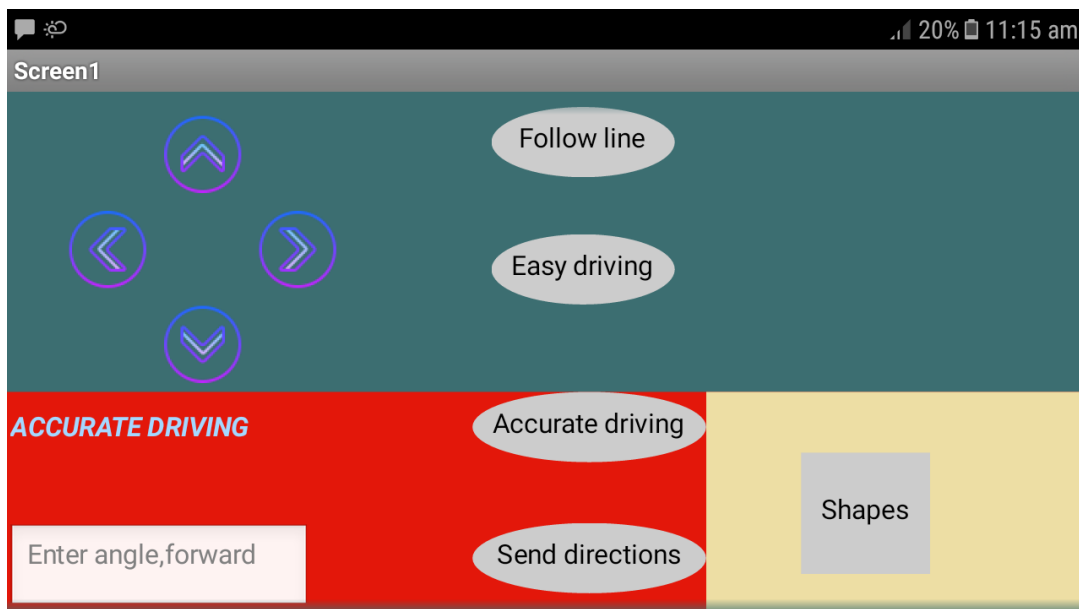*Figure 2 MIT APP INVENTOR USER INTERFACE*

Figure 3 APPLECATION USER INTERFACE ON SMART PHONE

HOW THE CAR WORKS

First we connect the voltage supplies (Batteries) to the Arduino and the L298N H-bridge IC, Then we open our smart phone application and we connect it to Arduino via the Bluetooth connection which is through the HC-05 Bluetooth module.

Now we are on the "Easy Driving Mode", where you can use the arrows to control the direction of motion of the car, If you press on the forward arrow the car will move forward but it will automatically stop when there is an obstacle at 10 cm ahead, Additionally if the is initially at rest, it won't start to move forward if there is an obstacle at 10 cm ahead but it can move in all the other directions in order to move away from that obstacle.

If your press on the "Follow Line" button then now you are submitting the car to the line tracking mode, In this mode the car will start autonomously detect and follow the path of the black line, To exit the line tracking mode all you have to do is to press the "Easy driving" button this will take you to the "Easy Driving Mode" to freely control the car.

If you press on the "Accurate driving" button the car will inter the "Accurate Driving Mode", In this mode you are ordering the car to move right with a certain angle and choosing a forward then a backward distance, When the **blue LED** turns on this means that the car is waiting for you to enter a certain angle, Type the desired angle in the text box then hit the "Send directions" button -*This button is used to send directions for the Arduino*- , After entering the angle the **blue LED** will turn off and the car will move right till it reaches the desired angle, Then the **blue LED** will turn on again this means that the car is waiting for you to enter the forward distance (in cm) to move, The same goes to backward distance.

After entering al the accurate driving parameters *(Angle, Forward distance, Backward distance)*, Then a **red LED** will turn on this asks you if you want to continue in the accurate mode or you want to exit it, if you want to continue then press on the "Accurate driving" button, If you want to exit then press on the "Easy driving" button.
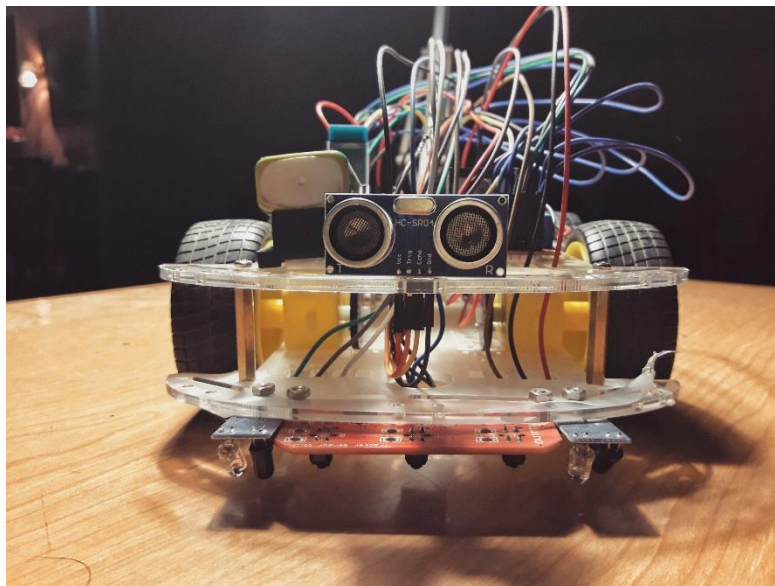

Figure 4 OUR BELOVED CAR