Microprocessor Systems Lab

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Report–Voice Controlled Car using Tiva Tm4c123GXL
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Voice Controlled Car

1 Overview of the Project

The motivation behind this project was to build a prototype for the blind people to perform daily tasks using only voice commands. The project works on the basis of vocal instructions. This prototype can currently perform specific amount of tasks like moving forward, backward, left and right on voice commands. We have also added the functionality of speed control and also object detection to make it a bit smarter.
Talking about the multiple parts of this project, explaining in step by step would be easy for the reader to understand:

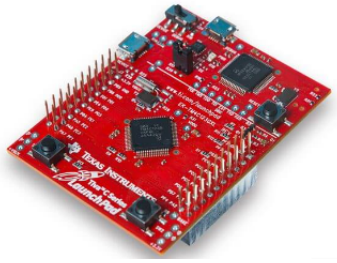

Figure 1: Tiva Tm4c123GXL

i. Giving Voice Commands:

Suppose you have spoken "**Right**", the first task for Micro-controller is to understand the command, for which we need to receive the user instruction. We had two ways to accomplish this task, firstly, by using microphone which would increase the cost and ultimately the complexity of project as well.

ii. Bluetooth Module:

So, to make the project easier, we came up with the idea of using Bluetooth Module **HC-06**. This module will work with a **BT Voice Control Application** easily available on play-store/App Store. So, continuing with **"Right"** command, you will send this command using your phone and Tiva[1] will be programmed accordingly to receive the instruction using the Bluetooth Module. The application will perform the task of Conversion of audio to text and simply we will receive **"Right"** instruction.

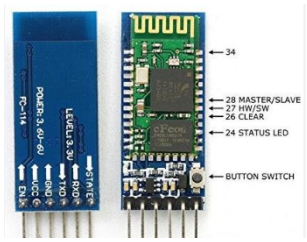

Figure 2: Bluetooth Module(HC-06)

[1]Note: *Tiva is the used micro-controller for this project, therefore, both Tiva/Micro-controller terms will be used for the same meaning*

iii. Movement of Car :

After receiving the **"Right"** command using **UART** Module[2], in next step, I had configured the micro-controller pins as GPIO pins to send the movement signals to input pins of Motor Driver **L298N** shown in the figure below. The code for the whole working of the project can be found on github link as After receiving the command **"Right"**, I had written few lines of code for configuring Tiva Tm4c1233GH6PM as GPIO Pins to communicate with motor driver **L298N** and work accordingly and here it is, the car working on your commands which will turn "right" on your instructions.

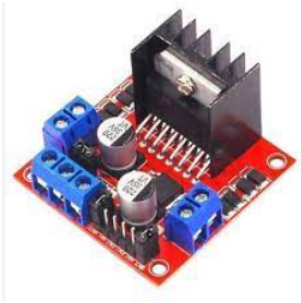

Figure 3: Motor Driver(L298N)

iv. Object detection:

Final and bonus task was to add objection detection to make this project a bit fancier,so for this purpose we used **Ultrasonic Sensor** which will prevent it from hitting into objects blindly.

Figure 4: Ultra-Sonic Sensor

[2]Character by character data transfer was configured, so, only 'R' will be received

2 Logic Diagram

Before implementing the code, we have to design a logic diagram so we may have a idea how all the blocks will work as a whole together. Therefore, I had taken help from the online document [**?**] available on google scholar for Aurdino and then implement the same for Tiva Board, I used *Draw.io* for this purpose and the implemented design is given as:

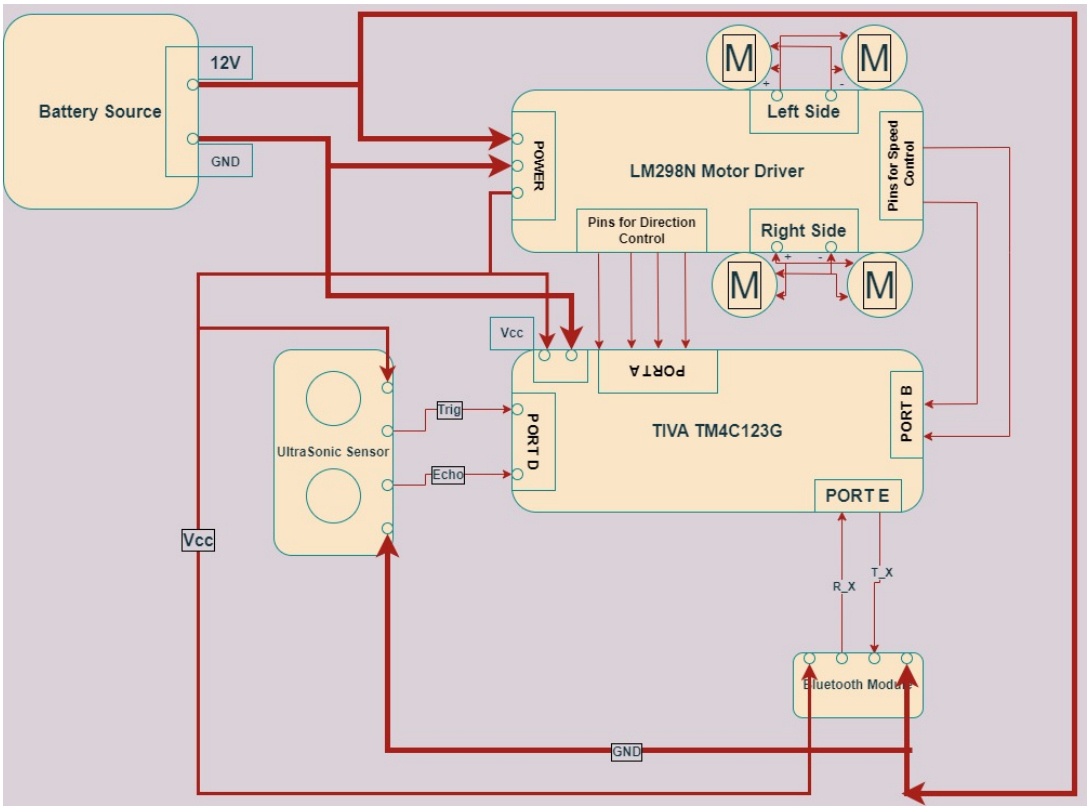

Figure 5: Logic Diagram for Project

3 Components & Budget for Project

As I already explained all the components used in the project, so naming all of them and also the price in Pakistani Rupee(Pkr) to estimate the total cost for the project.(*Cost of Tiva Board is excluded)

	Component	Price (Pkr)
1	Car Chasis (Four Wheel)	1200
2	Bluetooth Module (HC-06)	600
3	Motor Driver (L298N)	300
4	UltraSonic Sensor (HCSR-04)	150
5	BT Voice Control Application	Free
6	Jumper Wire & Battery	300
	Total Expenses	**2550**

Table 1: Expenses for Project