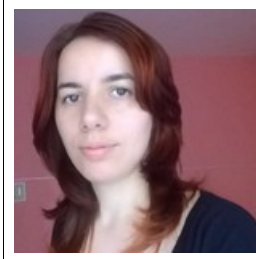


1. Project title: Line following car



Botez Diana

dia.botez@gmail.com

2. Abstract

The idea of this project was to create a modern electric self-driving car that also has remote control for basic commands. The motor driver is controlled from the XMC 4500 Relax Kit where is implemented all the sensor data analysis.

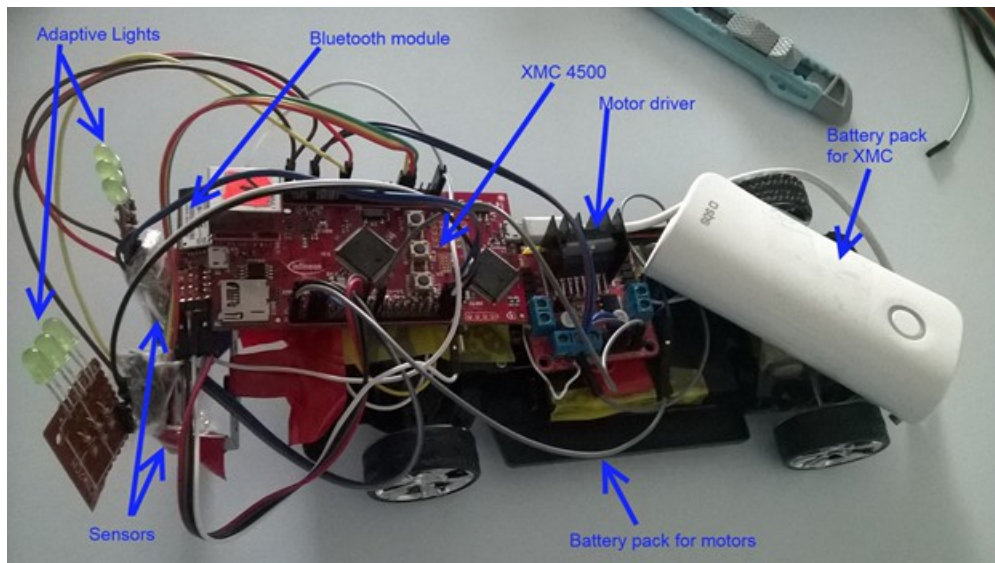


Figure 1 Line following car

3. Introduction, project aims and objectives

This project is a line following car (Figure 1). I used phototransistors as line detecting sensors. They are close to a light source so the light that is reflected is received by the phototransistor. If the light is reflected from a white surface, the ADC_MESURMENT app will read from the sensor a high value. If the light is reflected from a black (or dark) surface, the app will read a low value (close to 0).

Depending on which sensor returns a “close to 0 value”, the car will turn right or left. Also, during the turn, the car lights will adapt themselves, if they are turned on (Figure 2). The lights and the traction motor are turned on & off throughout Bluetooth commands.



Figure 4 The Bluetooth module

The third module is the motor driver module (Figure 5). This driver model can control 2 motors. The supply voltage is the same with the one used for the motors, but the GND is common with the GND from the XMC. The left/right motor is controlled with 2 digital/IO output pins from XMC. When the left pin has a high voltage, the direction motor works with +5V and when the right pin has a high voltage, the direction motor works with -5V (Figure 6).

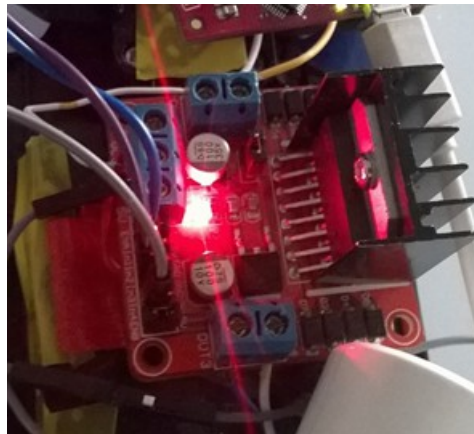


Figure 5 the motor driver

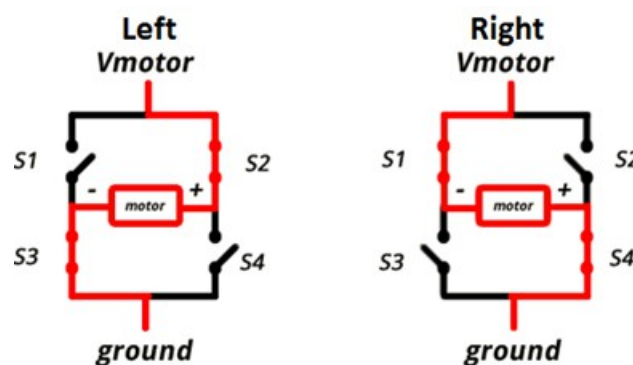


Figure 6 H Bridge [1]

The traction motor is controlled with a PWM. I used PWM to control the motor because I wanted to control the speed so I can make the car go slower.

The supply voltage for the car is divided in two parts. One supply voltage for XMC and sensors (Figure 7) and another supply voltage for the motors (Figure 1) – under the car.



Figure 7 XMC supply voltage

The sensor modules are composed from a LED and a phototransistor (Figure 8). The connection scheme for the sensors is presented in Figure 9.

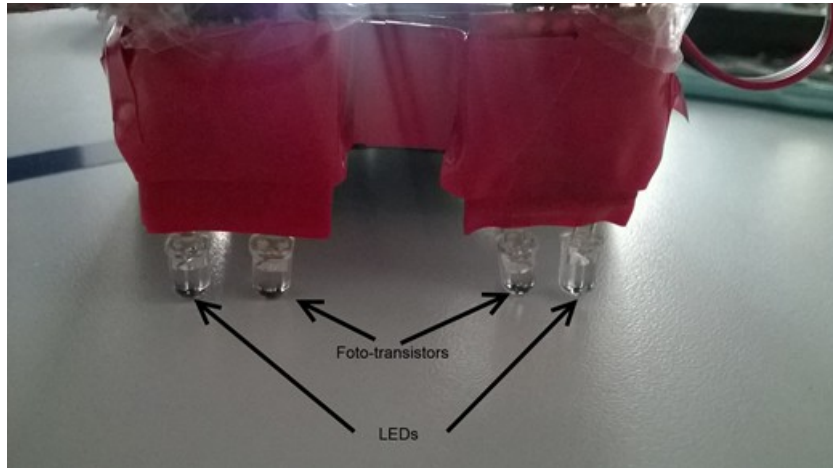


Figure 8 the sensor modules

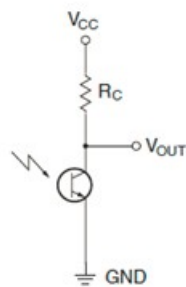


Figure 9 Sensor connection scheme [2]

6. Software

As a software platform, I used DAVE 4. The apps I used are shown in Figure 10 and 11.

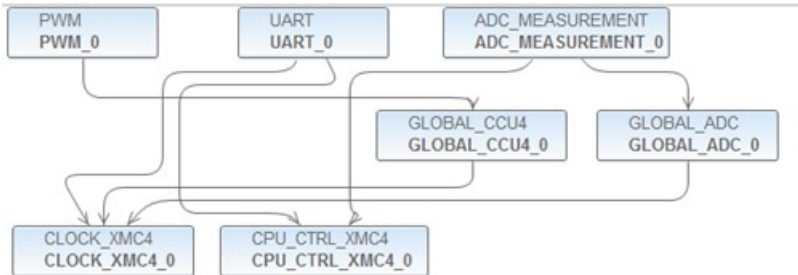


Figure 10 Dave 4 apps 1



Figure 11 Dave 4 apps 2

In Figure 10 I showed the apps used for motor control, BT transmission and sensors. In Figure 11, I showed all the IO apps used for lights and left/right commands.

7. Project results & applications

The car follows the dark line and adapts its lights when it turns left or right. The car can be started or stopped at any time using commands from a BT terminal. The car can start without its lights on and also the lights can be turned on/off while driving.

8. Reference

[1]	H bridge scheme	http://blog.solutions-cubed.com/wp-content/uploads/2012/06/h-bridge_thumb.png
[2]	Phototransistor connection scheme	https://mikedodaro.files.wordpress.com/2011/10/phototransistor.png