AMCC

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1 Abstract

The goal of AMCC project is to design a self-control car able to detect and avoid obstacles in the way. The project uses the Arduino Uno microcontroller board for taking decisions and controlling the mechanical movements of the car. The board receives information from two sensors: an ultrasound sensor for determining the distance towards an object, along with a object recognition camera.

The full list of components used in the project:

- 1 $\times$ Arduino Uno Board
- 3 $\times$ 5 V DC Motors
- 2 $\times$ $L298N$ Motor Drivers
- 1 $\times$ $SG90$ Servo Motor
- 1 $\times$ $HC-SR04$ Ultrasonic Distance Sensor
- 1 $\times$ $Pixy2$ Camera
- 1 $\times$ 7.4 V LiPo Battery

The circuit diagram is shown in Fig. 1. The project has it's own library that is flexible enough for creating complex movements by using a series of primitive actions, for example the a *left forward turn* is a sequence of the following primitives:

- Power up the front motor;
- Power up the back motors;
- Spin front motor clockwise; (turns front wheels left)
- Spin right back motor counter clockwise;
- Spin left back motor clockwise;
- Power off the front motor;

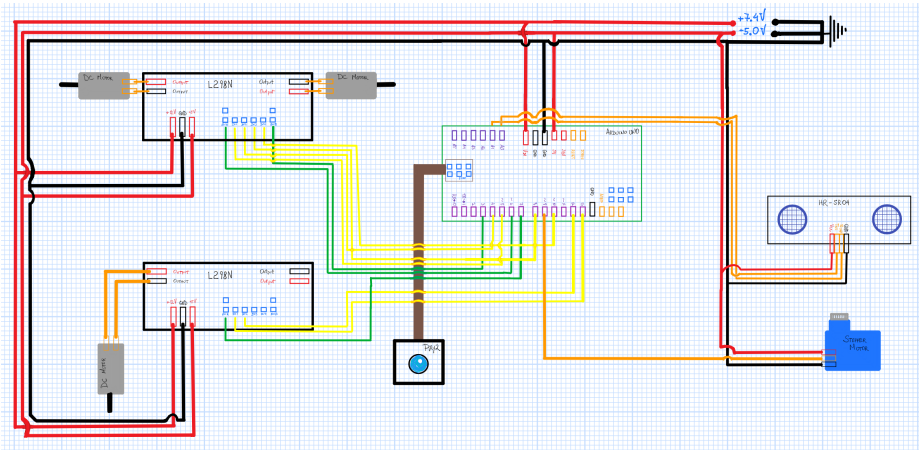

Figure 1: Circuit Diagram for the AMCC project

- Power off the back motors;

For a more complete list of available primitives and some simple movements, consult the *myDCMotorLibrary.h* file in the *myDCMotorLibrary* library.

The current logic of the car is to move forward until it reaches a threshold distance from an object. At this point, the car will stop and will measure the available distance to objects on the left and right side. It then chooses the side with the largest distance and turns in that direction. If the distance in all direction (forward, left, and right) are below the specified threshold, the car will move backwards and reassess its position. The issue, that the camera is supposed to solve, is the car not being able to keep track of the turning angle sue to the DC nature of the motors. As a solution, the mounted camera records the area of a rectangle (that was trained to identify) before the turn, rotates by 90 degrees in the opposite direction of the desired turn, then the actual turning is initiated and it stops when the newly recorded area matches the initial value. For the full code along with the necessary libraries can be found on github.
For a simple video demonstration of the car's behavior follow this link.