



Ryerson Rams Robotics

Software Training Package: 1 of 2

Start Date: Wed October 7, 2020

Due Date: Sun October 18, 2020

Introduction

A new project has started at Ryerson Rams Robotics. The team would like to develop a mini rover to test new drive and motor controls. You are tasked with wiring and programming 2 motors to an Arduino using the L293D motor controller and using a potentiometer to control the motors speed with PWM. As well as that, you should use a dip switch to switch between control modes. This task will all be done online and simulated using Tinkercad.

You will need to power the motor controller with a 9v battery source as well as the 5v arduino power.

L293D Pinout

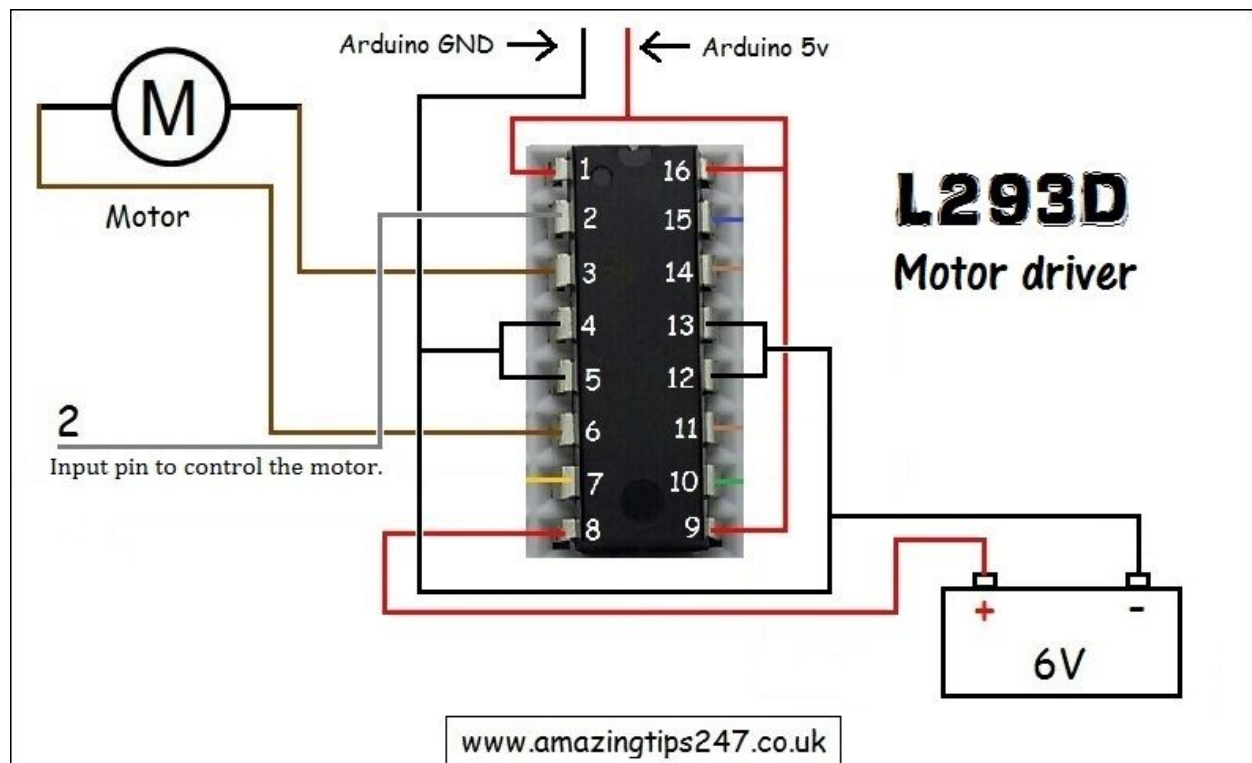


Figure 1.0 : L293D Pinout

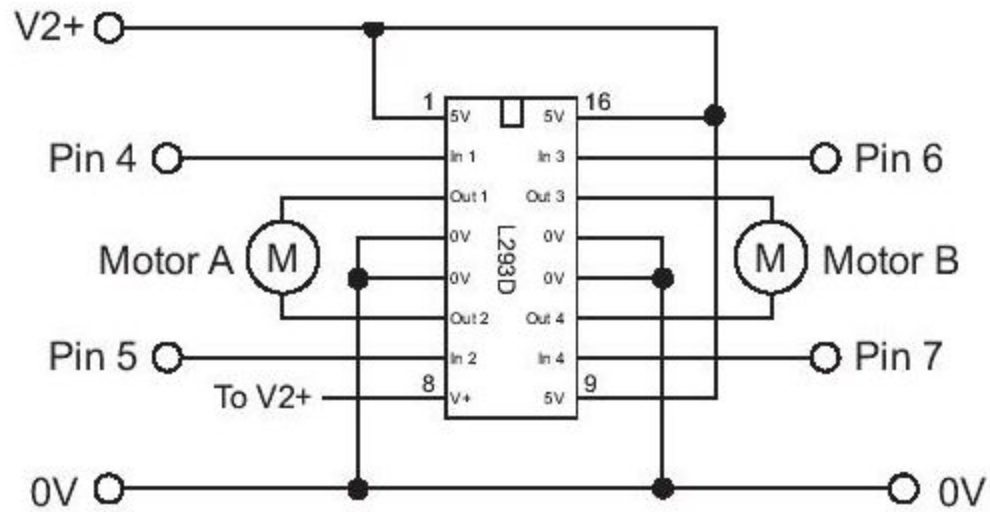


Figure 1.1 : L293D Pinout for 2 Motors

Parts You Can Use

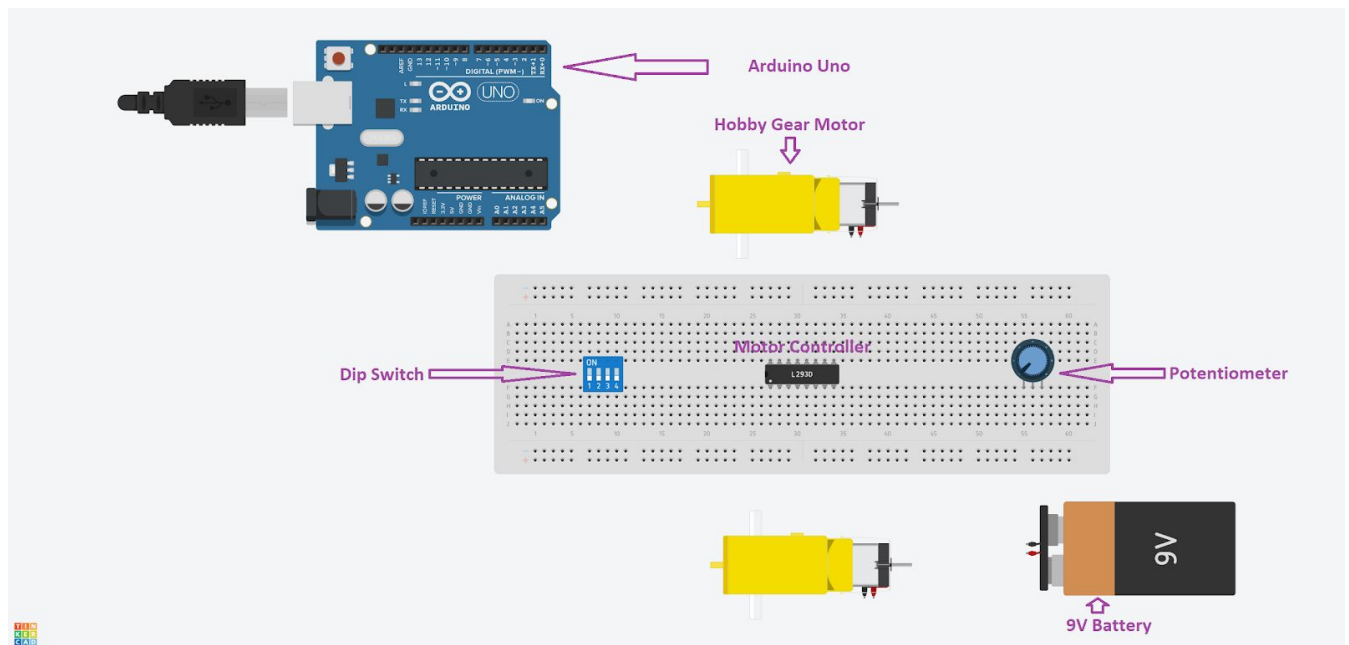


Figure 1.2 : The Parts you are allowed to use

Resources

Git Basics - https://www.youtube.com/watch?v=USjZcfj8yxE&ab_channel=ColtSteele

If you are new to Github or are not familiar with terminal commands you can download github desktop from here: <https://desktop.github.com/>

Arduino syntax - <https://www.arduino.cc/reference/en/>

Seminar By Moustafa, Introducing the rover and Arduino tutorial with encoders and PWM:
https://drive.google.com/file/d/17bBGedycEk0_vxj3FpWLtM3hH9WtjYIZ/view

Arduino Basics:
<https://www.youtube.com/watch?v=nL34zDTPkcs>

PWM Basics:
https://www.youtube.com/watch?v=_LCCGF5MOr4

Type of Steering (We are interested in differential and skid-steering)
https://www.youtube.com/watch?v=F3G0sUz3_Jw

What are the Arduino's IO (Analog and Digital) and how to use them:
<https://www.allaboutcircuits.com/projects/using-the-arduinios-analog-io/>

Requirements

- Create a Tinkercad account (<https://www.tinkercad.com/join>) before starting as this is what we will use to simulate an Arduino.
- Create a circuit with **2 motors, 1 L293D Motor Driver, A potentiometer, Dip Switch and 9V Battery**.
- Use the above resources to learn all the concepts you need to do this assignment. Also use the Pinout Diagrams posted above as a reference to how you should connect everything together (Replace 6V battery shown with 9 V Battery).
- Program the Arduino to do 5 commands
 - Move Forward (Both Motors Moving Forward)
 - Move Backwards (Both Motors Moving Backward)
 - Move Left (Move Left Motor Backwards and Right Motor Forwards)
 - Move Right (Move Right Motor Backwards and Left Motor Forwards)
 - Stop (Stop All Motors)

- The Arduino should also control the speed of both motors using a potentiometer
- Use the Dip Switch to switch between the 5 modes mentioned above.

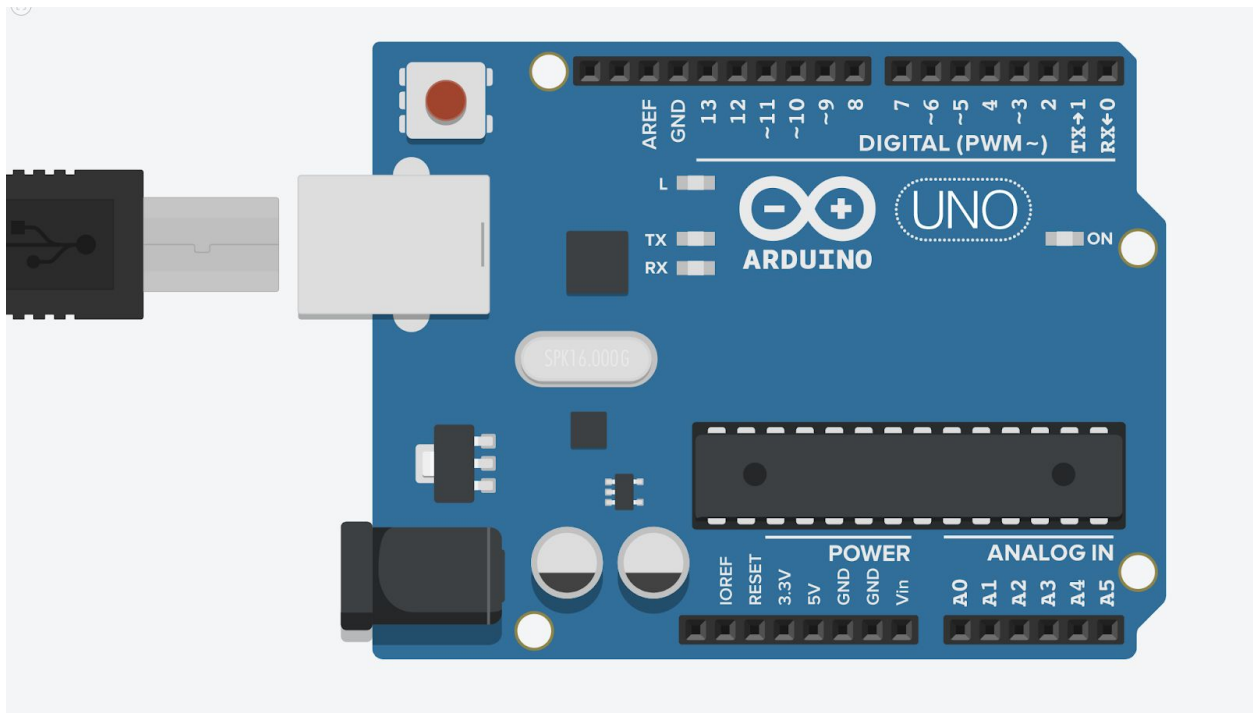


Figure 1.3 : Arduino Uno (PWM Pins are the ones with the ~ and they are what the motors need to connect to)

- The mini rover will have 4 motors (For this Assignment You only have 2, 1 on each side). Each motor **must be able to spin forward and backwards**. See figure below...

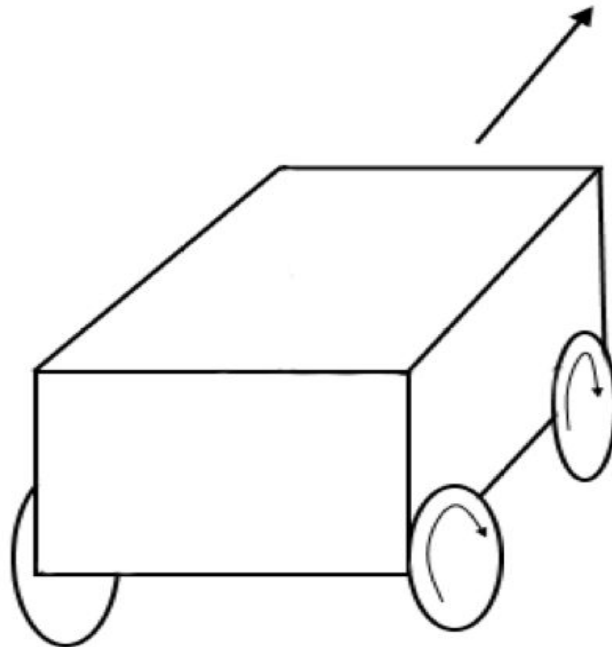


Figure 1.4 : The Mini rover has 4 wheels that are able to move in both directions

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Where to start & Tips

- Look at the resources posted above and familiarize yourself with arduino.
- Play around with Tinkercad to be able to use it for the assignment
- Get 1 motor to work first and you can Use DigitalRead to give commands to the motor before implementing speed control
- For the dip switch you will need an if, else if and else to specify the mode. **Make sure to stop the motors when all switches are off**
- Make sure that the **battery's ground is always connected to the arduino ground on the breadboard** but **do not** connect the battery voltage to arduino 5v on the breadboard
- Make sure your code is **clean and commented**, utilize external functions for different modes and do not type everything in to the loop function
- Initialize your Dip Switch as **INPUT_PULLUP** and to check if its on you can digitalRead if the **pin is LOW meaning it is turned on**
- Make sure all your wiring is clean and bend the wires so that they are easy to follow. Do not connect 2 things straight to each other if it gets in the way of another component. Here is an example of what clean wiring looks like:

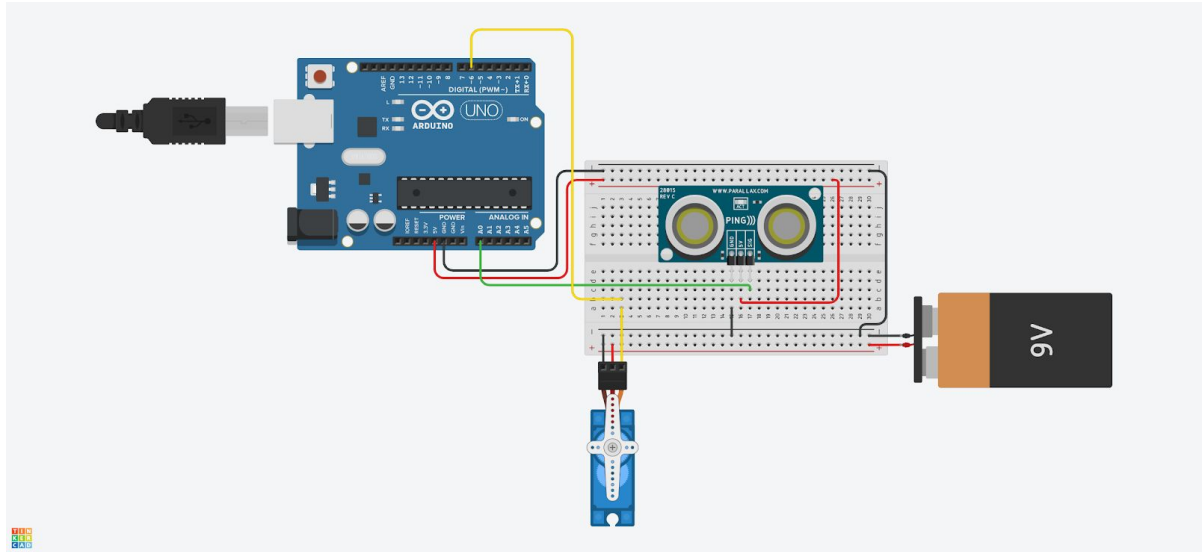


Figure 1.5 : Clean and Color Coded Wiring

- Utilize Color Codes to keep circuit clear (Red for power, Black for Ground etc.)

What you must hand In

Submit your answers by publishing your project as a public git repository. Submit your repo link to the google form here. Also name the repo, “R3-SoftwareTraining-FirstnameLastname”

Your repo must also have a readme file detailing how your project works with tinkercad diagrams.

What To Submit:

1. Download Arduino code from TinkerCad and push it to the github repo
2. Write a detailed readme indicating your progress and what you did for this project
3. In the readme have a link to your project and make sure it is **public**
 - a. [Follow This: <https://www.youtube.com/watch?v=RLPs1PCvhck>]
4. Please also upload screenshots to the readme and make it look presentable
5. Last step is to paste a link to your github repo and tinkercad assignment in the google form provided in the email for software/hardware. Make sure i can access the repo so it has to be public.

To **Submit** your project please use the following link:

<https://forms.gle/gzT3AByKKirMi1qt5>

Due Date

You will have 1.5 weeks to complete this package, so it is due by Sunday, October 18th at 11:59pm. Any changes made to the part after that deadline will be overlooked, so please finish on time.