

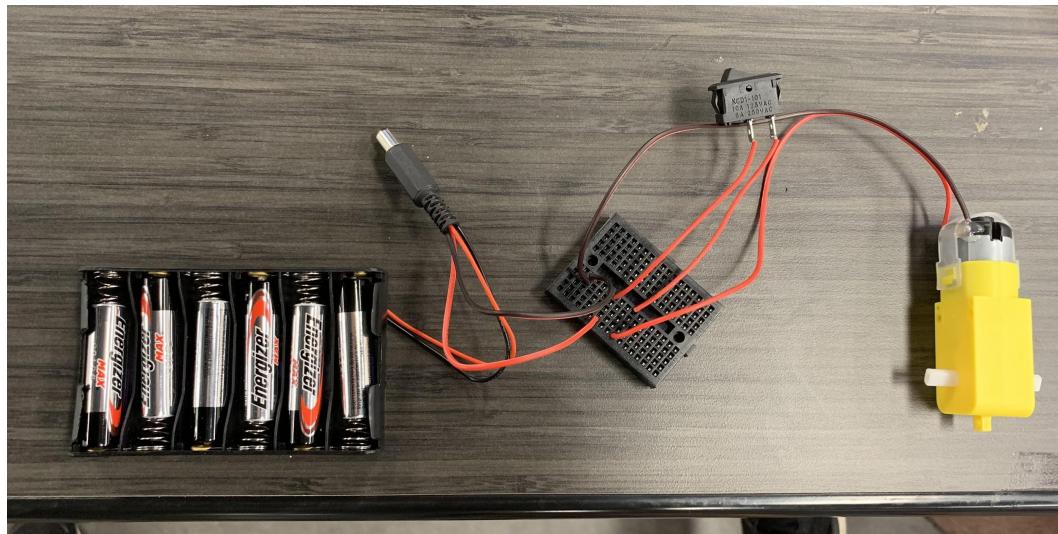
Task 0: Get Movin'!

Overview

Ever wanted to just figure out how easy it is to get a motor moving? Let's find out...

Objectives

The goal of this task is to get the motors to spin using a breadboard, a switch, and a battery pack!



Materials Needed

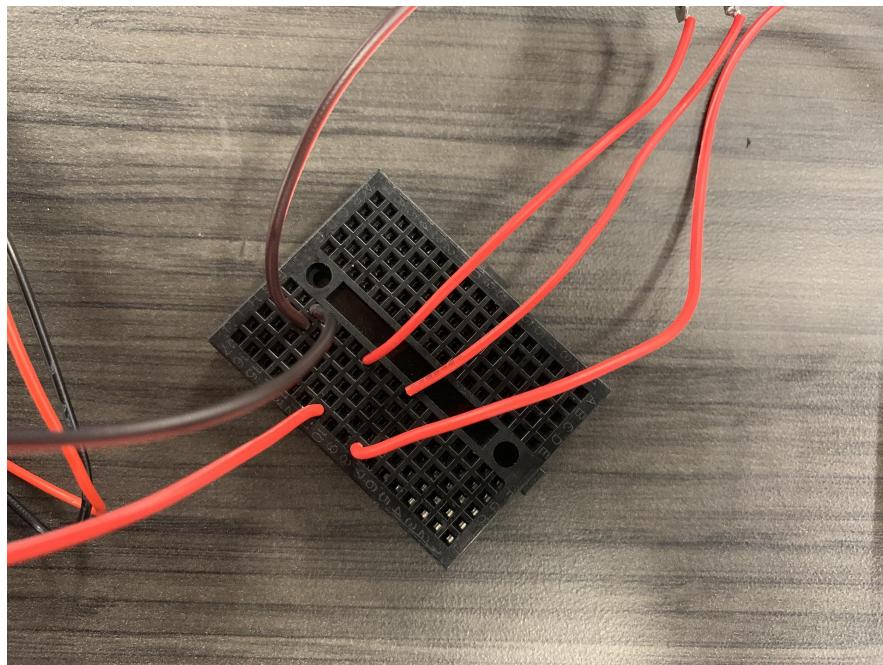
1. breadboard
2. a switch
3. motor
4. battery pack

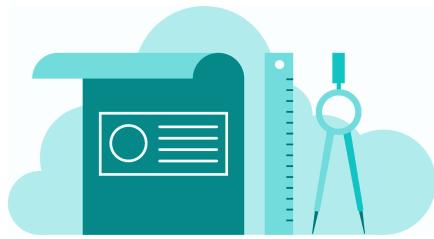


Please note: is a barrel jack!

Instructions

1. Place all 6 batteries into the battery pack
2. Connect the black wire from barrel jack to a breadboard cell
3. Connect to a red wire from barrel jack to a breadboard cell not in the same row
4. Connect switch's one end to same row as red wire from barrel jack. Connect the other end to a different row (not the same as any of the other rows from before!)
5. Place motor's red wire to that row from step 4 and the black (GND) wire to the row from step 2.
6. Now turn on the switch!





Task One: Construction

Overview

We're going to lay the ground work here by starting the car's body construction. Credit to Stephen A. Edwards's guide on constructing the chassis for the car!

Objectives

The goal of this task is to have the car parts together and constructed. Instructions start on the next page! This part of the tutorial has been derived from a different tutorial, so edits and changes have been made! Please be aware!

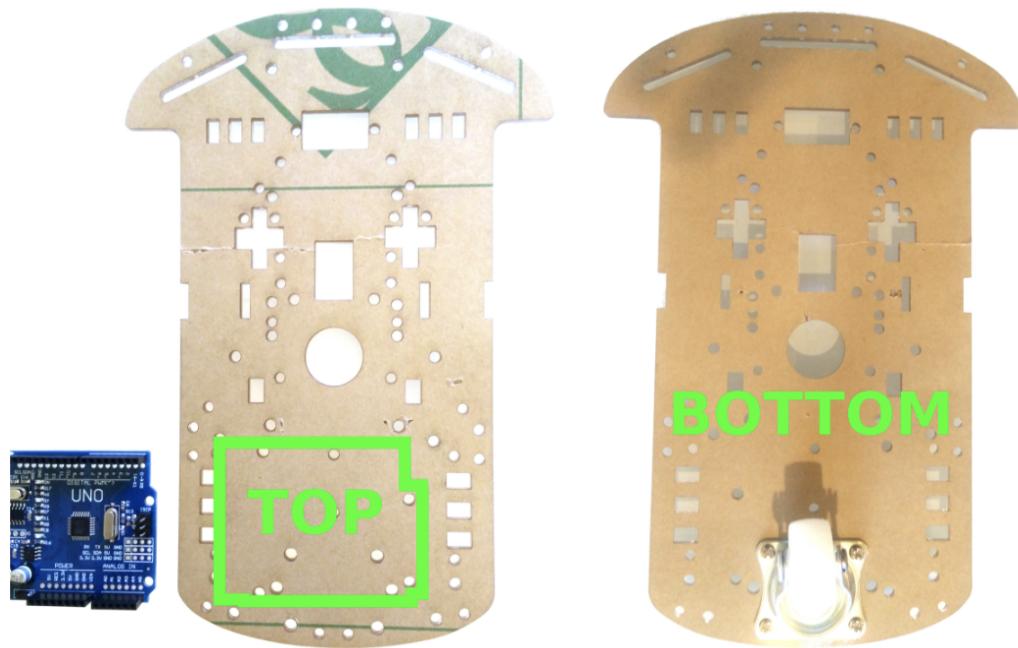
1 Mount the Swivel Wheel

Parts Needed

Swivel Wheel
4 × 5 mm M3 screws
4 × M3 nuts



- Determine the top of the baseplate; it is not symmetric. Use the Arduino as a guide.
- Attach the swivel to the **bottom** of the baseplate using the screws and nuts.

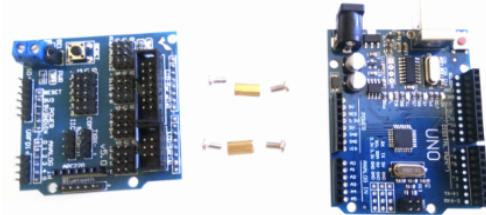


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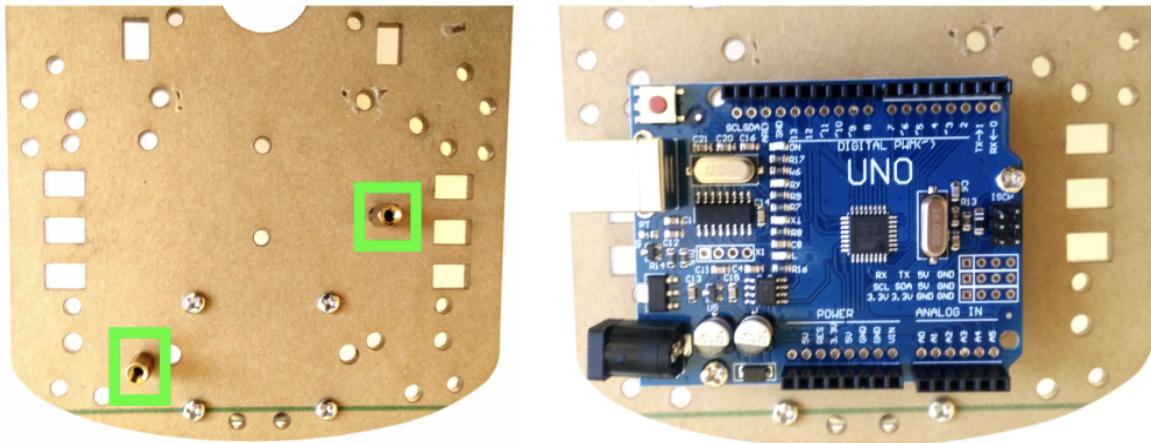
2 Mount the Arduino and Sensor Shield

Parts Needed

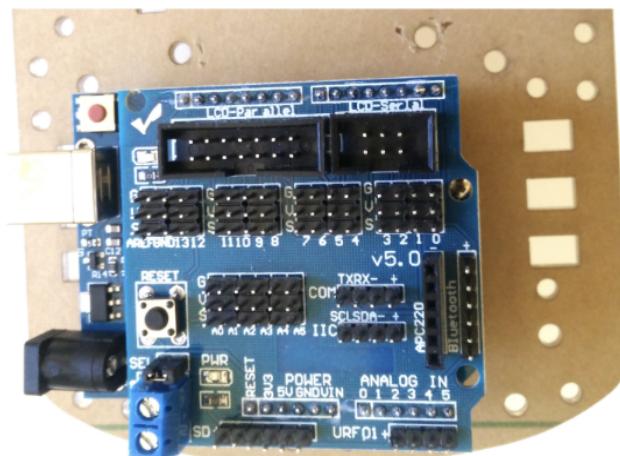
Arduino
Sensor Shield
2 × 10 mm M3 spacers
4 × 5 mm M3 screws



- Connect the two spacers to the **top** of the baseplate using two screws
- Mount the Arduino on the spacers using the other two screws



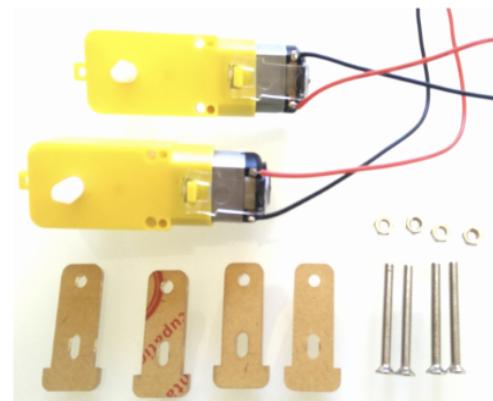
- Mount the Sensor Shield atop the Arduino. Line up the right edges of the boards. Make sure each pin goes in a connector.



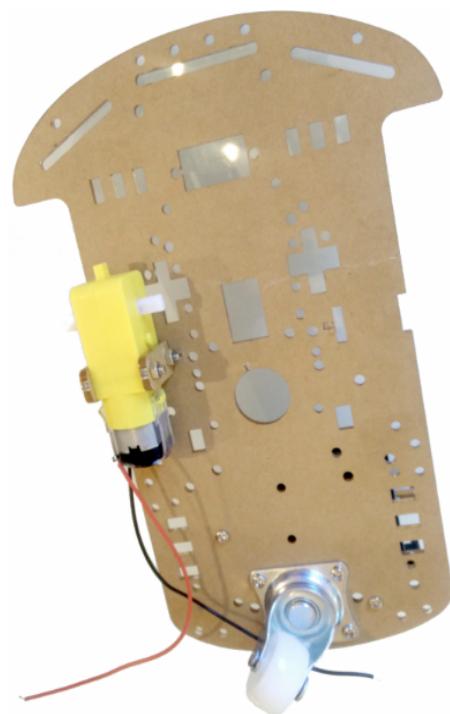
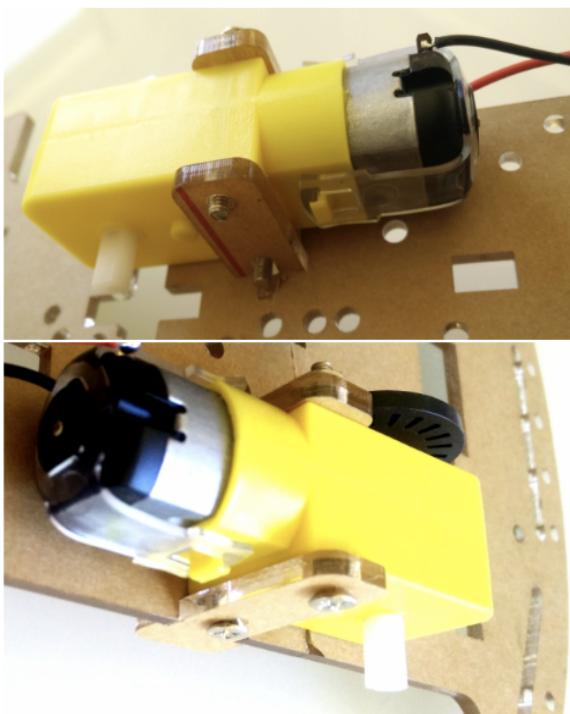
3 Mount the Motors on the Bottom of the Baseplate

Parts Needed

2 × motors
 2 × 10 cm wires, black
 2 × 10 cm wires, red
 4 × acrylic tabs
 4 × 30 mm M3 screws
 4 × M3 nuts 2 × Wheels



- Place one tab in a slot **down from the top** of the baseplate, align the motor, and place the other tab on the slot on the side of the baseplate.
- Insert two screws from the outside tab through the motor and inside tab and connect the nuts.



- Repeat the procedure for the other motor
- Mount the wheels on the motors
- (Optional) Attach the optical interruptor discs on the inside axles

*Please ignore the switch in the upcoming picture diagrams



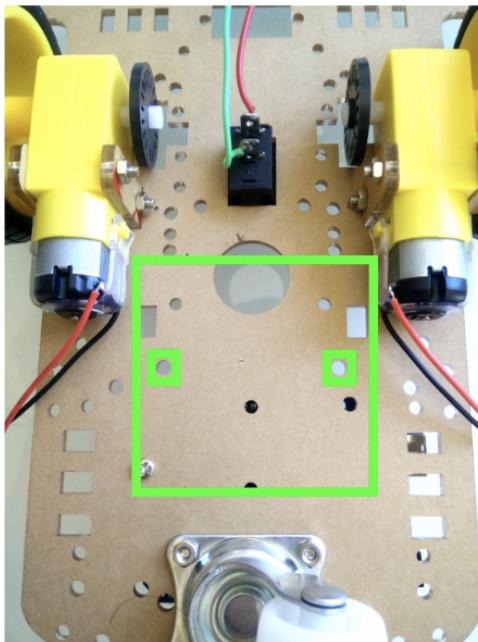
4 Mount the Switch, the Battery Holder, and L298N

Parts Needed

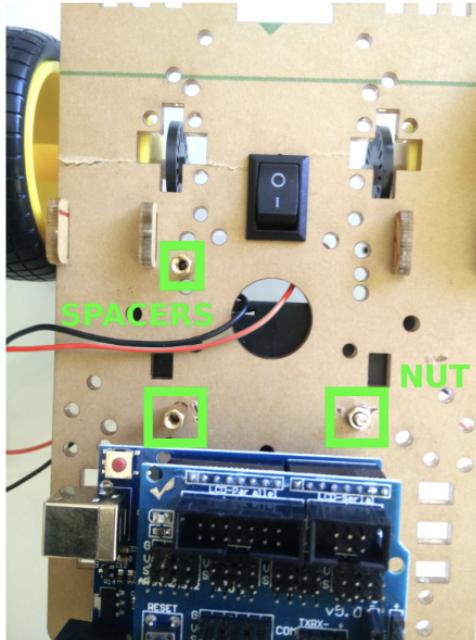
Rocker switch
 L298N board
 Battery holder
 3 × 5 mm M3 screws
 2 × 8 mm countersunk M3 screws
 2 × 10 mm M3 spacers
 1 × M3 nut



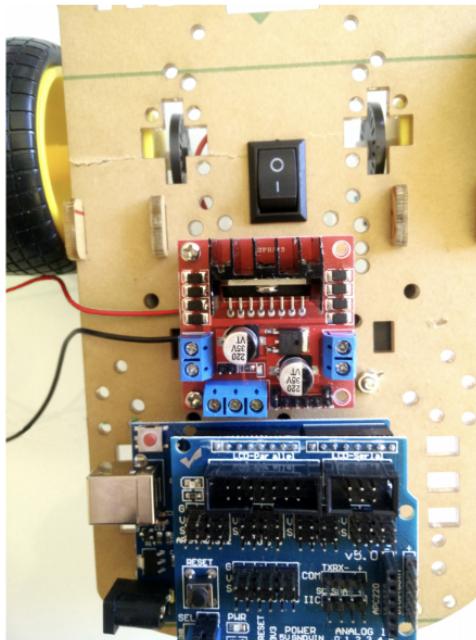
- Insert the switch on the top of the baseplate between the two motors
- Locate the battery holder on the underside of the baseplate just in front of the swivel and insert the two countersunk M3 screws into the leftmost and rightmost holes.



- Connect one of the screws to the M3 nut and the other to a spacer
- Connect the other spacer to the baseplate with a 5 mm M3 screw

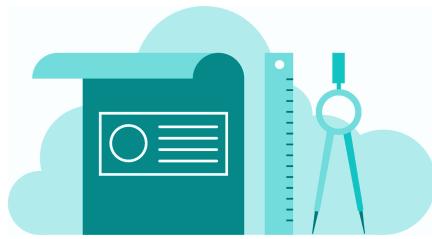


- Remove the three jumpers on the L298N board by pulling them up
- Mount the L298N board to the two protruding spacers with the two other 5 mm screws.



Lastly, fill up your battery cell with 6 double AA batteries and plant it on top of the chassis behind the red motor driver!





Task Two: Moving Forwards and Back

Overview & Purpose

Let's finally get this car moving! We're going to be using the H-bridge (L298H) to get the car to move forwards and backwards using some pre-made code.



(L298H)

Objectives

1. Move car forwards
2. Move car backwards

Materials Needed

5. Computer
6. Wires

Instructions

1. Install the Arduino IDE from <https://www.arduino.cc/en/Main/Software>

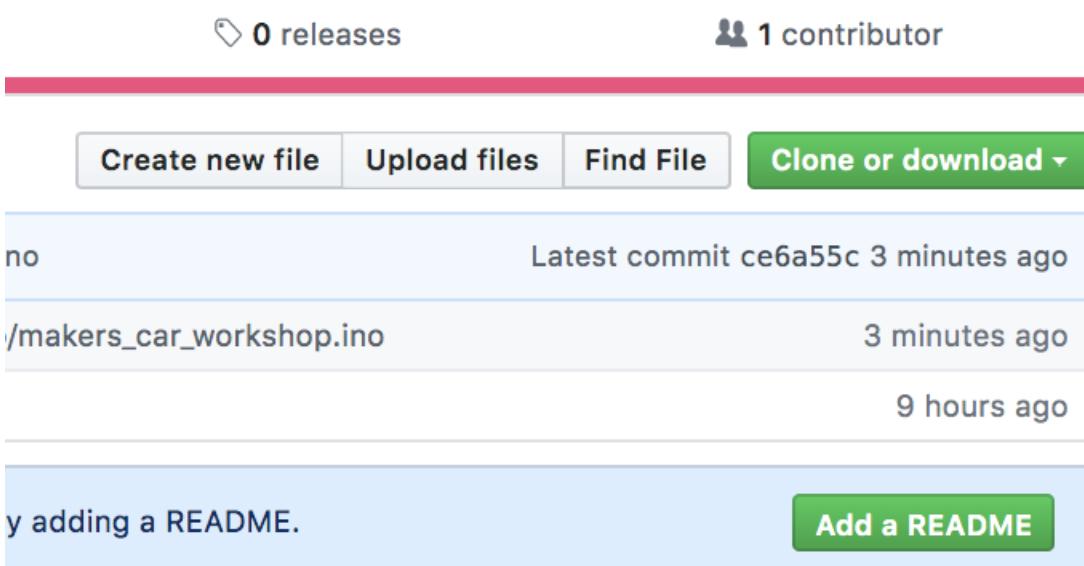
Download the Arduino IDE



The screenshot shows the Arduino IDE download page. On the left, there's a large teal circle with the Arduino logo (a minus sign inside a circle followed by a plus sign inside a circle). To the right of the logo, the text "ARDUINO 1.8.9" is displayed in bold. Below this, a paragraph of text describes the Arduino Software (IDE) as open-source, easy to use for writing code and uploading to boards, and compatible with Windows, Mac OS X, and Linux. It also mentions that it's based on Processing and other open-source software. A note below says the software can be used with any Arduino board and refers to the "Getting Started" page for installation instructions. On the right side of the page, there are download links for Windows (Windows Installer for XP and up, Windows ZIP file for non-admin install), Windows app (Requires Win 8.1 or 10, with a "Get" button), Mac OS X (10.8 Mountain Lion or newer), Linux (32-bit and 64-bit), Linux ARM (32-bit and 64-bit), and links for Release Notes, Source Code, and Checksums (sha512).

2. Navigate to <https://github.com/jedouard98/robotic-car-workshop>

3. Download the repository by clicking on this button here:

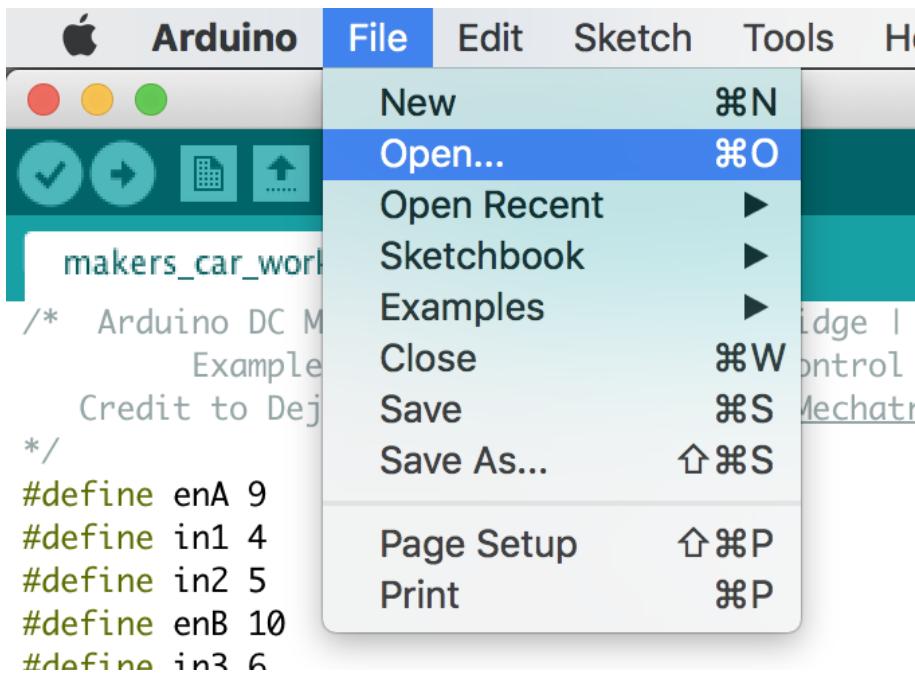


The screenshot shows a GitHub repository page for "jedouard98/robotic-car-workshop". At the top, it shows "0 releases" and "1 contributor". Below that is a navigation bar with "Create new file", "Upload files", "Find File", and a green "Clone or download" button. The main content area shows a table of files. The table has two columns: file name and last commit time. The files listed are "no" (last commit 3 minutes ago), "/makers_car_workshop.ino" (3 minutes ago), and a partially visible file (9 hours ago). At the bottom of the page, there's a note about adding a README and a green "Add a README" button.

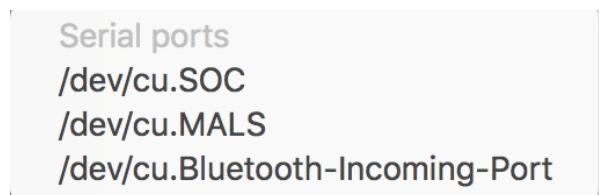
File	Last Commit
no	Latest commit ce6a55c 3 minutes ago
/makers_car_workshop.ino	3 minutes ago
	9 hours ago

y adding a README. [Add a README](#)

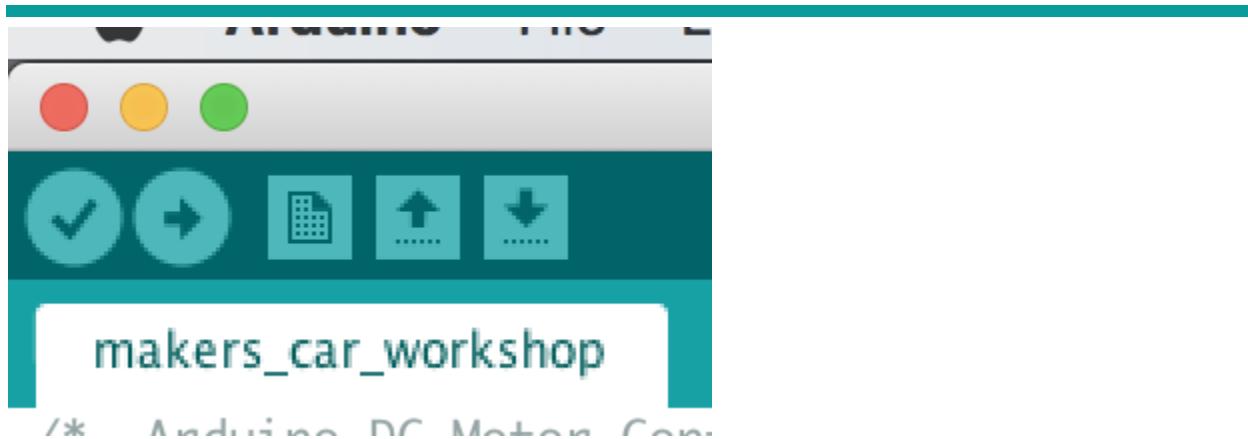
4. Open the Arduino IDE that you just downloaded. Now click open and open the file “makers_car_workshop.ino” that is inside makers_car_workshop folder (which is inside of the folder you just downloaded from github!)



5. Now it's time to flash the Arduino with the code you're looking at. Connect the black wire to the arduino and to your computer. Click on tools and make sure that Board is the correct board (Arduino Uno) and that a port is selected that's NOT any of these:



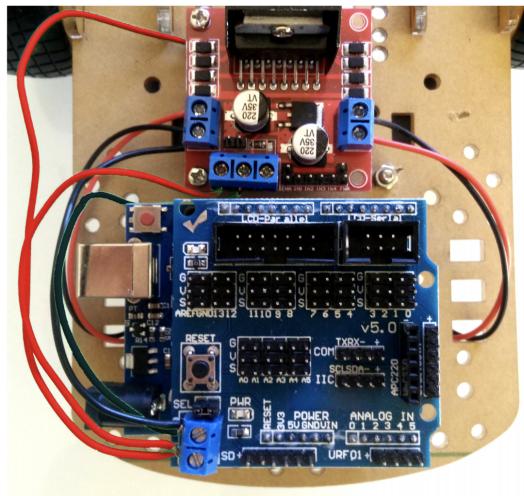
6. Lastly, to get the code onto the Arduino, all you have to do is click the leftward arrow button. It should flash to your Arduino with no problem!



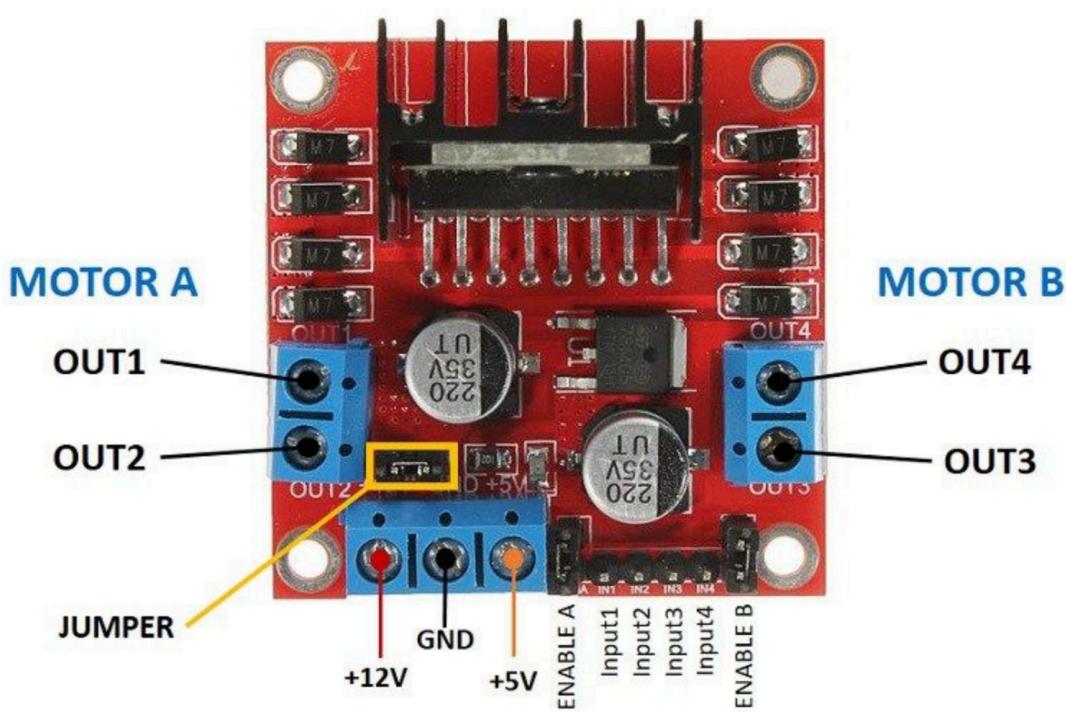
7. Now that the software's done, let's wire up the Arduino to the l298n (red module) and the motor. Follow this diagram/chart when wiring up your car to the motor driver:

<u>10 cm jumpers</u>	
L298N	Arduino
ENA	6 S
IN1	7 S
IN2	5 S
IN3	4 S
IN4	2 S
ENB	3 S
+5V	2 V (+5V)

**Note Arduino
pin order**



Place the barrel jack into your Arduino and put the red and black loose wires off the barrel jack into the motor driver's GND and 12V pins, shown below



**The way you put wires in the L298N module is you unscrew the top and stick wires in the opening in the side. Then you screw the top down again and make sure it's tight!

If you've done this correctly the car should move forwards and backwards.





Task 3: Turning the Car!

Overview & Purpose

Now that you successfully flashed a file onto the car that can make the car go forwards and backwards, let's try making the car turn

Objectives

Get the car to turn left and right.

Materials Needed

None! Just working on code

Activity

To get the car to turn, it's as simple as making one motor move slower than the other motor. What direction does the car turn when you move the left motor but not the right? What direction does the car turn when you move the right motor?

**IN1 and IN2 AND ENA are pins that correspond to 1 motor.

IN3 and IN4 AND ENB are pins that correspond to the 2 motor.