

How to Make the Robo Racer



By: Victor Guzman

List of Required Component

- ❖ [New Bright Remote Controlled Camaro](#) x1
- ❖ [Light Sensitive Resistor](#) x1
- ❖ [Attiny85](#) x1
- ❖ [Red LEDs](#) x2
- ❖ [White LEDs](#) x4
- ❖ [Arduino Pro Mini](#) x1
- ❖ [220 Ohm Resistor](#) x4
- ❖ [10K Ohm Resistor](#) x1
- ❖ [LM7805C MOSFET](#) x1
- ❖ [Single Digital Line Sensor](#) x7
- ❖ [Turnigy 7.4v Lipo Battery](#) x1
- ❖ [Micrometal Line Following Motors](#) x2
- ❖ [Motor Driver](#) x1
- ❖ Wires
- ❖ [Prototype Soldering Board](#)
- ❖ [Slide Switch](#) x1

Software and Tools

- 3d Printer
- [Arduino IDE](#)
- Soldering Iron

Function of The Racer Bot:

The Racer Bot is a line following car that can follow any track you make with electrical tape using infrared sensors.

Step 1:

Purchase the remote controlled car and completely remove all components including the wheels and internal circuitry leaving just the plastic shell of the car. Make sure you keep the rubber thats on the wheels in the back two wheels. They will be used in the new car we are making.



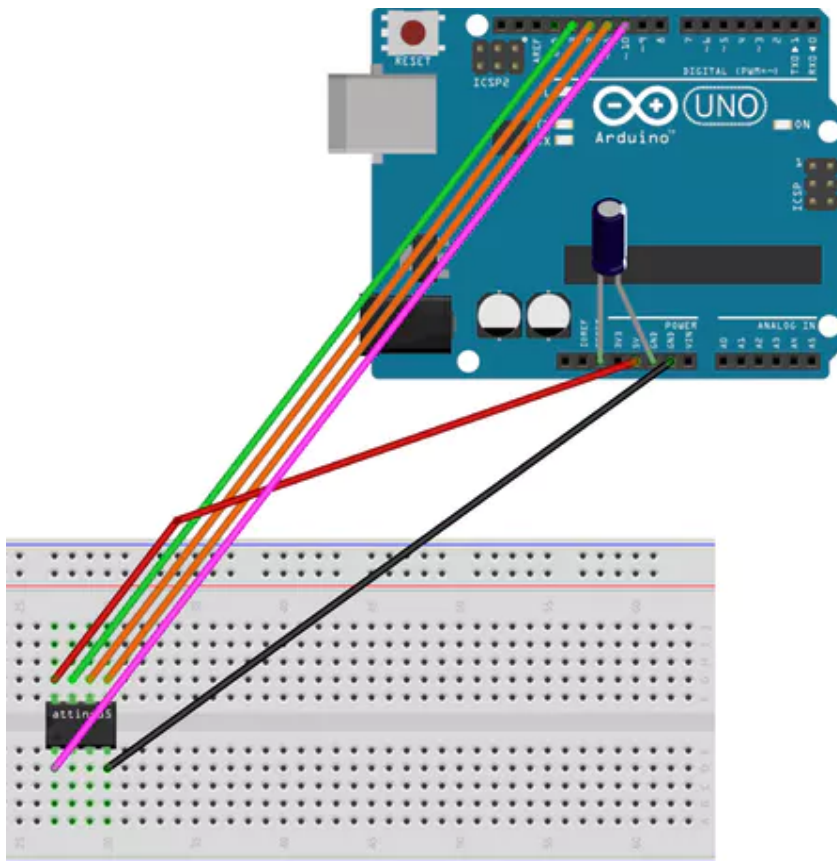
Step 2 (Setting up the headlight code):

Programming Attiny85:

(If you already know how to do this skip to the next step)

You will need an Arduino Uno, a 10uF/25V capacitor and jumper wires.

1. Since Arduino doesn't support the attiny85 we need to add the board to the Arduino IDE. In the Arduino IDE go to Files->preferences and then in the Additional boards' manager URLs box enter this URL
https://raw.githubusercontent.com/damellis/attiny/ide-1.6.x-boards-manager/package_damellis_attiny_index.json
2. Go to Tools->board->board manager, then in boards manager search scroll to the very bottom to "attiny by Davis A. Mellis" then install it. It should now be visible in the list of boards
3. Next, go to File->Examples->arduino isp and then upload it to your Arduino Uno board which now allows your Arduino to program other boards
4. Next connect the Arduino to the attiny85 like so



Arduino -- Attiny85

5V -- VCC

Gnd -- Gnd

Pin 13 -- Pin 2

Pin 12 -- Pin 1

Pin 11 -- Pin 0

Pin 10 -- Reset

Now in tools change to board to attiny25/45/85 and the processor to attiny85. Next, change the programmer to Arduino as ISP. Next set the clock to 8MHz Internal then burn the bootloader.

Step 3 (Headlight Code):

(While the attiny85 is configured the way it is in the previous step that is when you upload the code)

```
int sensorPin = A1; // select the input pin for the LDR  
int ledPin1 = 4; // select the pin for the Red LED pair  
int ledPin2 = 0; // select the pin for the White LED pair 1  
int ledPin3 = 1; // select the pin for the White LED pair 2
```

```
int sensorValue = 0; // variable to store the value coming from the sensor
```

```
void setup() {  
// declare the ledPins as an OUTPUT:  
pinMode(ledPin1, OUTPUT);  
pinMode(ledPin2, OUTPUT);  
pinMode(ledPin3, OUTPUT);  
}
```

```
void loop() {
```

```
// read the value from the sensor:  
sensorValue = analogRead(sensorPin);
```

```
if (sensorValue <= 200) {
```

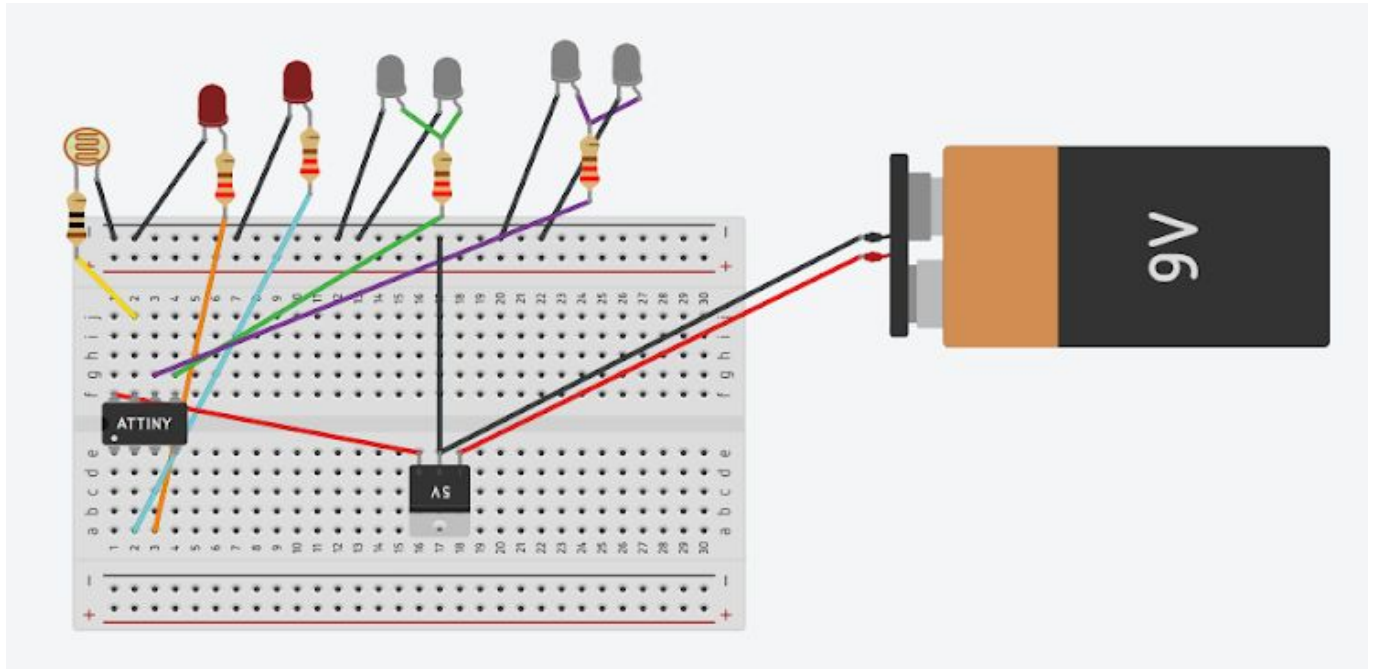
```
// turn the ledPin on  
digitalWrite(ledPin1, HIGH); //Turns leds on when dark  
digitalWrite(ledPin2, HIGH);  
digitalWrite(ledPin3, HIGH);  
}
```

```
else(100); {  
// turn the ledPin off:  
digitalWrite(ledPin1, LOW); //Turns leds off when there is sufficient light  
digitalWrite(ledPin2, LOW);  
digitalWrite(ledPin3, LOW);  
delay(100);  
}  
}
```

Step 4 (Adding the Headlights):

The headlights are created using leds, a photoresistor, and an attiny85. They are used for aesthetic as well as providing more contrast for the infrared sensors in poorly lit areas.

Circuit Diagram:



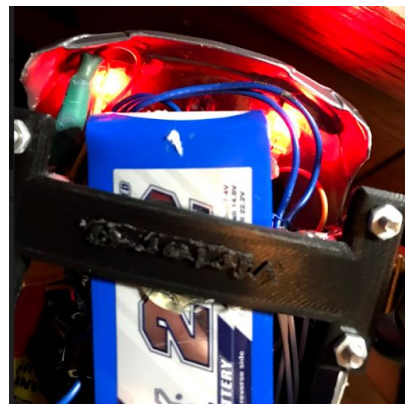
Use the 7.4v Lipo battery instead of 9V. (Battery linked in parts list)

When soldering the parts make sure to only solder the attiny85, MOSFET, and the resistors to the protoboard and leave long wires to the leds so that you can place them in the front and back of the car. Also leave long wires attached to the photoresistor so that you can place it on the top of the car for optimal light detection.

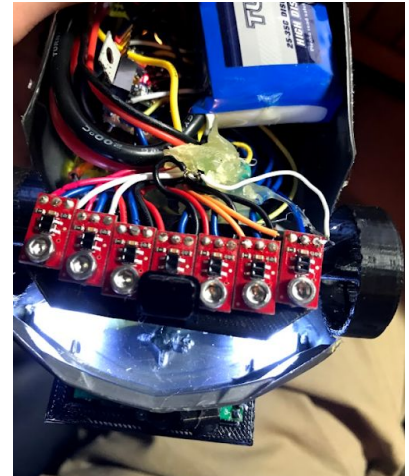
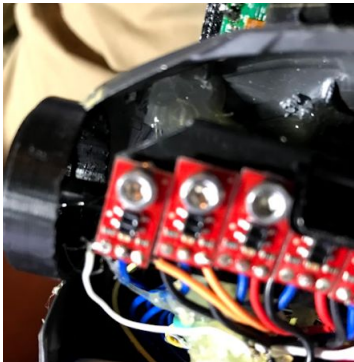
Photoresistor on top of Car.



Place one red led under each red headlight in the back.



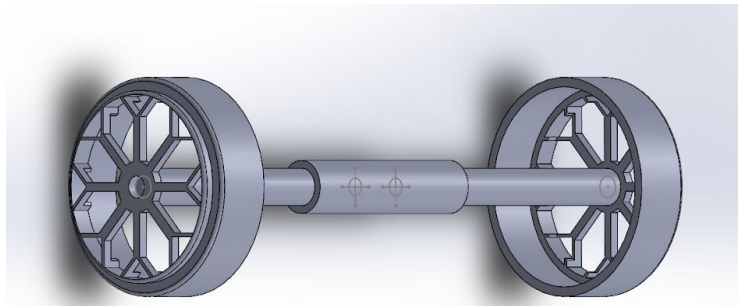
Place both white leds under the car's white lights remember to put 2 under each light in the front.



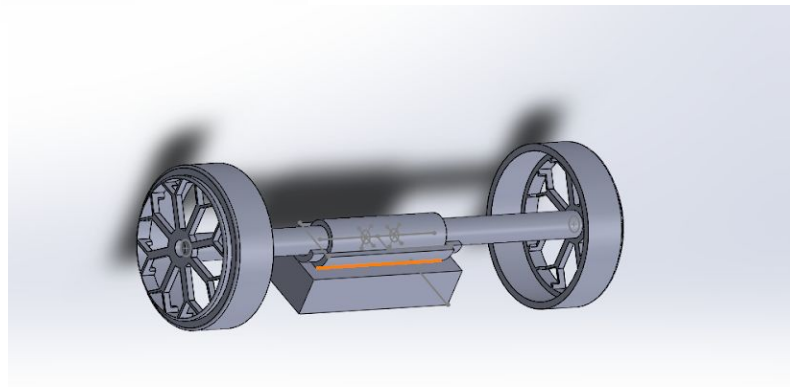
Finally place the soldered protoboard components on the top of the inside of the car right under the windshield.

Adding the Front Wheels: (Files found in thingiverse)

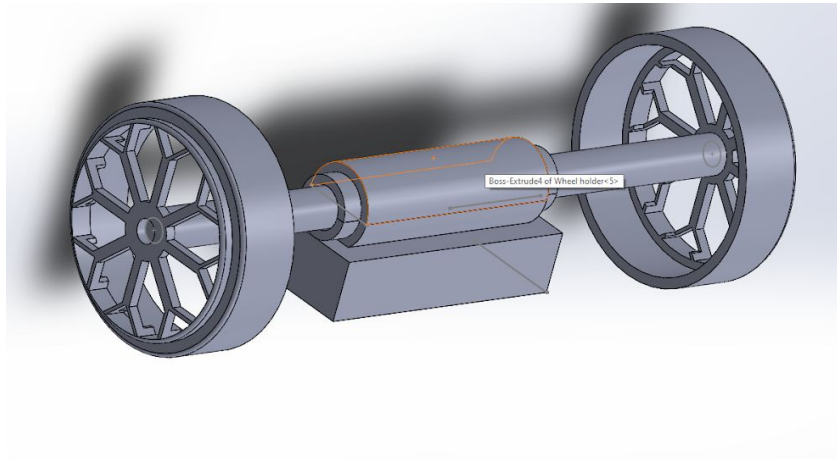
When adding the front wheels to the car you first need to print two of New Bright Rim stl files on a 3D printer preferably in black PLA. Next print the Wheel Connector stl file. Once that is printed attach the New Bright Rims to the connector by gluing the axle, or long rod at the end, to the inside of the connector so it looks like the picture below.



Once you have assembled the wheels like this you then need to print the Wheel Connector Bottom then place the wheel connector inside the bottom part. Make sure not to glue the connector to the holder because we want it to spin freely inside. Make it look like the picture on the right.



Next print the wheel holder not the bottom one and then place it on top of the wheel holder so that the wheel connector is completely surrounded by the wheel holders so it looks like the picture below



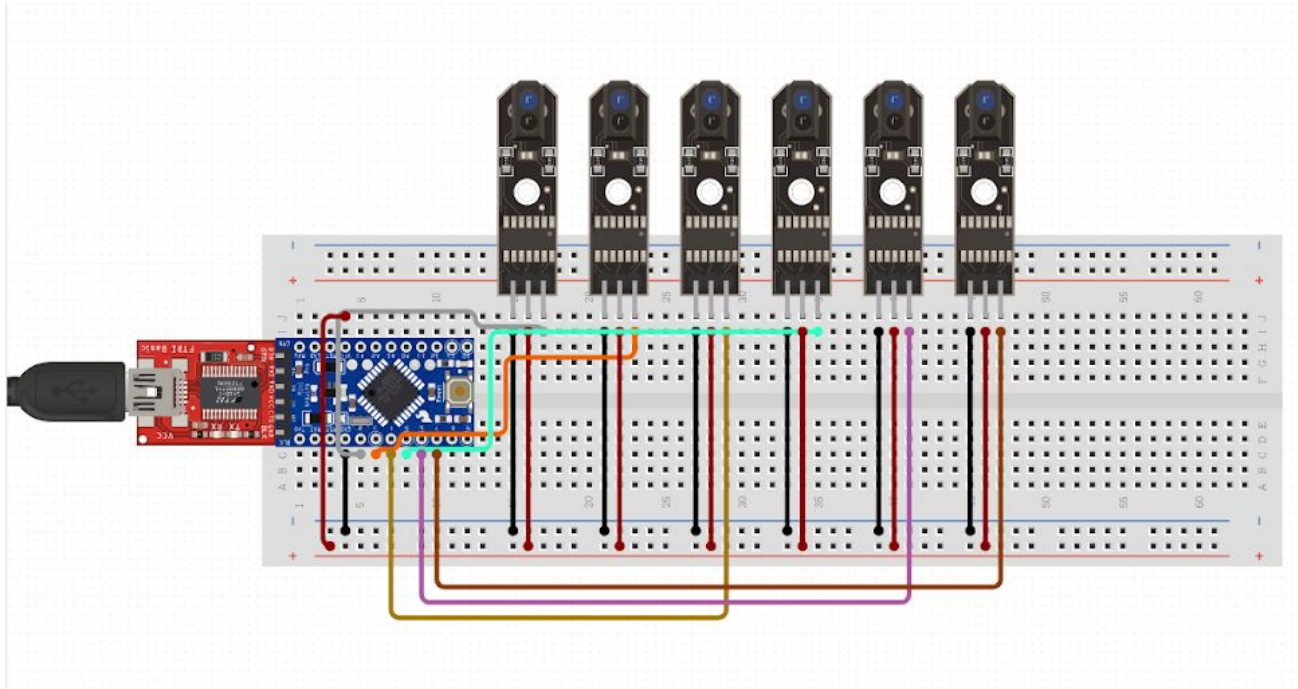
Glue the two wheel holder pieces together but make sure they don't glue to the connector so that the wheels spin freely.

After assembling all of the 3D printed parts for the wheels glue the flat side of the wheel holder to the top of the inside of the car so that it looks like car wheels should look in the car.

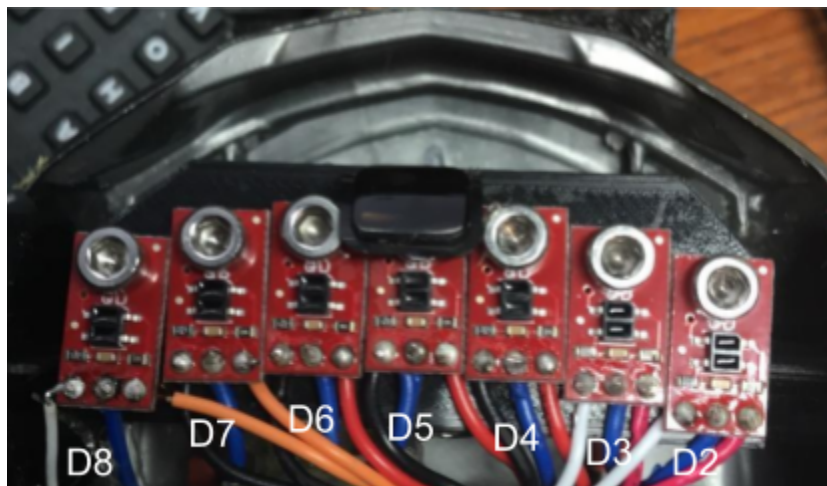
Step 5 (Making the Car Drive):

The way the car drives is it uses an arduino and seven line following sensors to follow a black path on a white background.

Circuits:



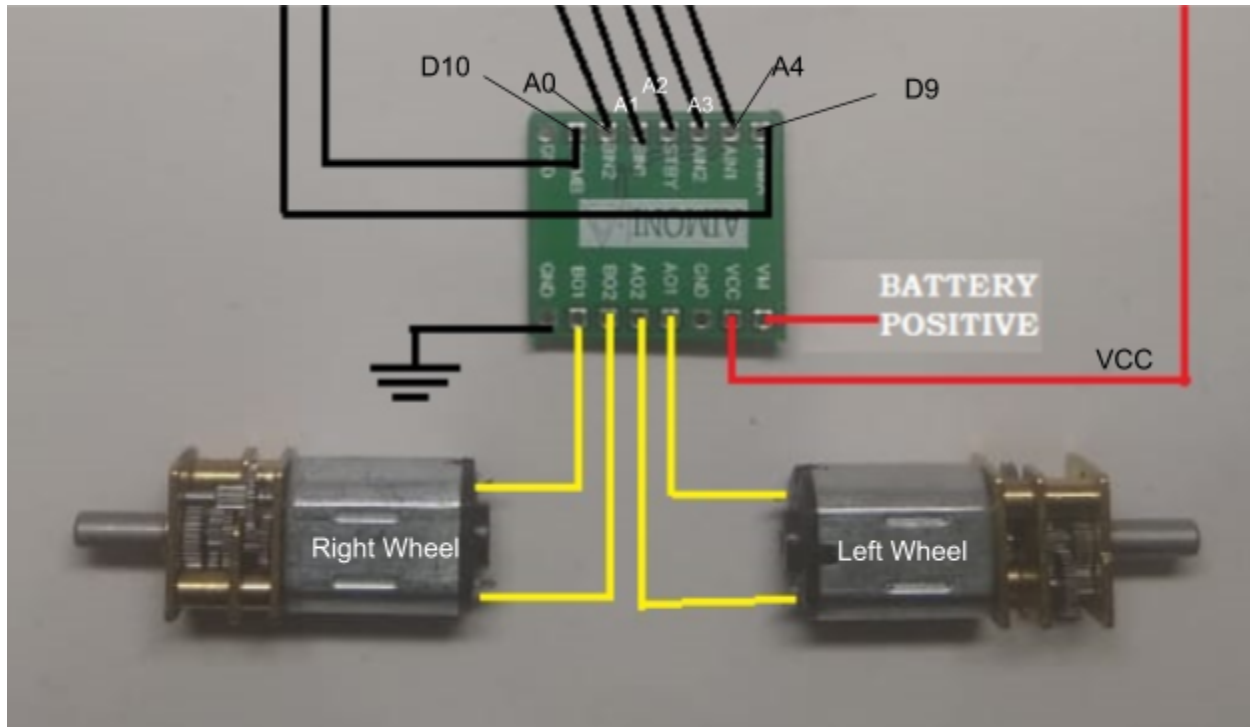
Connect seven digital line sensors from sparkfun to your arduino connecting the one on the far right (number 7) to the arduino digital pin 2 and the sensor on the far left (number 1) to digital pin 8. (the D on the image indicate which digital pin on the arduino is attached to, also this is an image from the bottom of the car) Also connect the ground and vcc of each sensor to the arduinos ground and vcc ports.



Next
motor to

connect the
the same

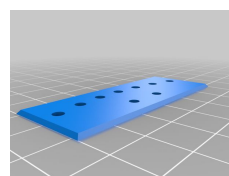
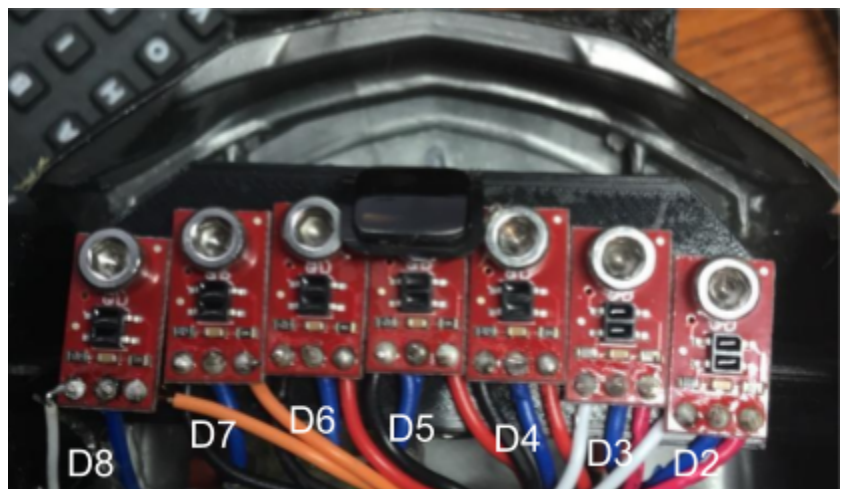
arduino by following the diagram below (the analog 4 pin is called the SDA pin on the



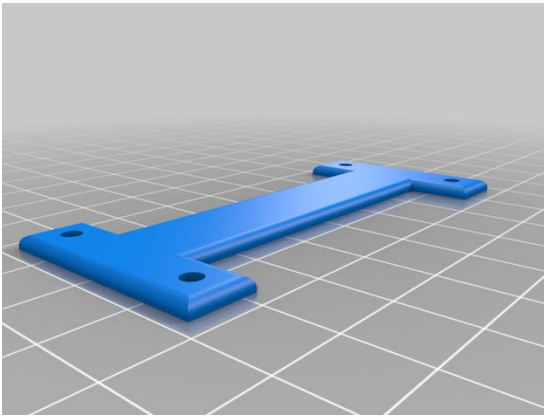
arduino and it is located in the middle of the arduino so make sure to connect that one first. A0-4 represent the analog pins on the arduino, this is a bottom view of the circuit) These should all be connected to the same arduino to allow the motors and sensors to work together. Also make sure you have the 7.4v battery powering all of this as well as the headlights.

Mounting Sensors and The Motors:

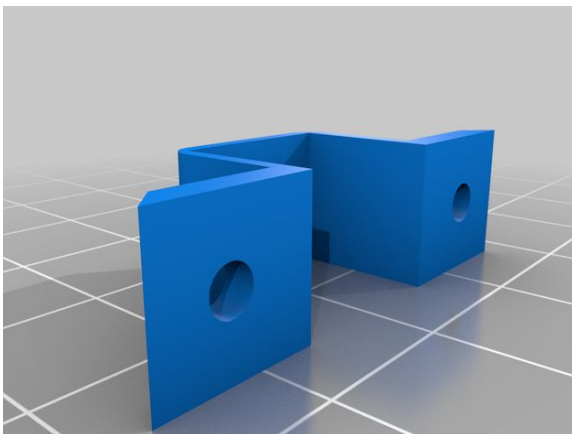
When mounting the line following sensors make sure you 3D print the stl file in thingiverse called “Sensor Mount”. Once you have printed the part, mount all seven sensors to it by screwing them in the holes on it so it looks like the image. I recommend you put a nut on the back of the screws so that the sensors don't fall out. The holes are .116 inches in diameter so find a screw and nut that would fit the holes.



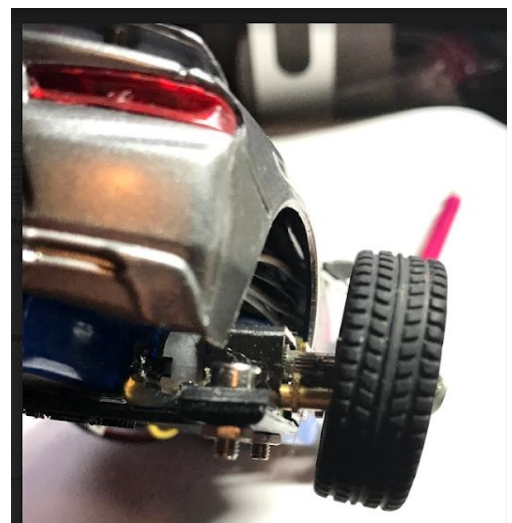
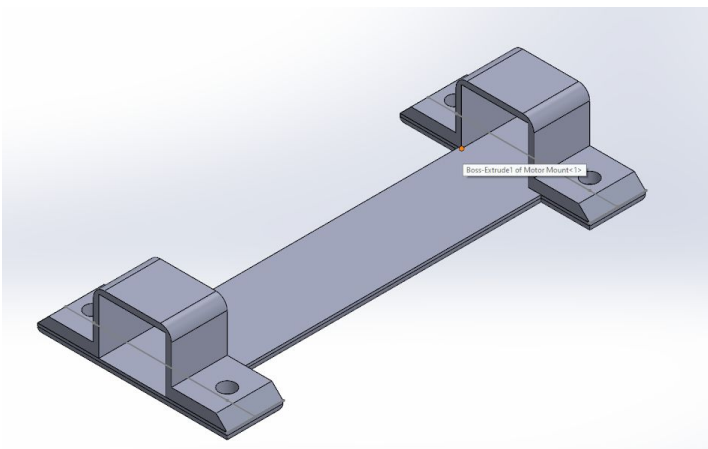
When mounting the motors to the back and to the wheels you first need to print out the part called “Wheel Bracket” that looks like the image below.



Once you have 3D printed this part print two of the parts called “Motor Mount”. Should look like the image below.

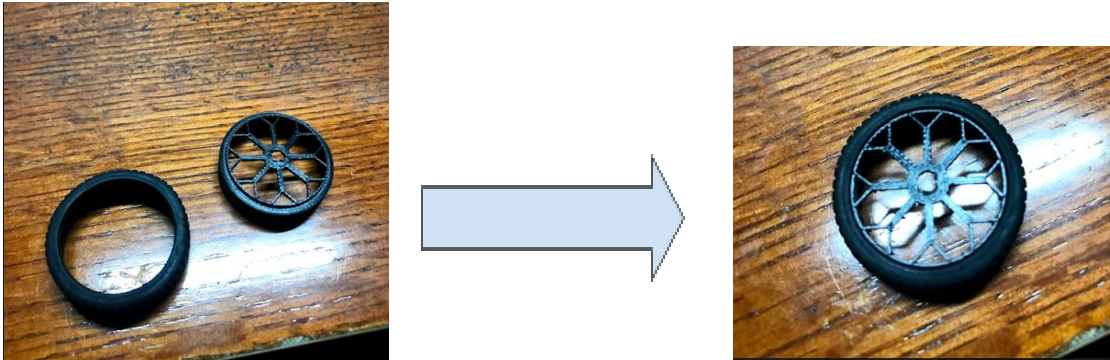


After printing all three parts put the motors inside the motor mounts and then put the motor brackets with the motor mounts. The assembled pieces should look like the image below. Use the same screws and nuts for mounting the sensors to mount the motors in between the motor mount and the motor bracket. Make sure you have the motors oriented correctly like the diagram shows above.

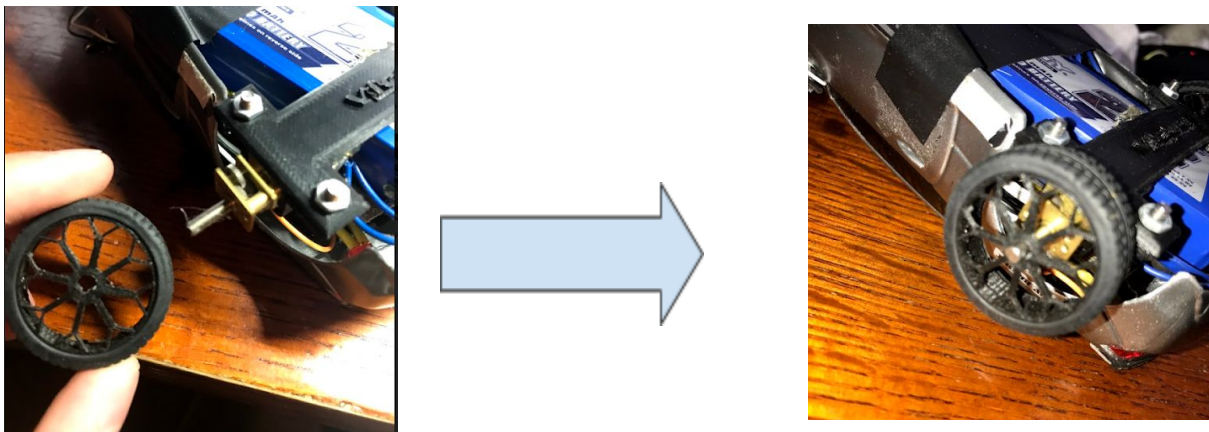


Step 6 (Adding the Back Wheels);

To add the wheels to the motors on the back of the car you need to print two of the pieces on thingiverse called “New Bright Wheel”. Once you have printed both of these you need to put the rubber we salvaged from the original wheels onto the 3D printed wheels.



Attach the wheels to the motor by putting the motor shaft through the hole in the center of the wheel.



Do this for both wheels and make sure you attach the wheel bracket to the battery and make sure that it is straight.

Step 7 (Line Following Code):

Code is very long so click the link to get to it.

[Driving Code](#)

Upload to the arduino and you'll be almost done.

Step 8 (Adding the Switch):

When you add the switch make sure that it is before all the driving circuit and the headlight circuit so that it switches both systems on and off when it is used. What I did was cut holes for the switch's prongs on the left door of the car and had all the connections inside the car and I glued the switch to the side.

