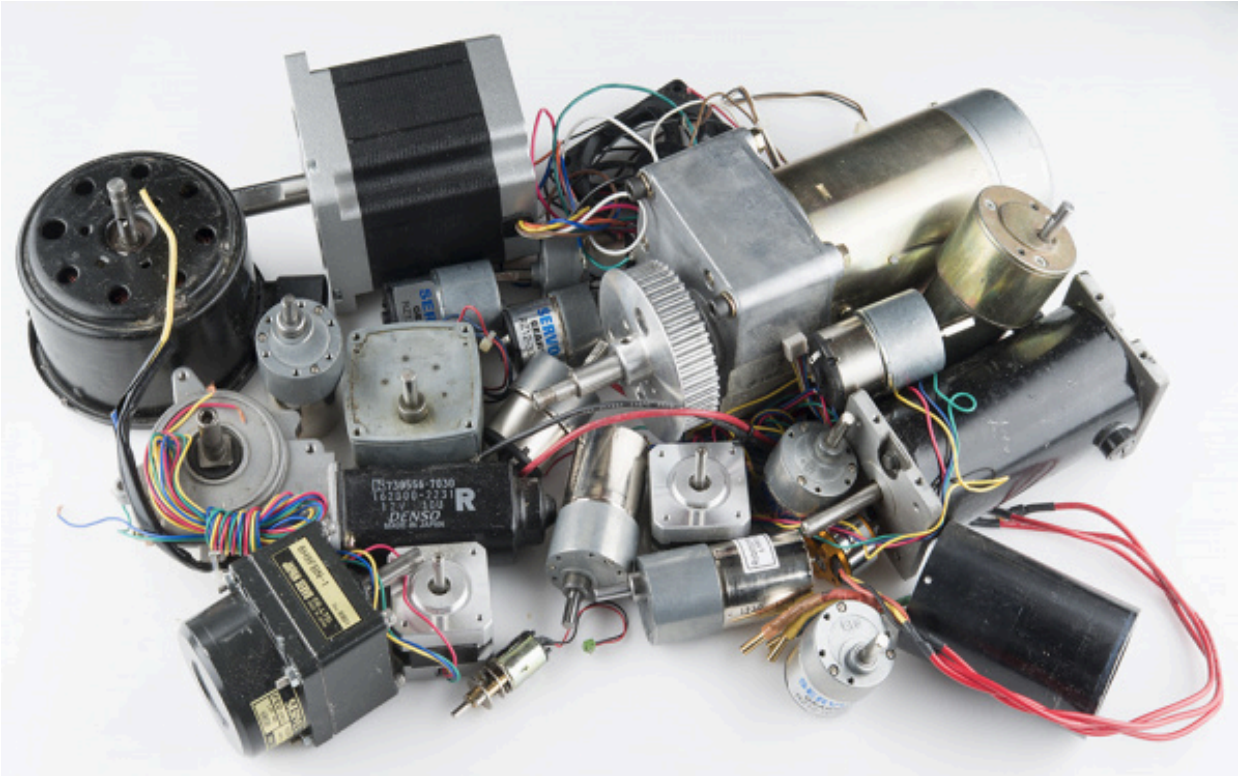
Electronics 1

Electronics for Interactive Media Design

Les5

Emma Pareschi

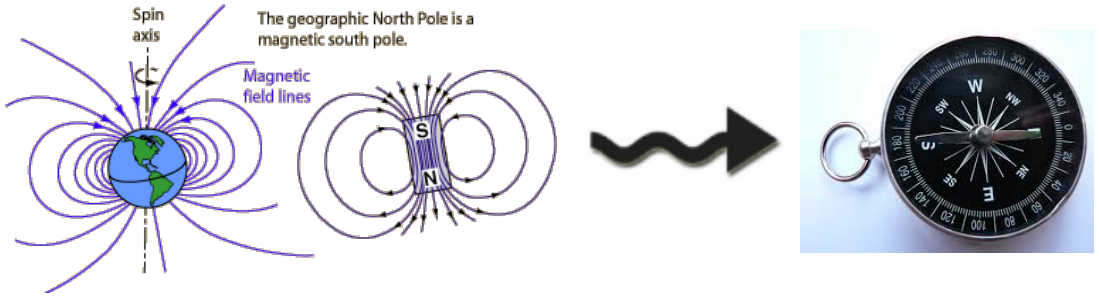
MOTORS



What makes Motors move?

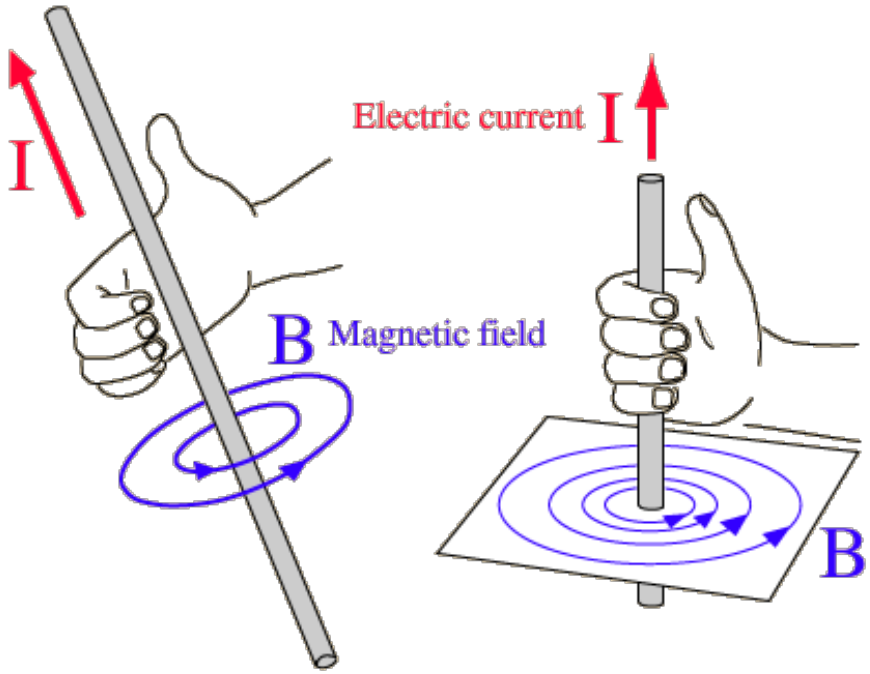
Magnetic Field

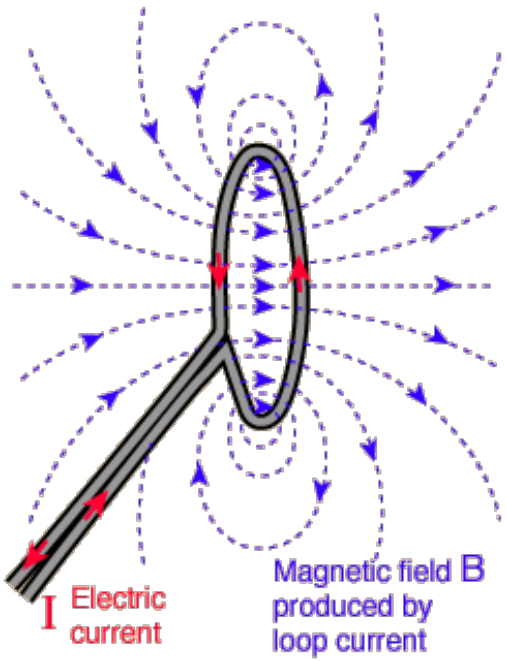
Motion



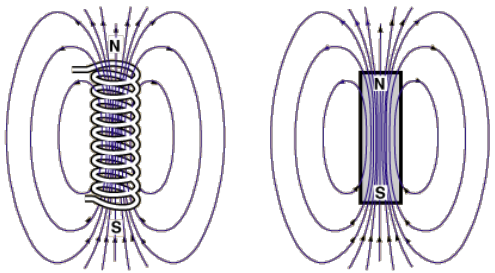
Electromagnetism

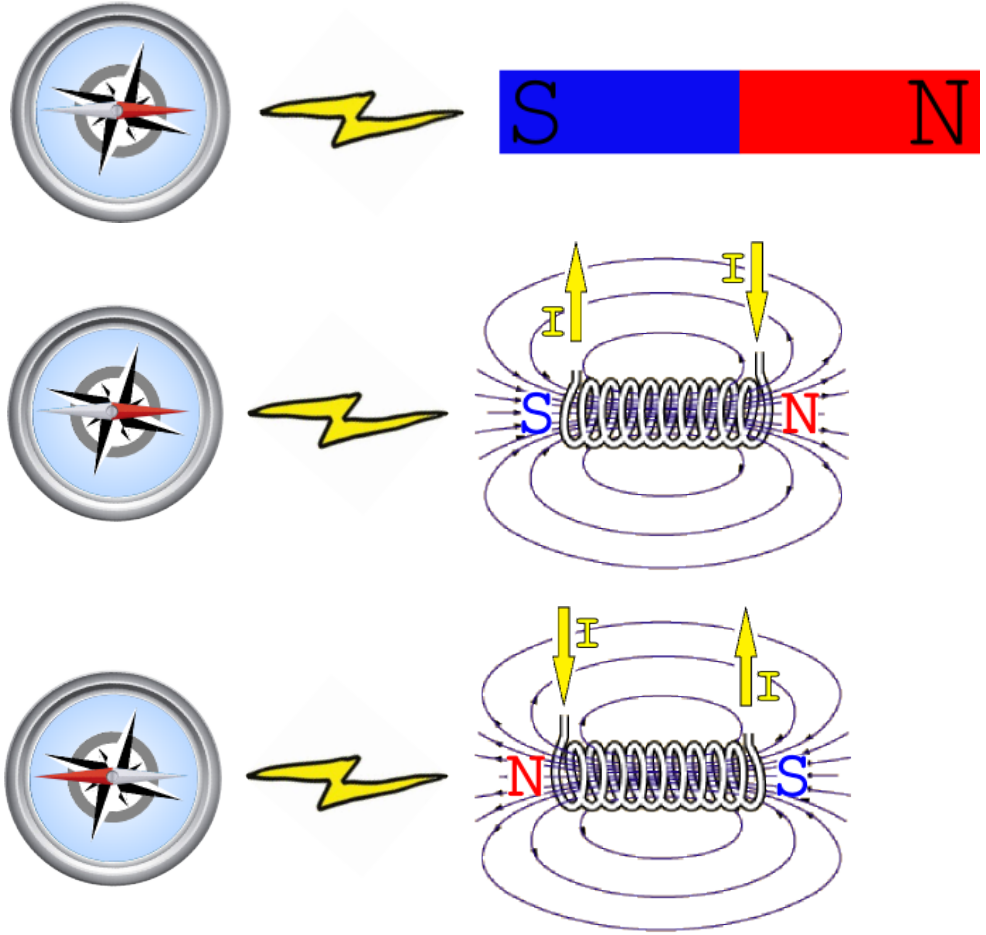
To create a magnet or magnetic field: current through a wire.



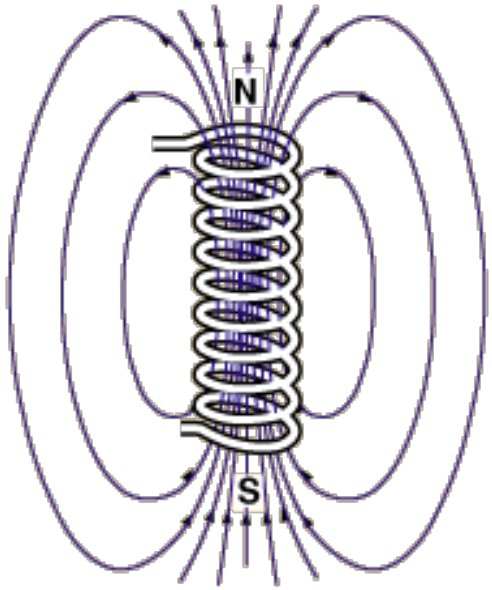


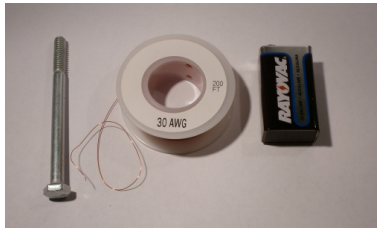
Electromagnet

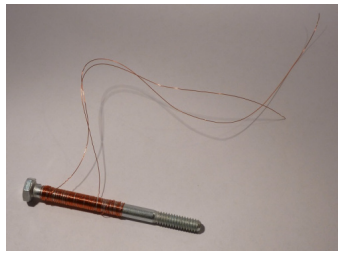


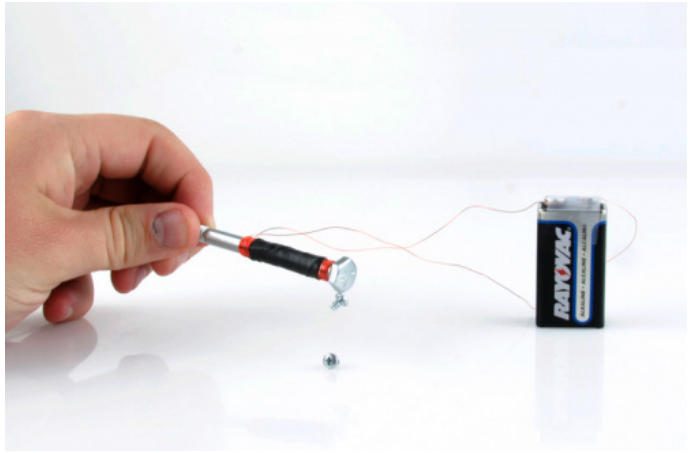


Electromagnet







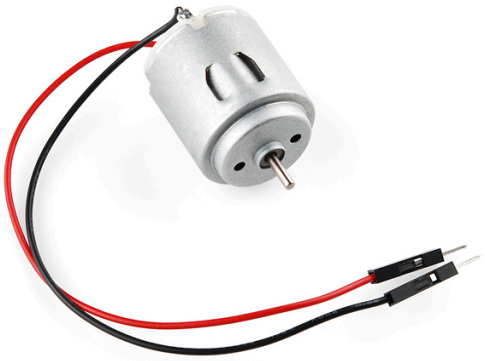


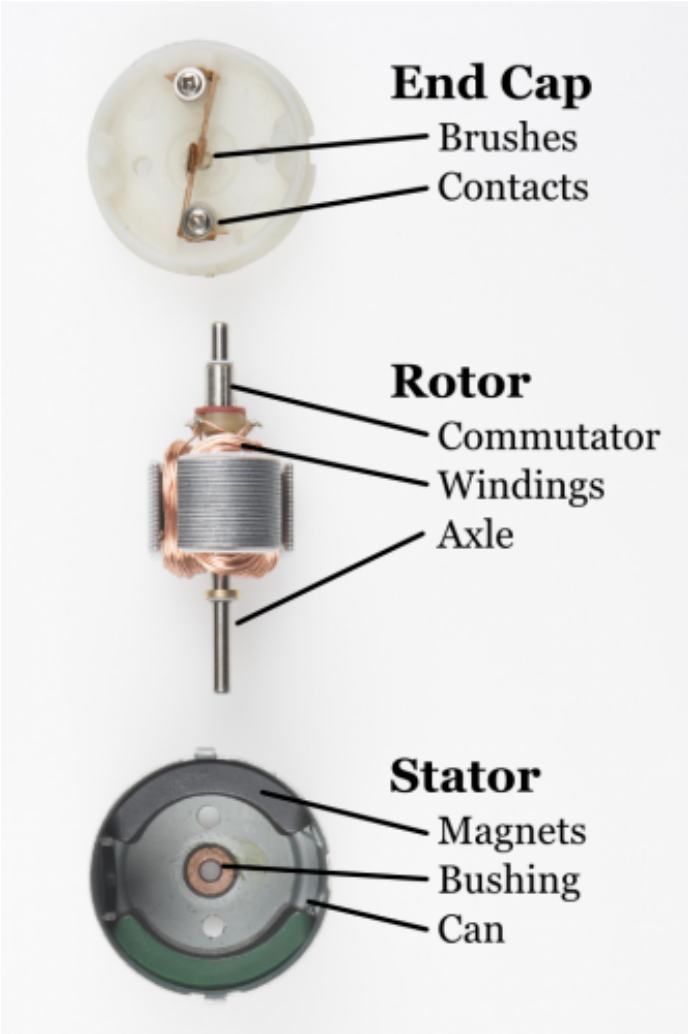
Kinds of Motors

DC Brush Motors
DC Brushless Motors
Servo motor
Stepper Motor Bipolar
Stepper Motor Unipolr

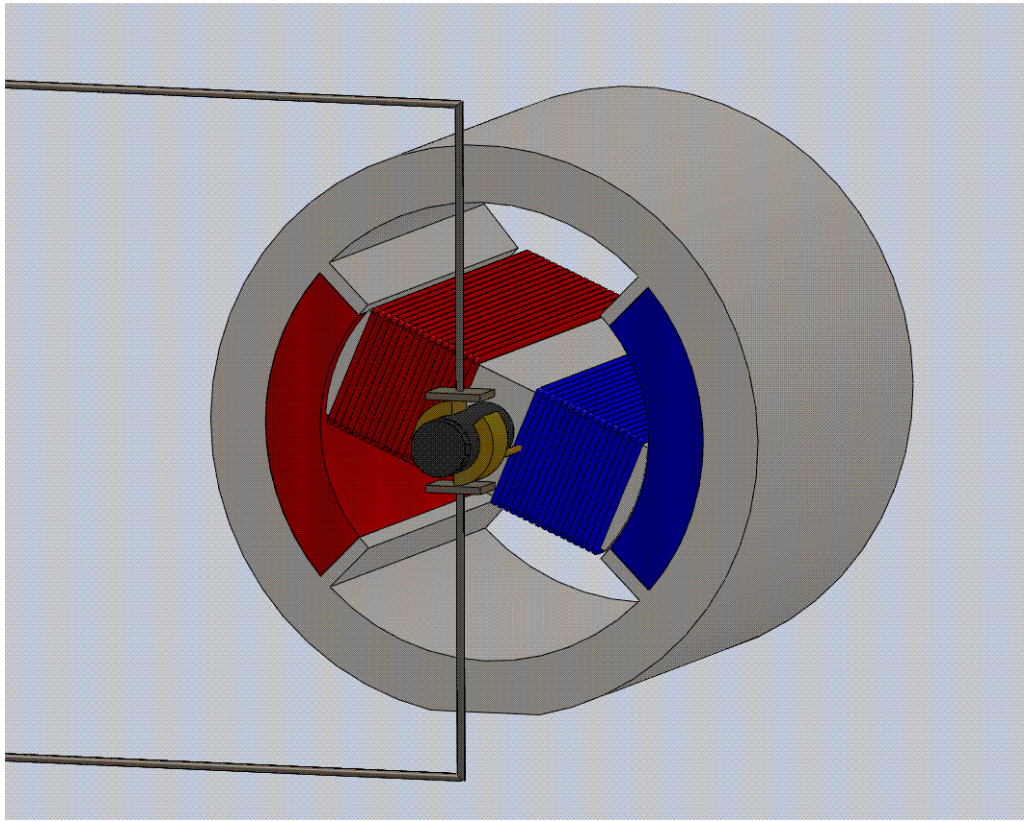
DC Brushed Motor

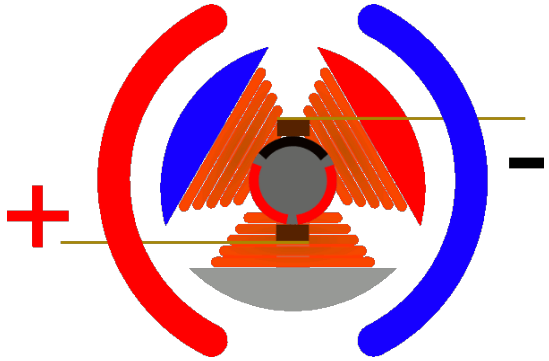
DC Brushed Motor



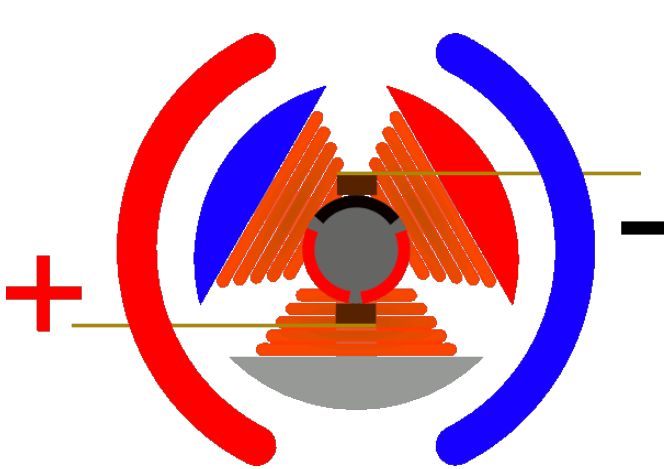


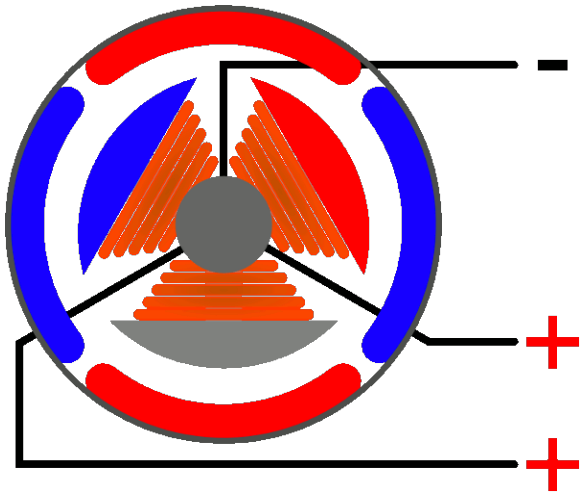
DC Brushed Motor



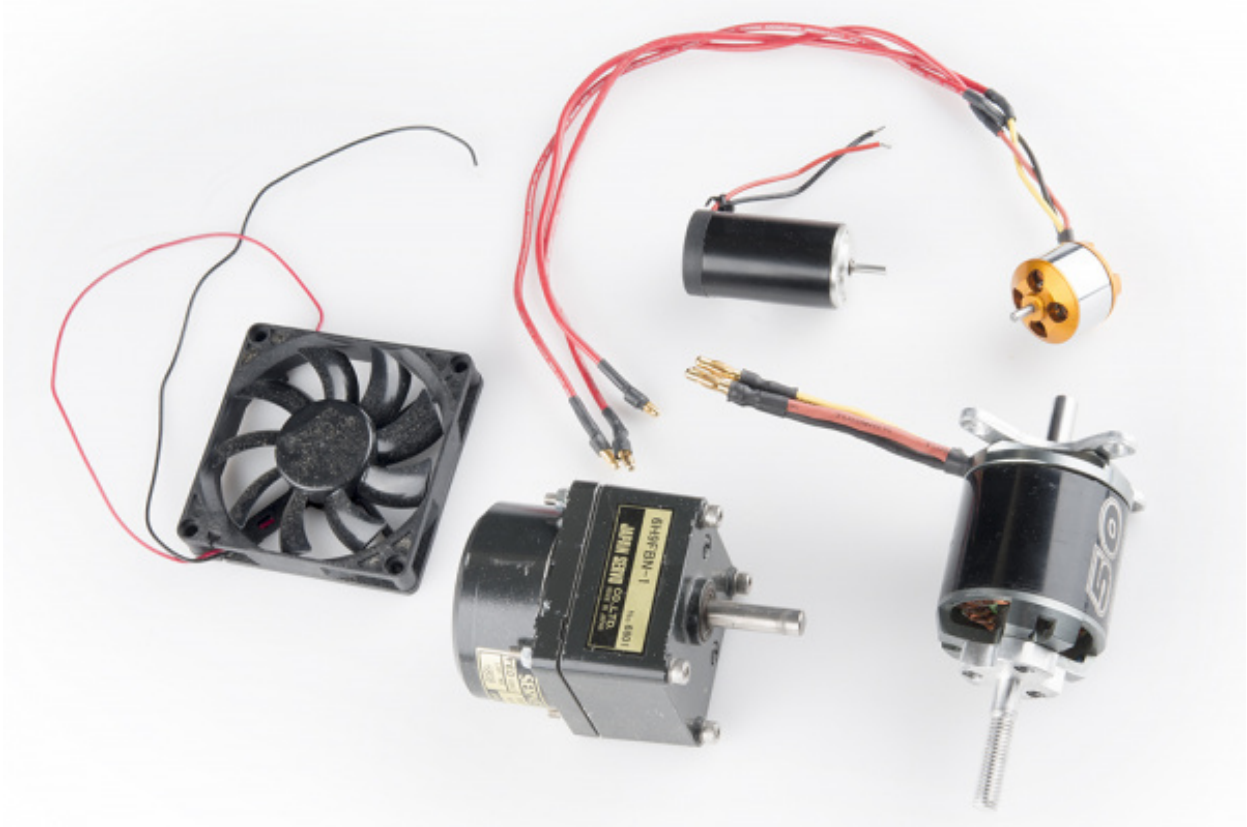


DC Motors - Brushed VS Brushless

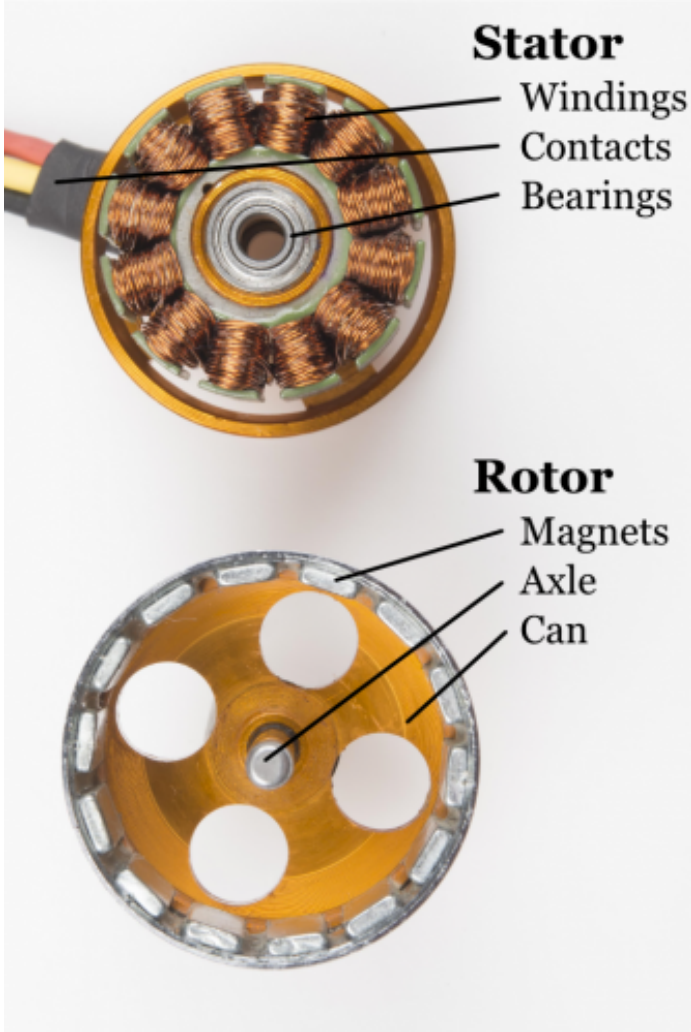




Brushless Motor

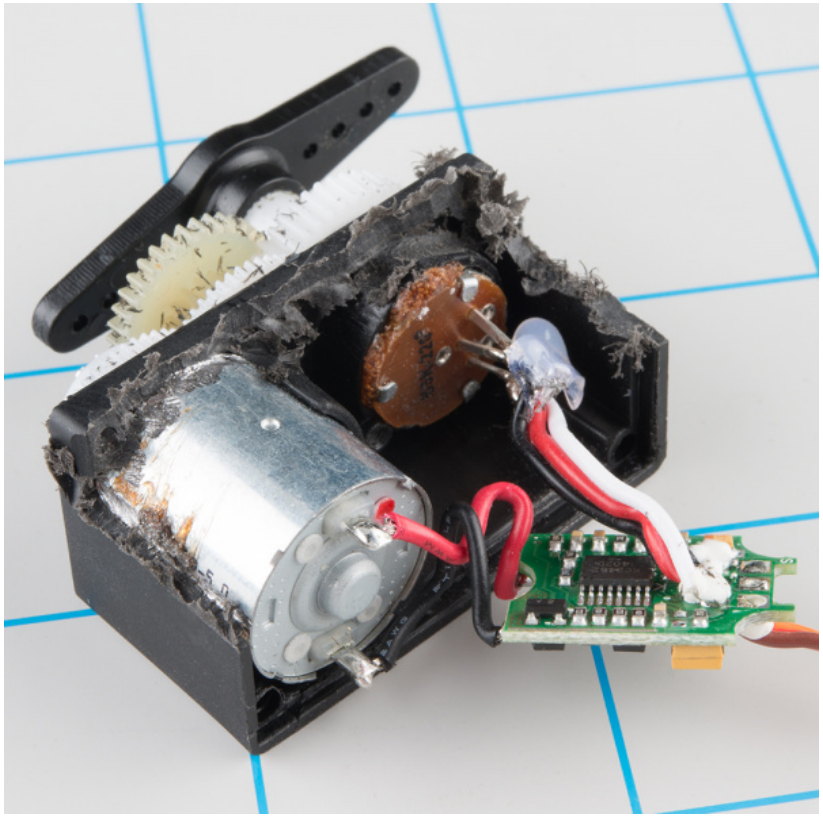


Brushless Motor

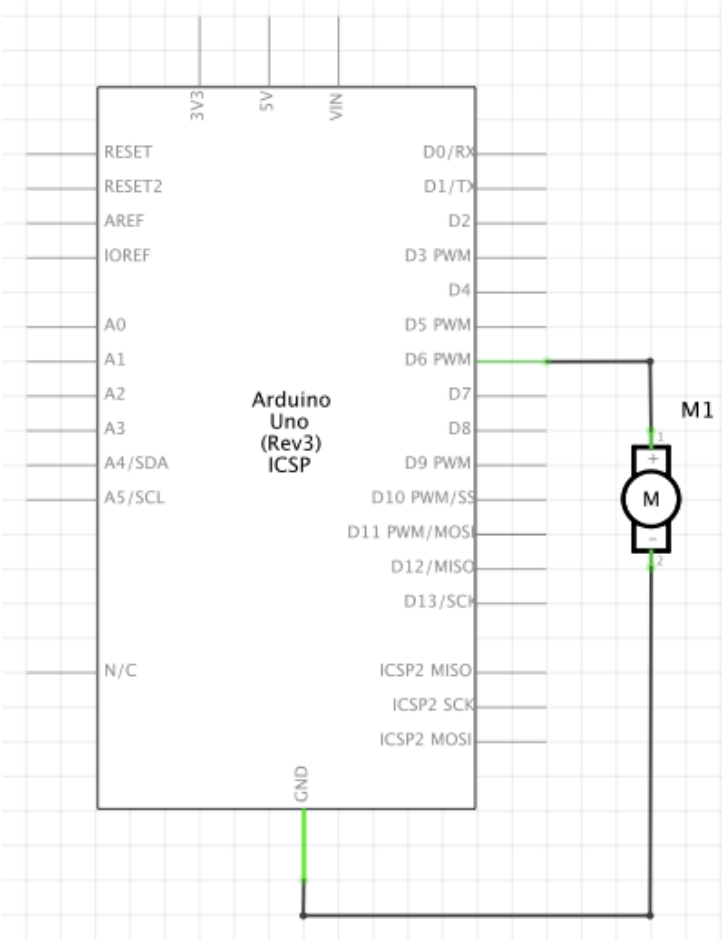


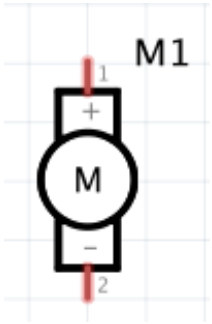
Servo Motor

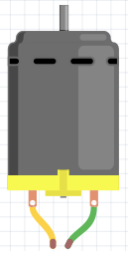
Servo Motor



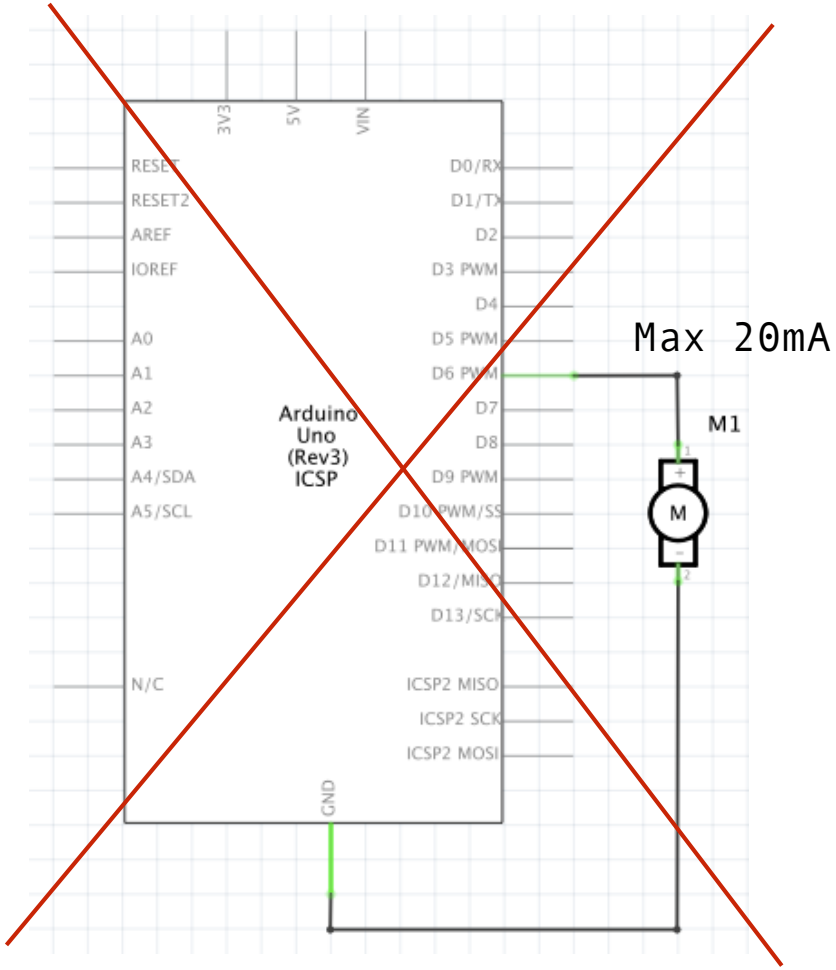
DC Motor (brushed) - Schematic - WRONG

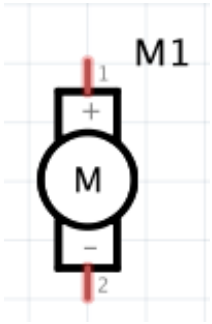


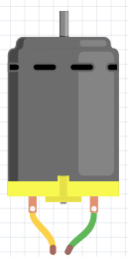




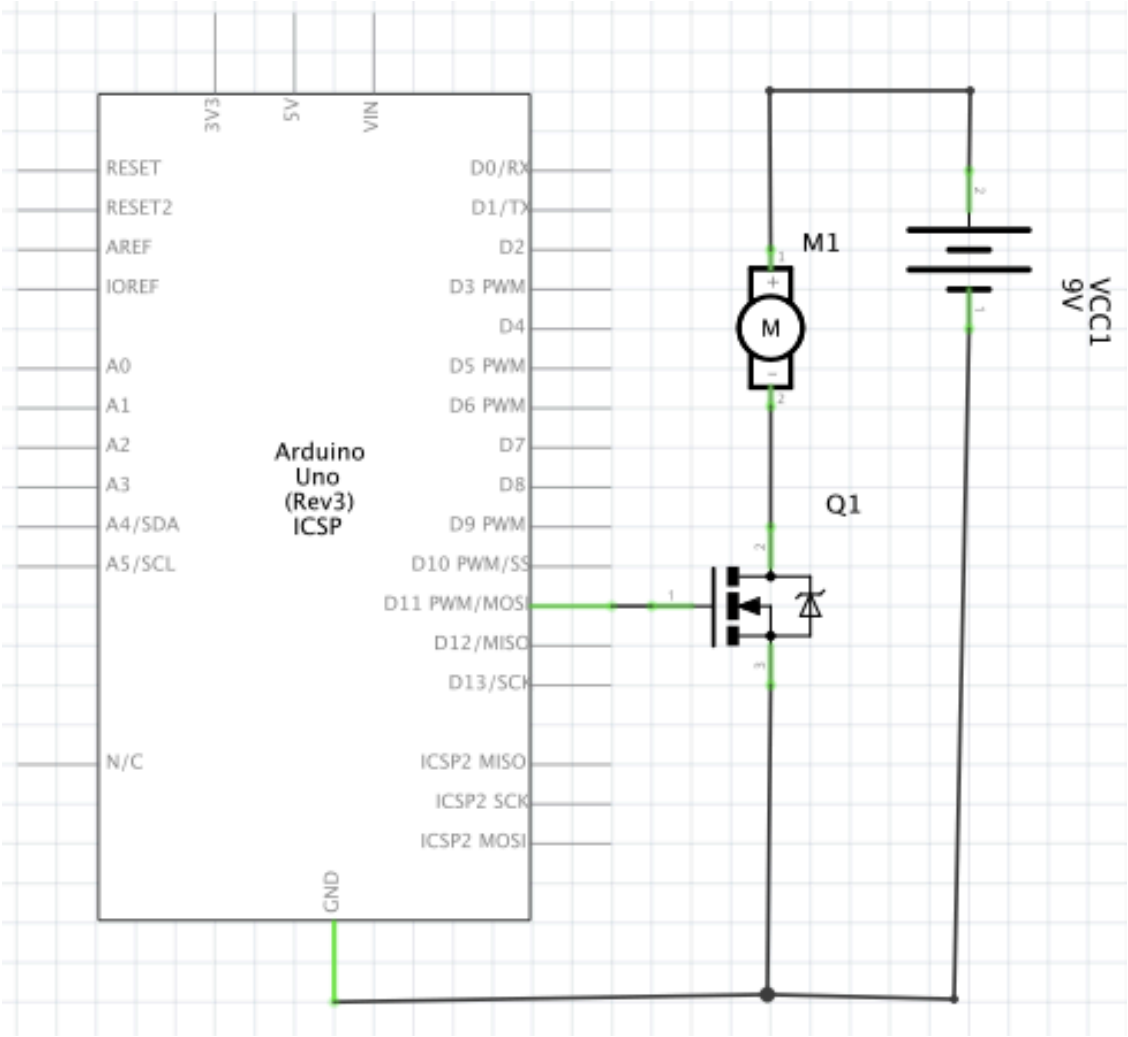
DC Motor (brushed) - Schematic - WRONG

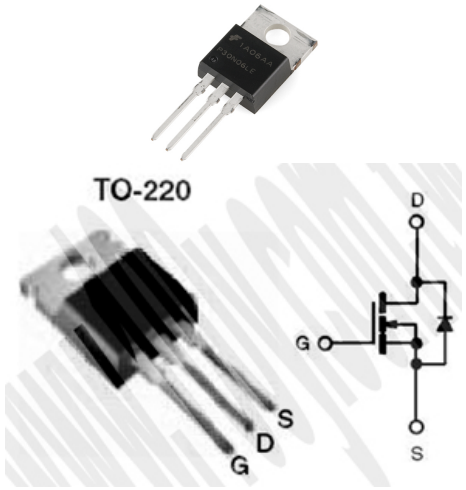






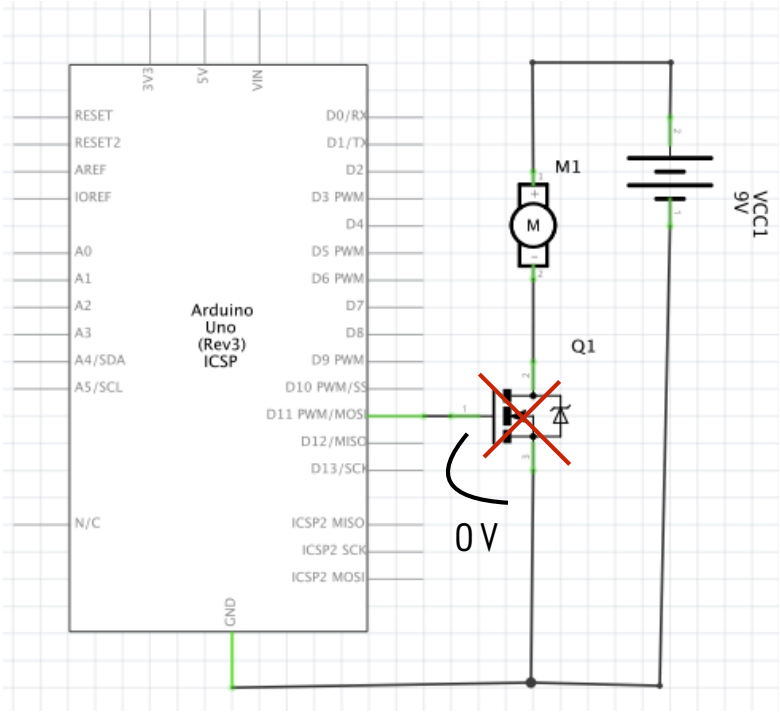
DC Motor (brushed) - Schematic



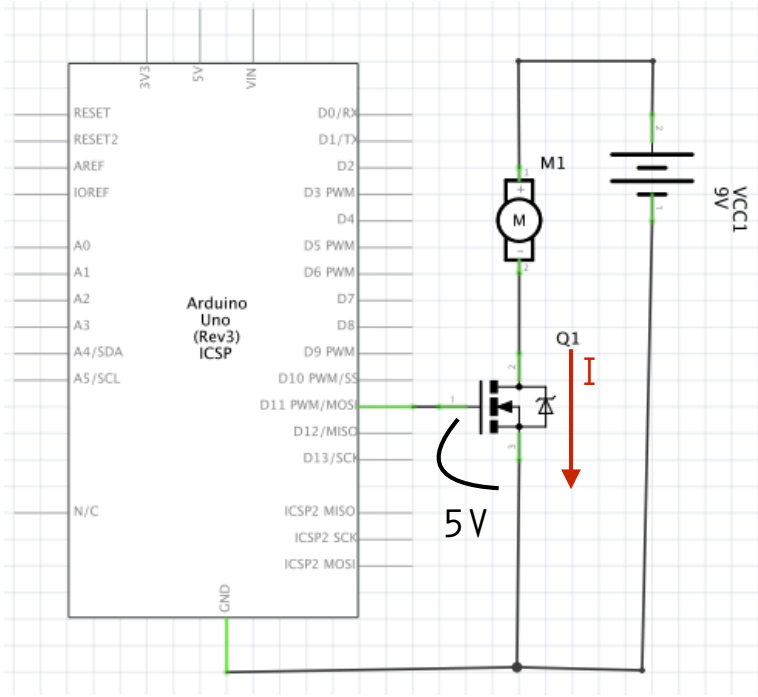


Three terminals:
Source
Gate
Drain

Mosfet N-channel

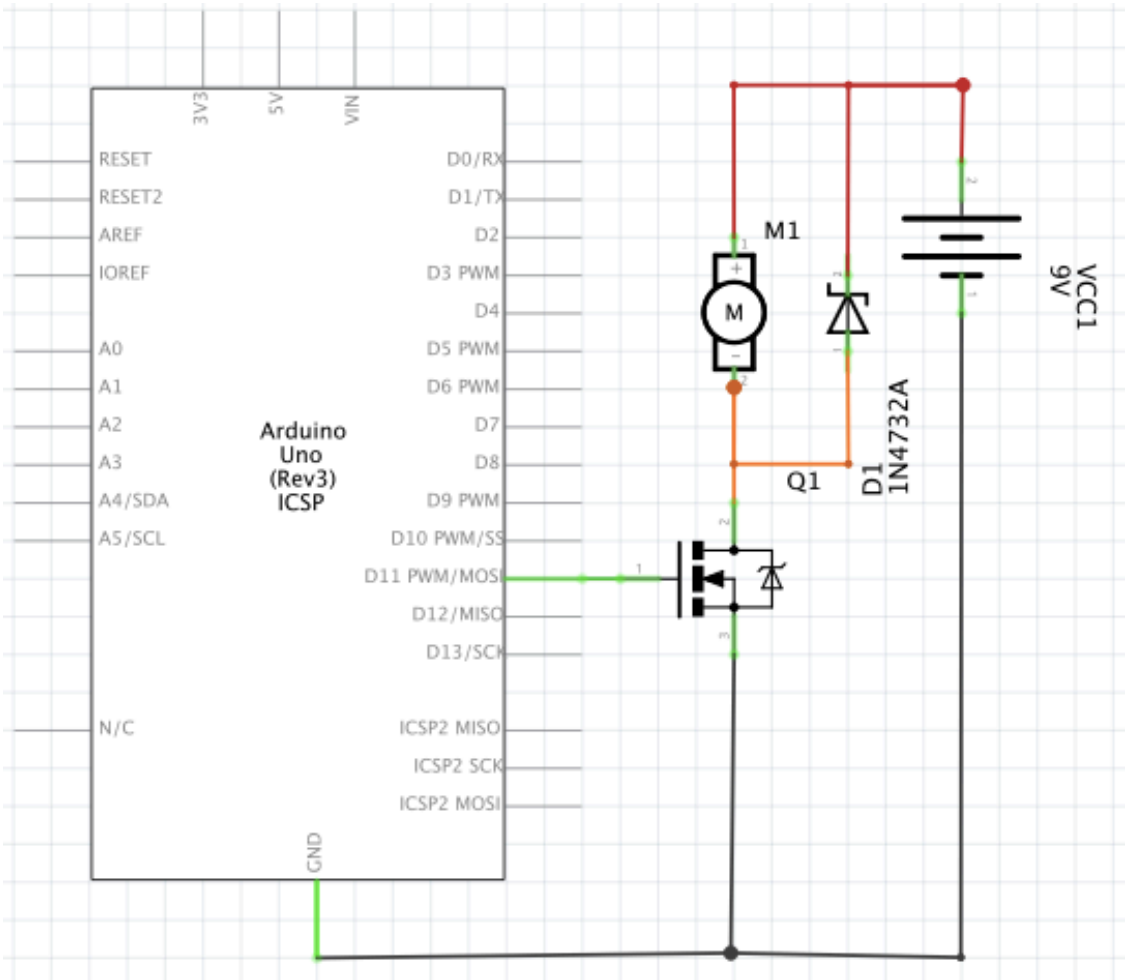


If Vgs = 0V
=> open loop, no current



If Vgs = 5V
=> Close loop, current

DC Motor (brushed) - Schematic



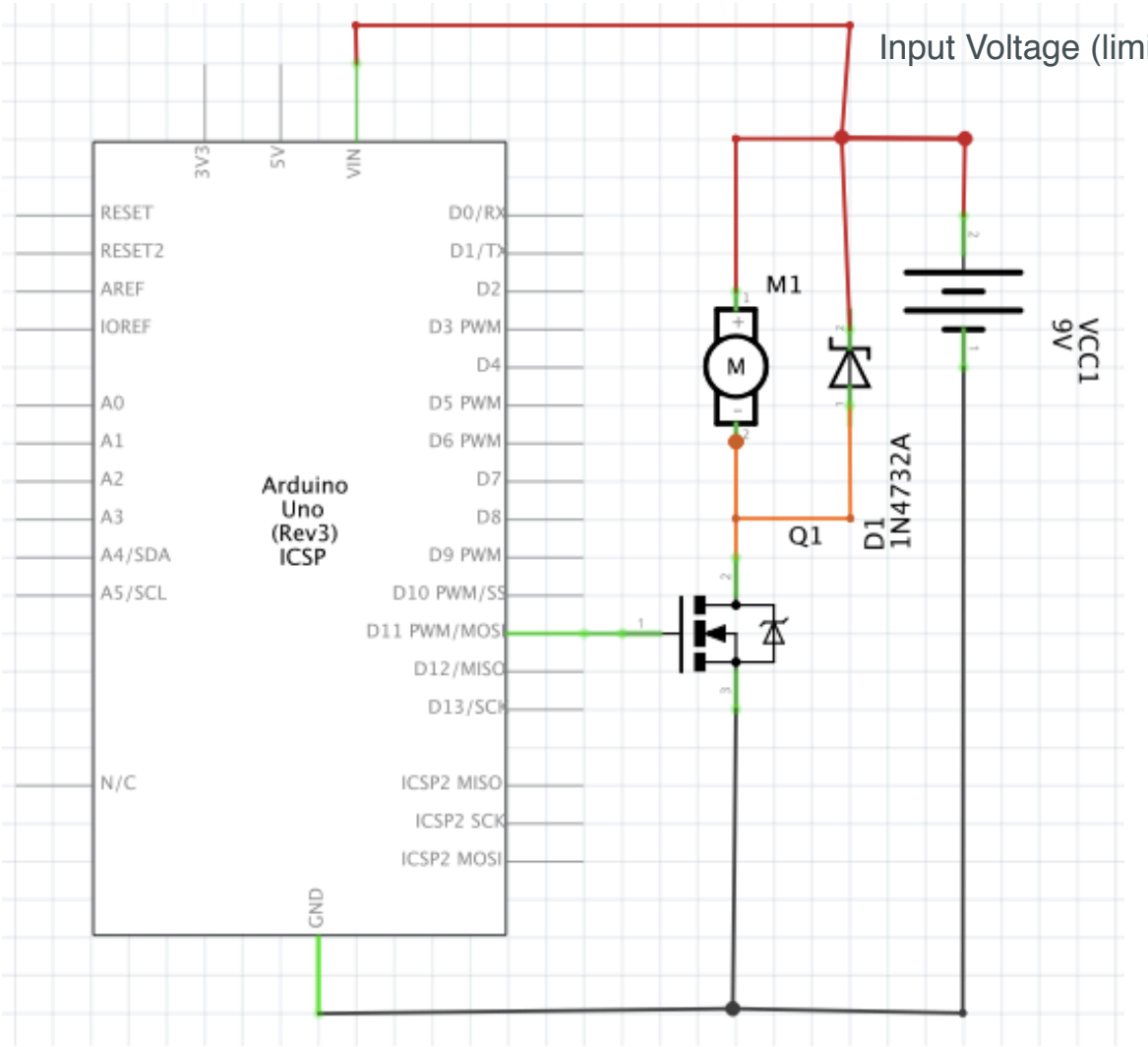
Diode

DC Motor (brushed) - Sketch

dc_motor

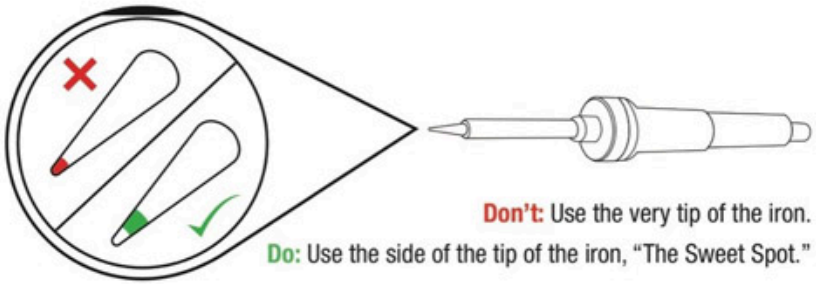
```
/*
Dc Motor
Emma Pareschi
November 2017
*/

int motorControl = 11;

void setup() {
  // put your setup code here, to run once:
  pinMode(motorControl, OUTPUT);
}

void loop() {
  // put your main code here, to run repeatedly:


  for(int x = 0; x <= 255; x+=5){
      analogWrite(motorControl, x);
      delay(50);
    }

    for(int x = 255; x >= 0; x-=5){
      analogWrite(motorControl, x);
      delay(50);
    }
}
```

DC Motor (brushed) - Schematic



Time to Solder and make your first shield

Soldering



Don't: Use the very tip of the iron.

Do: Use the side of the tip of the iron, "The Sweet Spot."

Do: Touch the iron to the component leg and metal ring at the same time.

Do: While continuing to hold the iron in contact with the leg and metal ring, feed solder into the joint.

Don't: Glob the solder straight onto the iron and try to apply the solder with the iron.

Do: Use a sponge to clean your iron whenever black oxidization builds up on the tip.

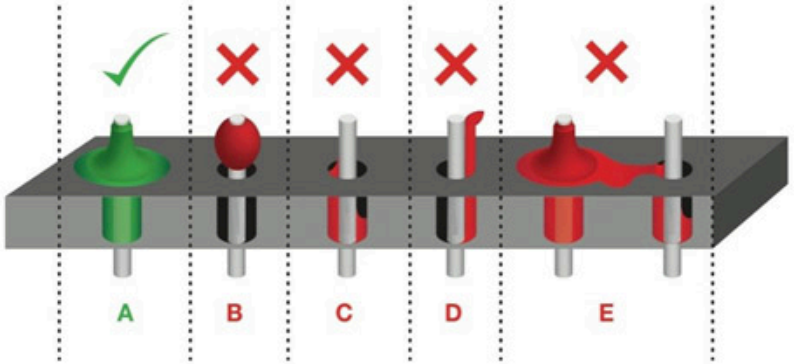
A Solder flows around the leg and fills the hole - forming a volcano-shaped mound of solder.

B Error: Solder balls up on the leg, not connecting the leg to the metal ring.
Solution: Add flux, then touch up with iron.

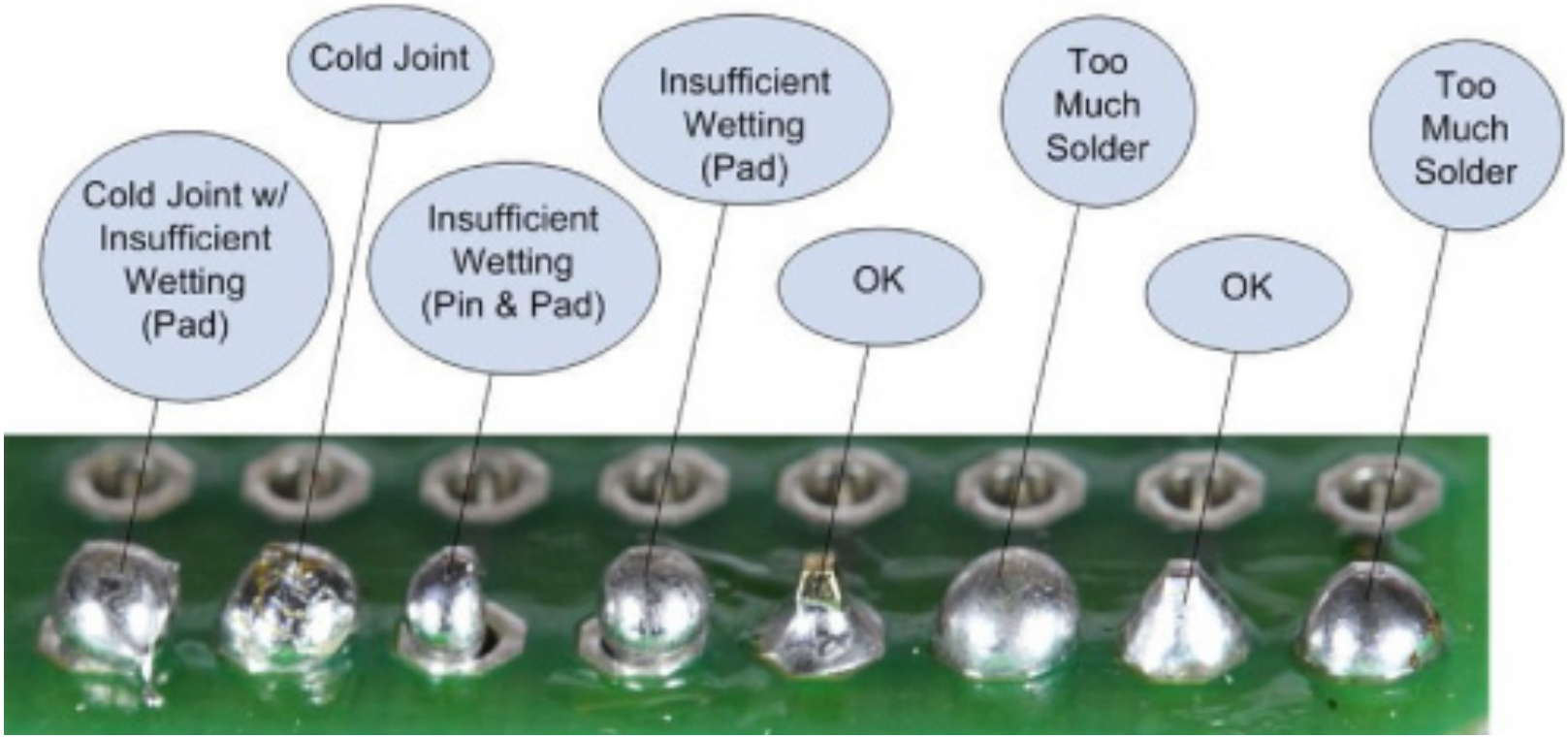
C Error: Bad Connection (i.e. it doesn't look like a volcano)
Solution: Flux then add solder.

D Error: Bad Connection...and ugly...oh so ugly.
Solution: Flux then add solder.

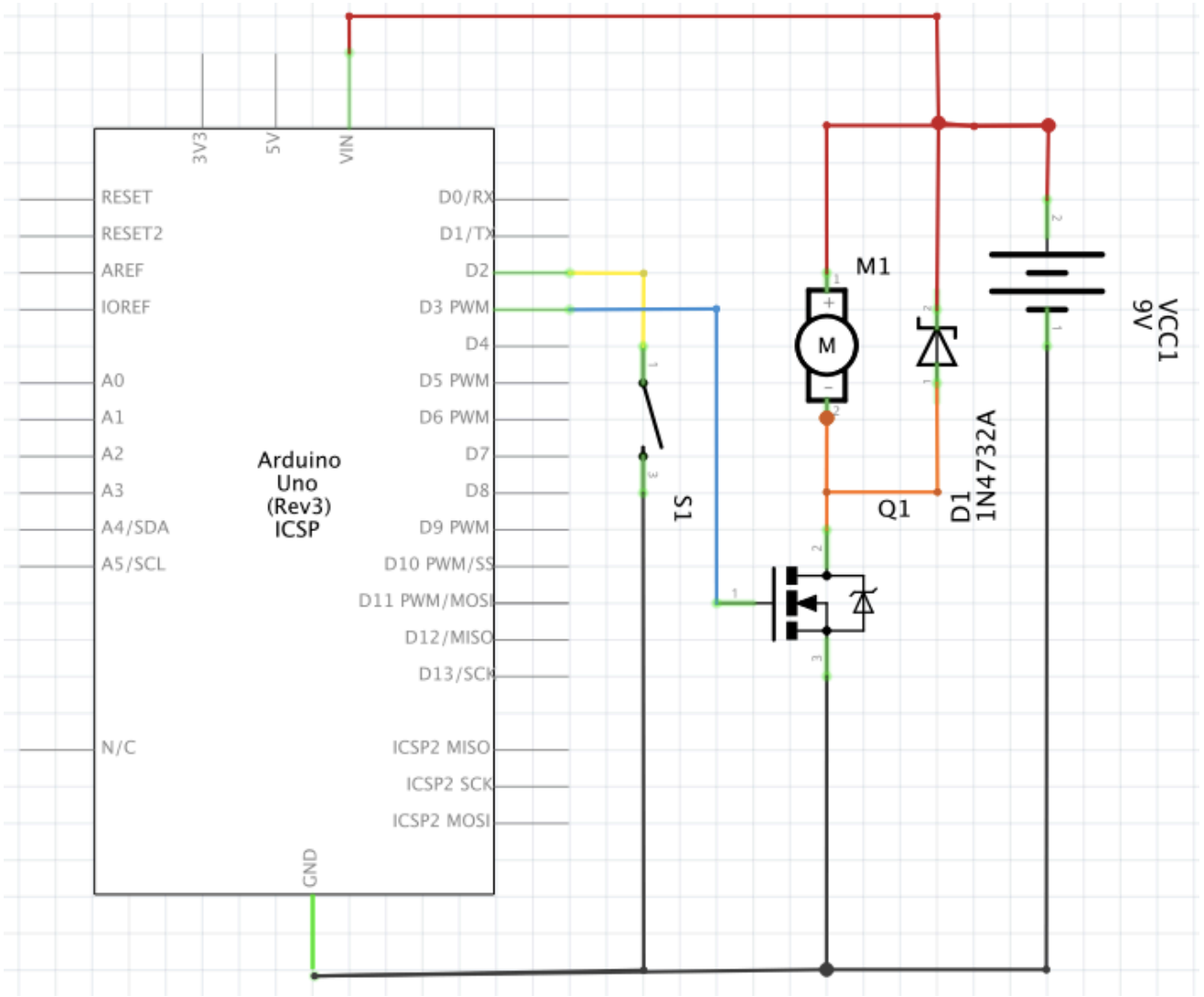
E Error: Too much solder connecting adjacent legs (aka a solder jumper).
Solution: Wick off excess solder.



Soldering


Cold Joint w/ Insufficient Wetting (Pad)
Cold Joint
Insufficient Wetting (Pin & Pad)
Insufficient Wetting (Pad)
OK
Too Much Solder
OK
Too Much Solder

DC Motor (brushed) - Schematic



Assignment

- Add a switch, or any other sensor, to the shield.
- Program the board so the Motor react based on the reading from the sensor
- Make a system that use the Arduino+shield to operate, for example: a box, a motorized Pinwheel, a gear system.
- Document the process and the result

Sources and Licence

Motors
https://learn.sparkfun.com/tutorials/motors-and-selecting-the-right-one
https://learn.sparkfun.com/tutorials/hobby-servo-tutorial