Fundamentals of Physical Computing

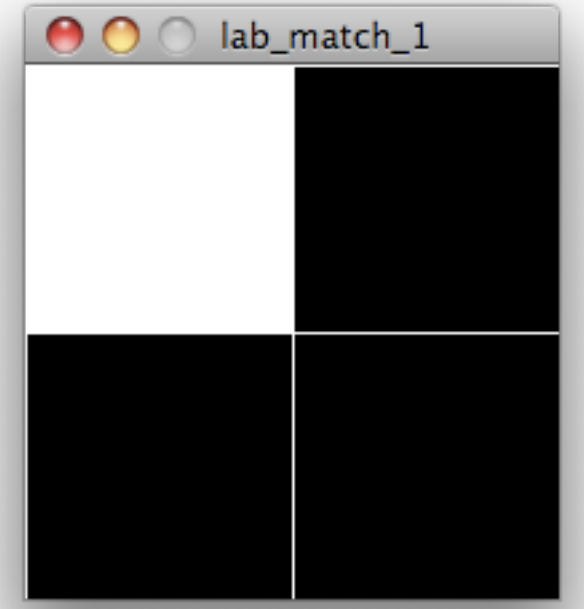
Instructor: Rob Faludi

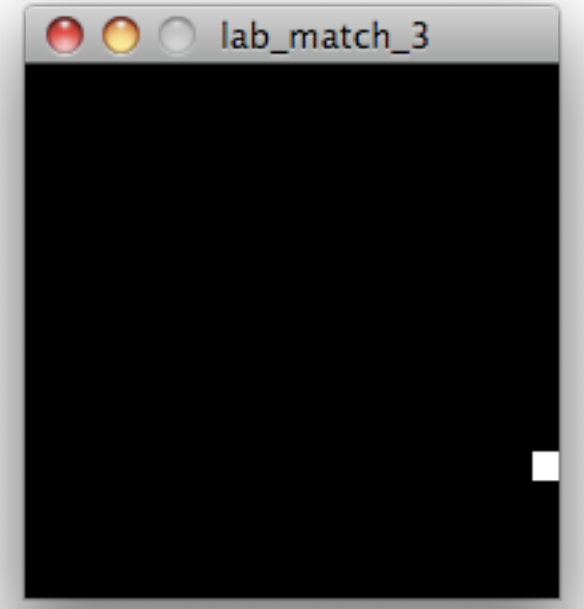
Plan for Today

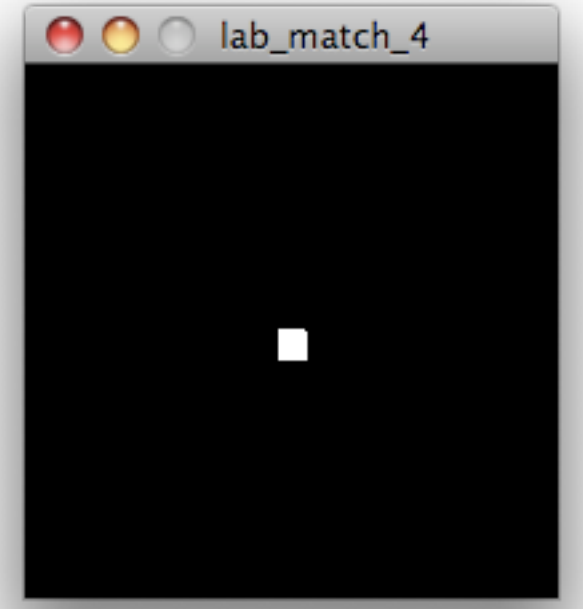
- Tuesdays?
- Lab Review
- Observation Presentations
- Motors
  - basics
  - speed
  - direction
- Readings & Assignments

Tuesdays?

Lab Review



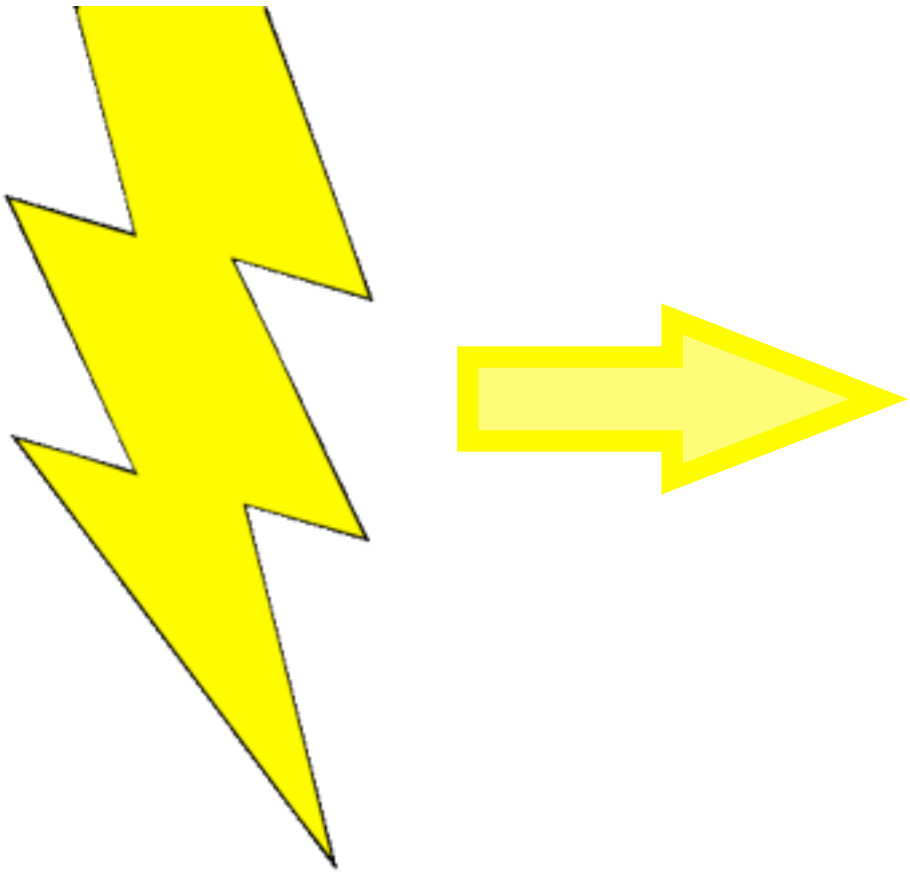




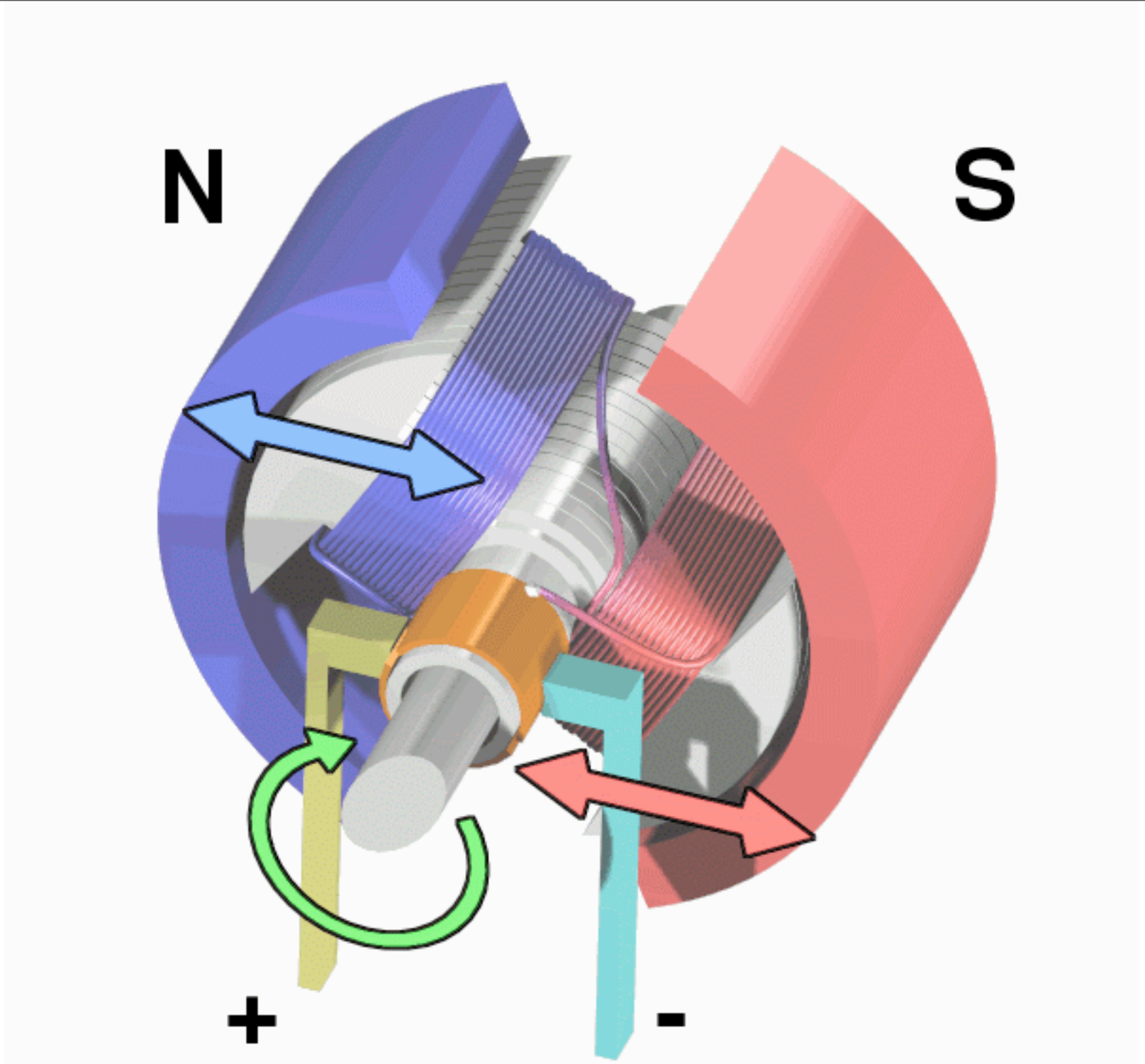
Observations

Motors

Remember Transduction?

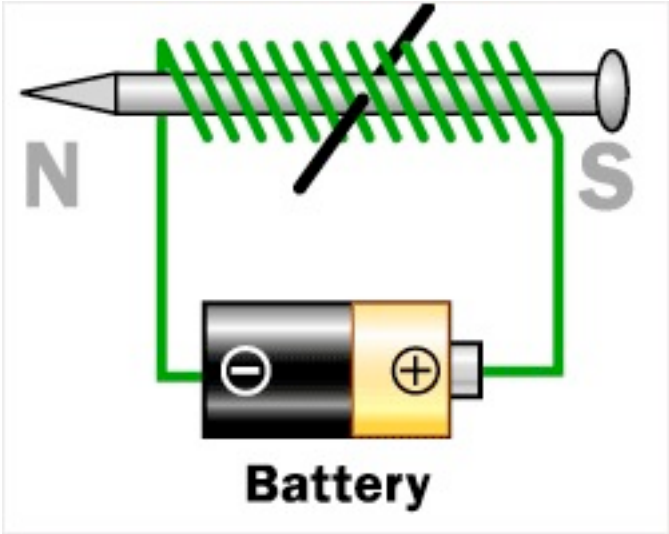


http://upload.wikimedia.org/wikipedia/commons/8/89/Electric_motor.gif

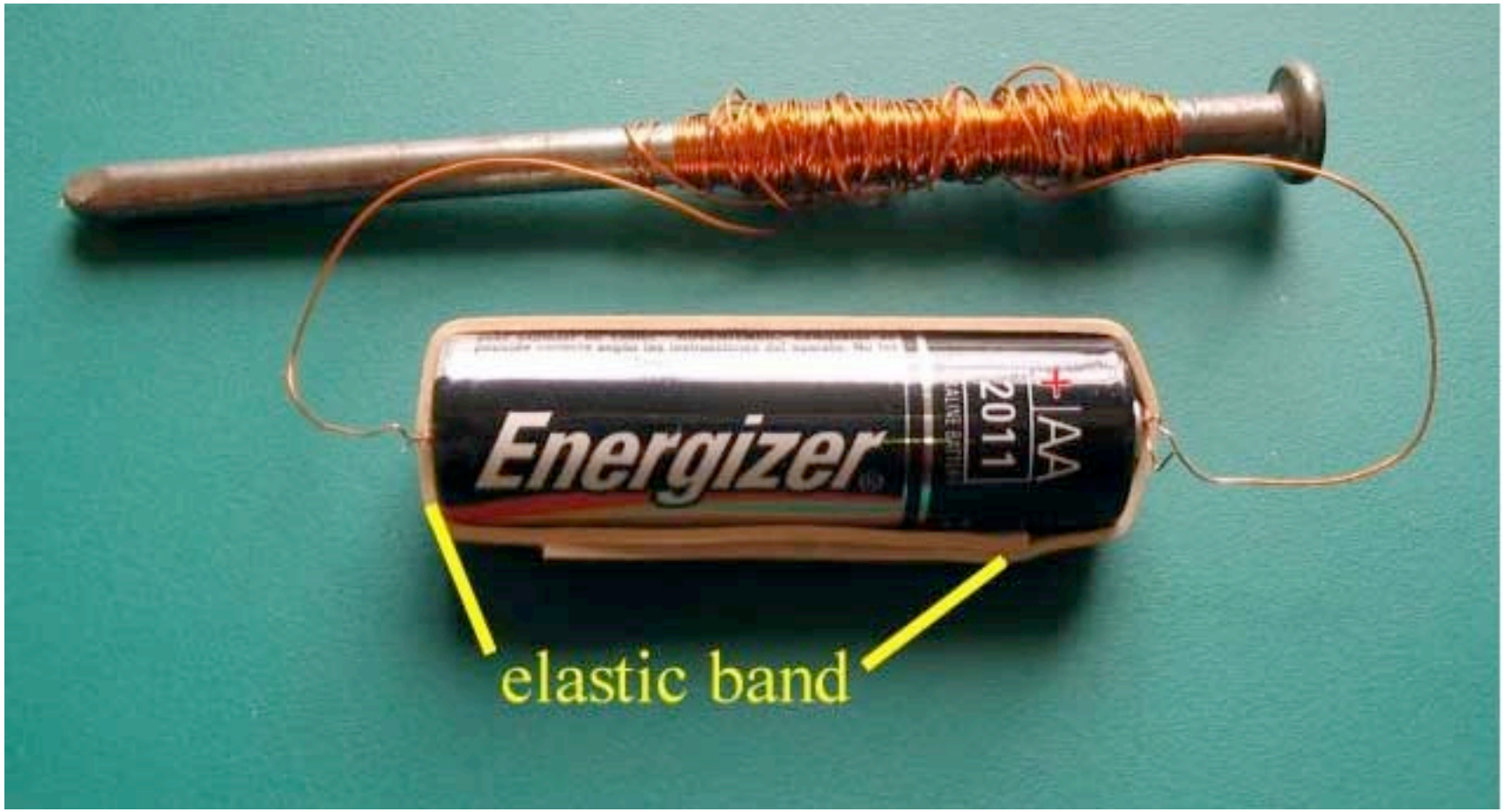


http://upload.wikimedia.org/wikipedia/commons/8/89/Electric_motor.gif

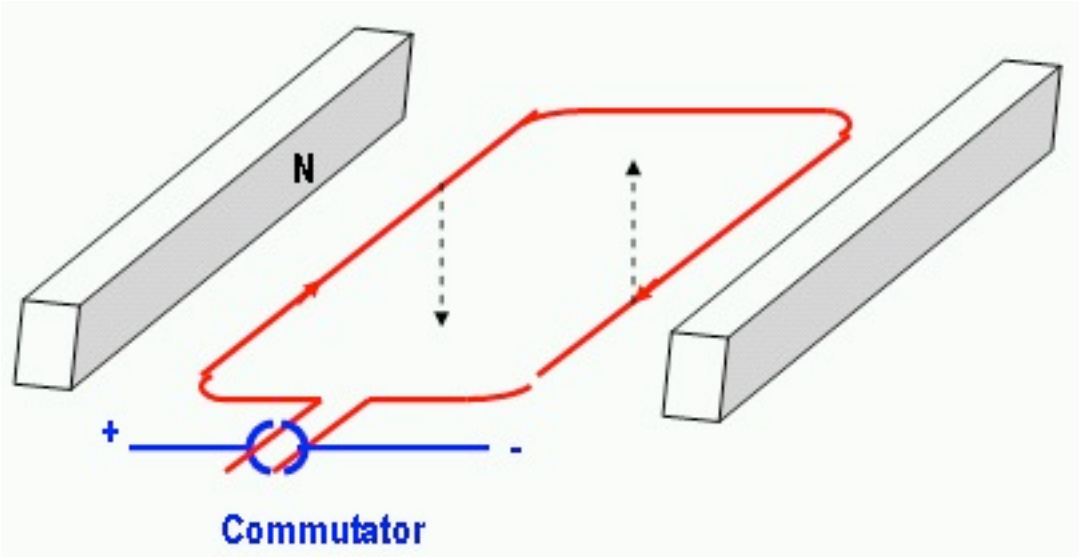
Induction



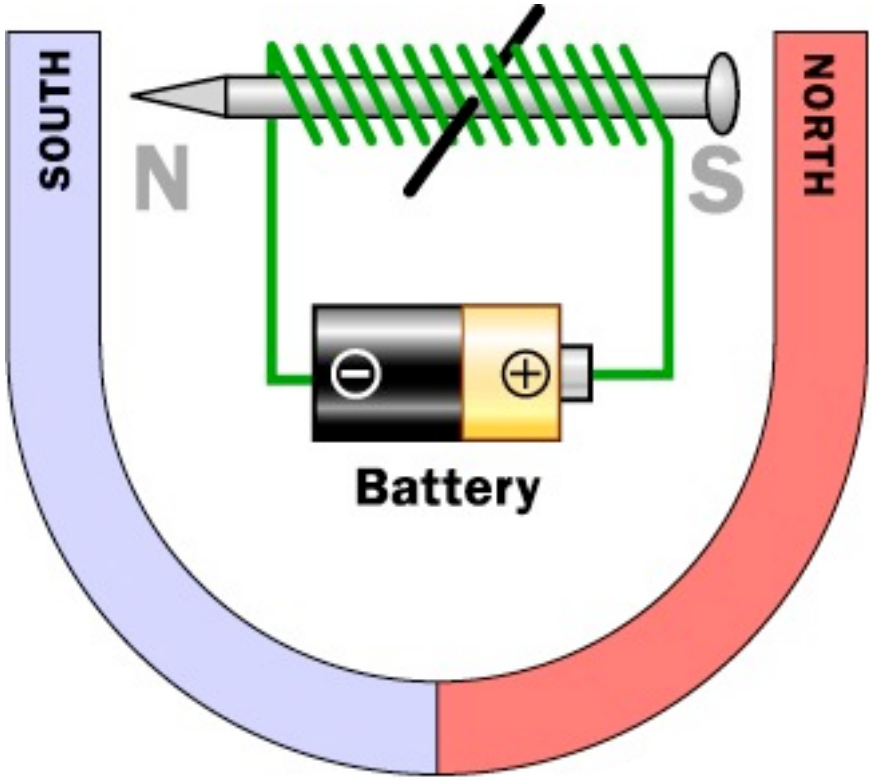
DIY



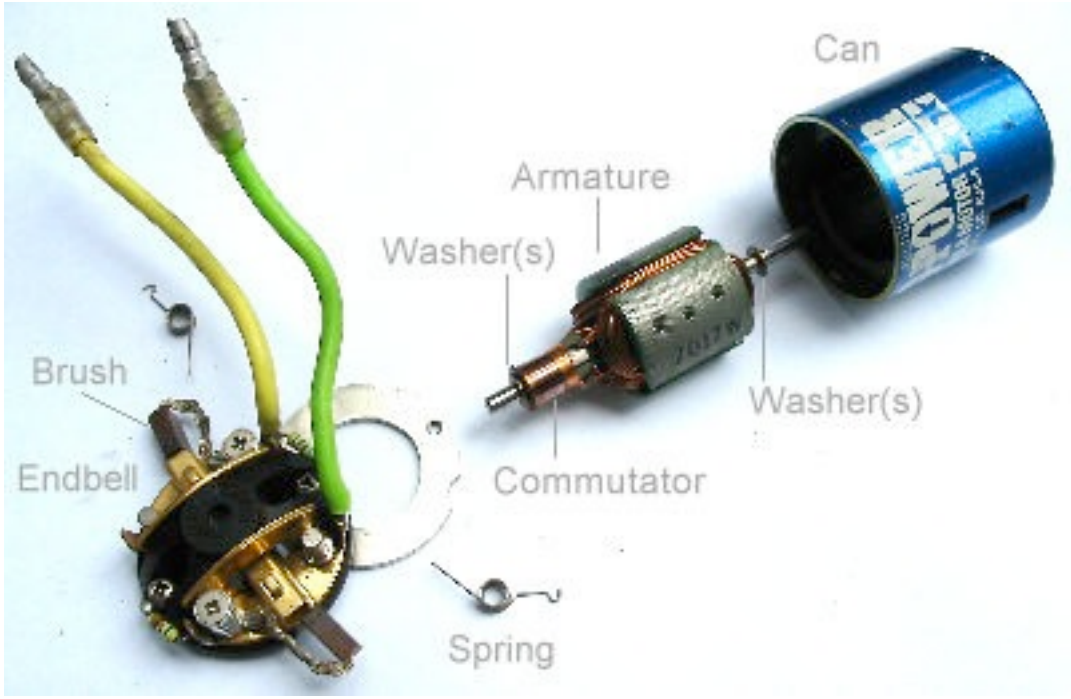
Basic Principle



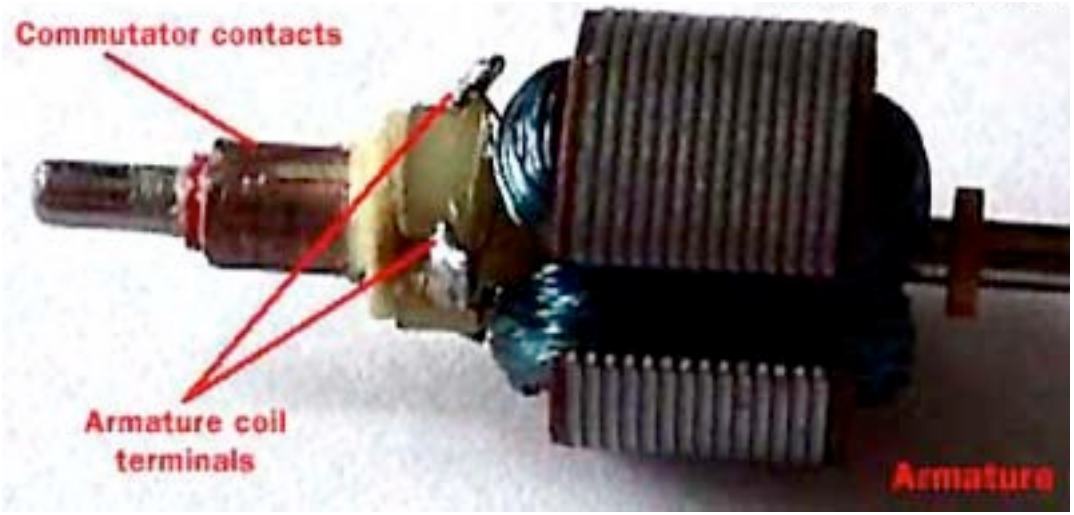
Another View



All the Parts

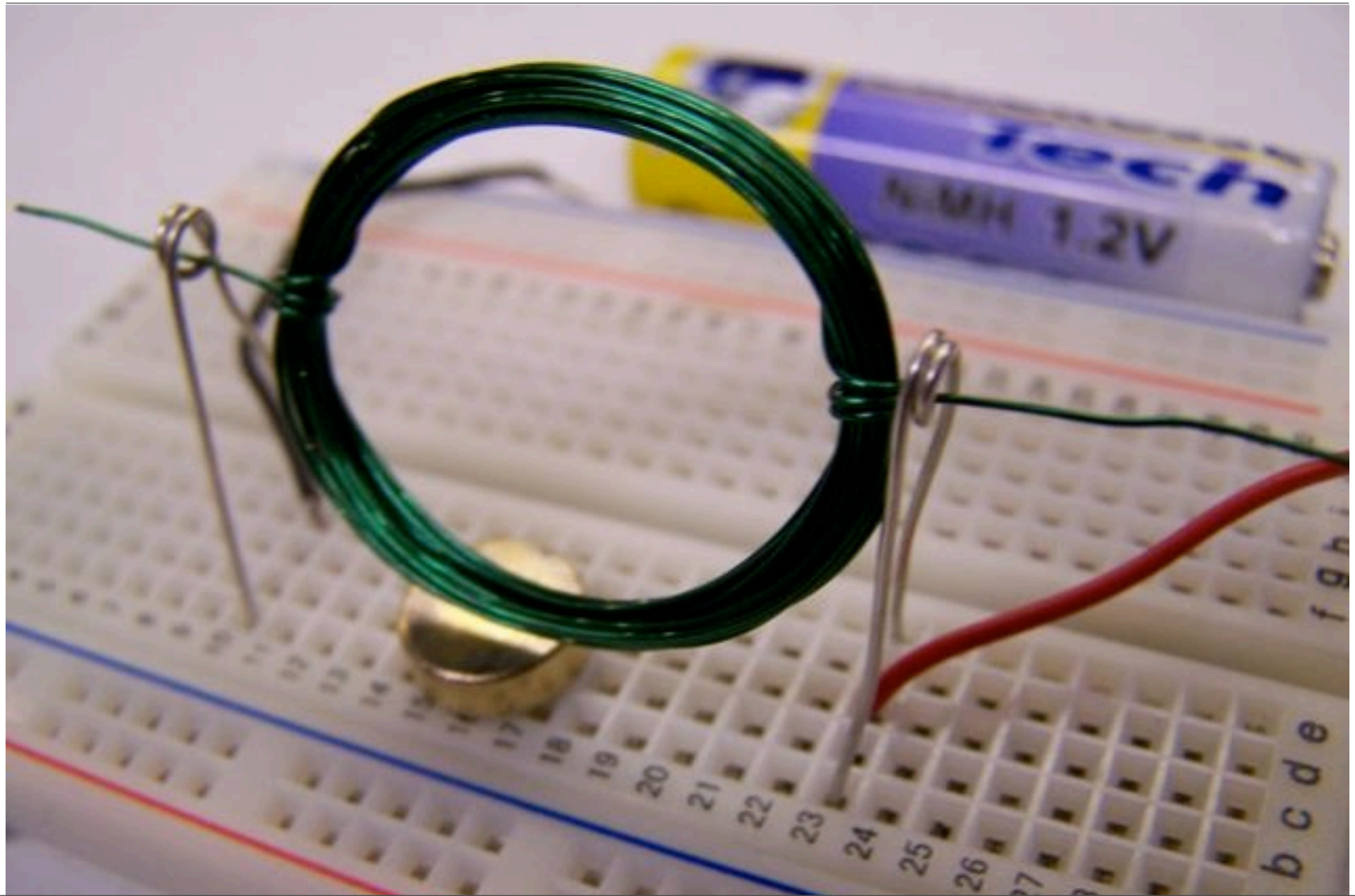


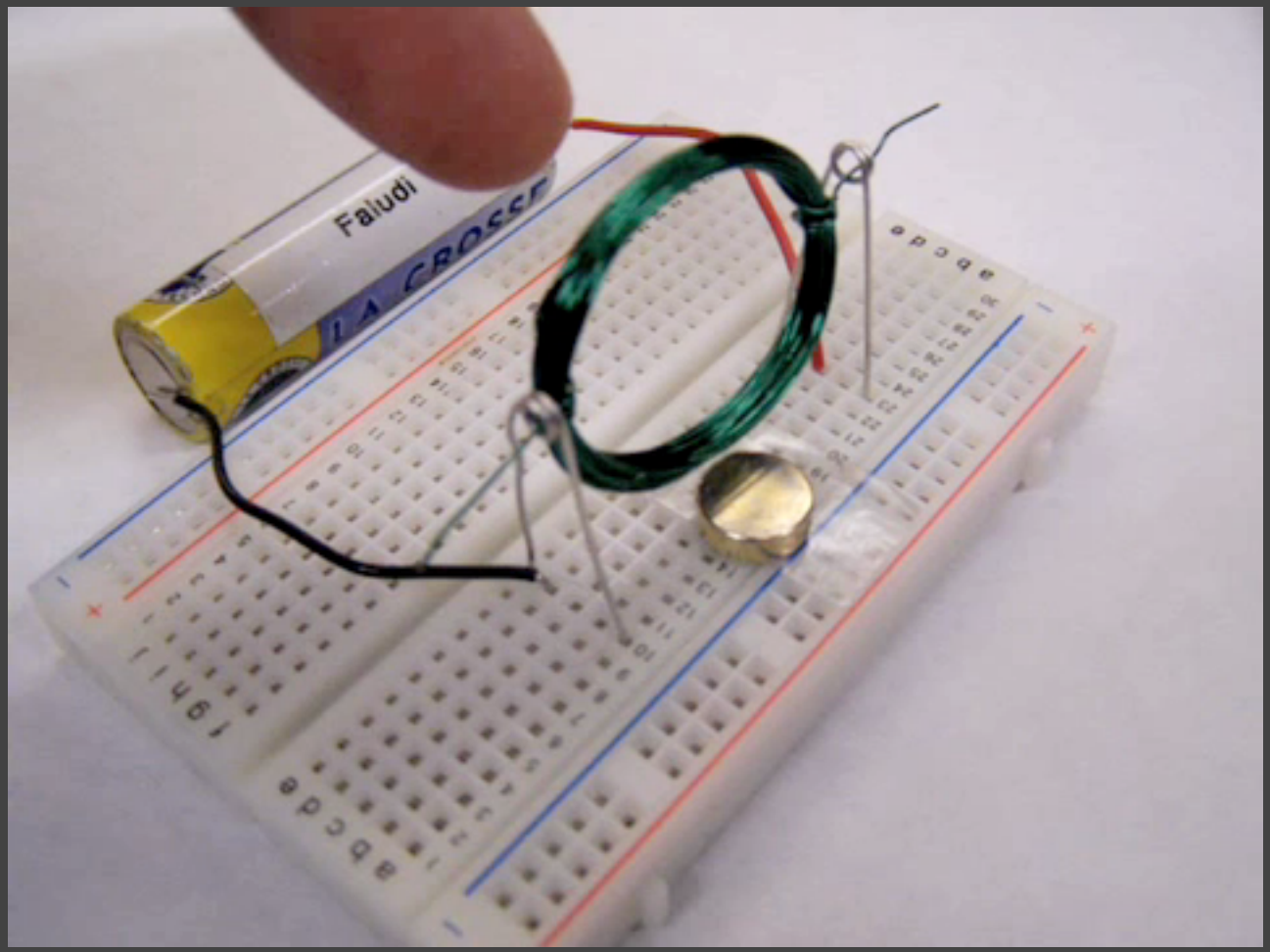
Spinning Part



Fixed Part

DIY




Faludi
LA CROSSE

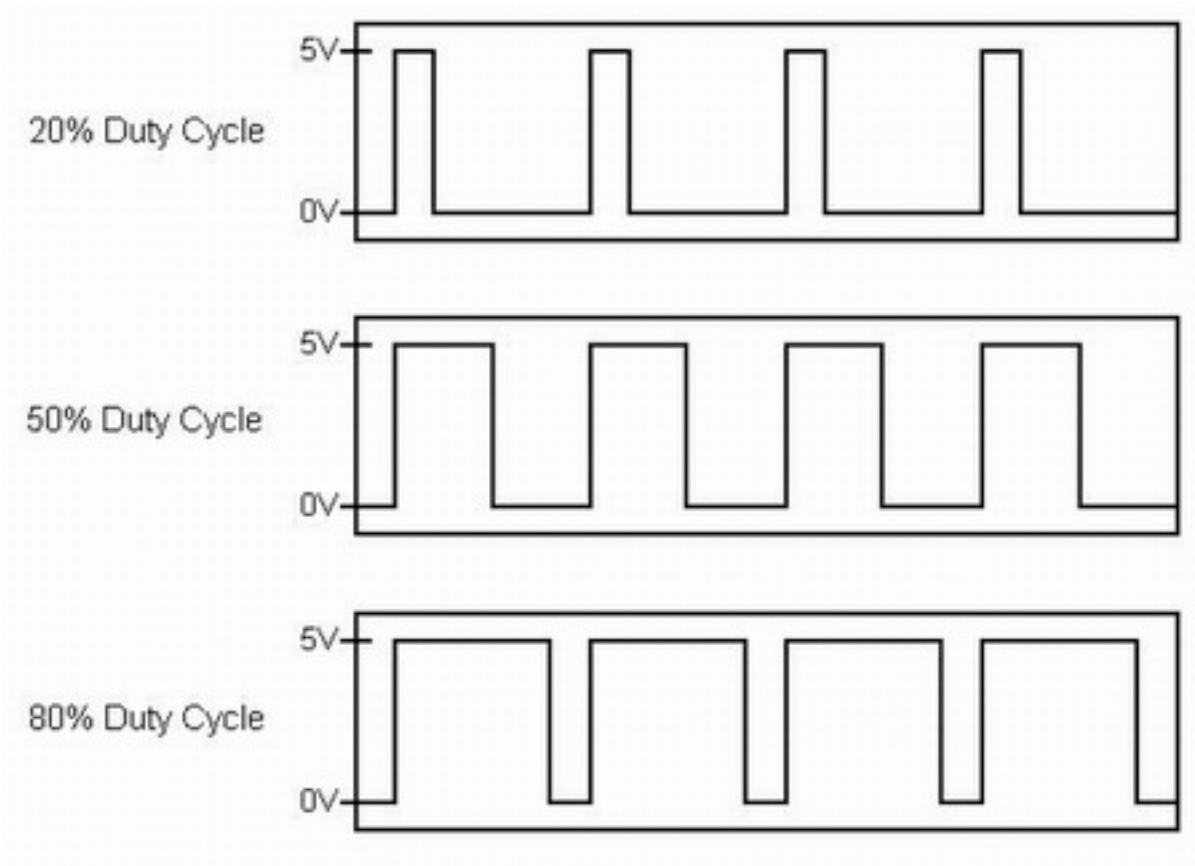
Induction works both ways

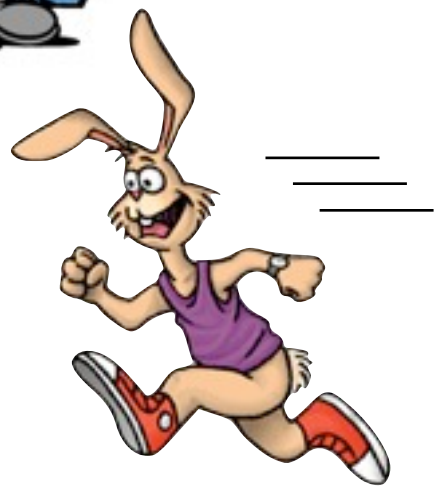
Varying Speed

Getting Analog from Digital

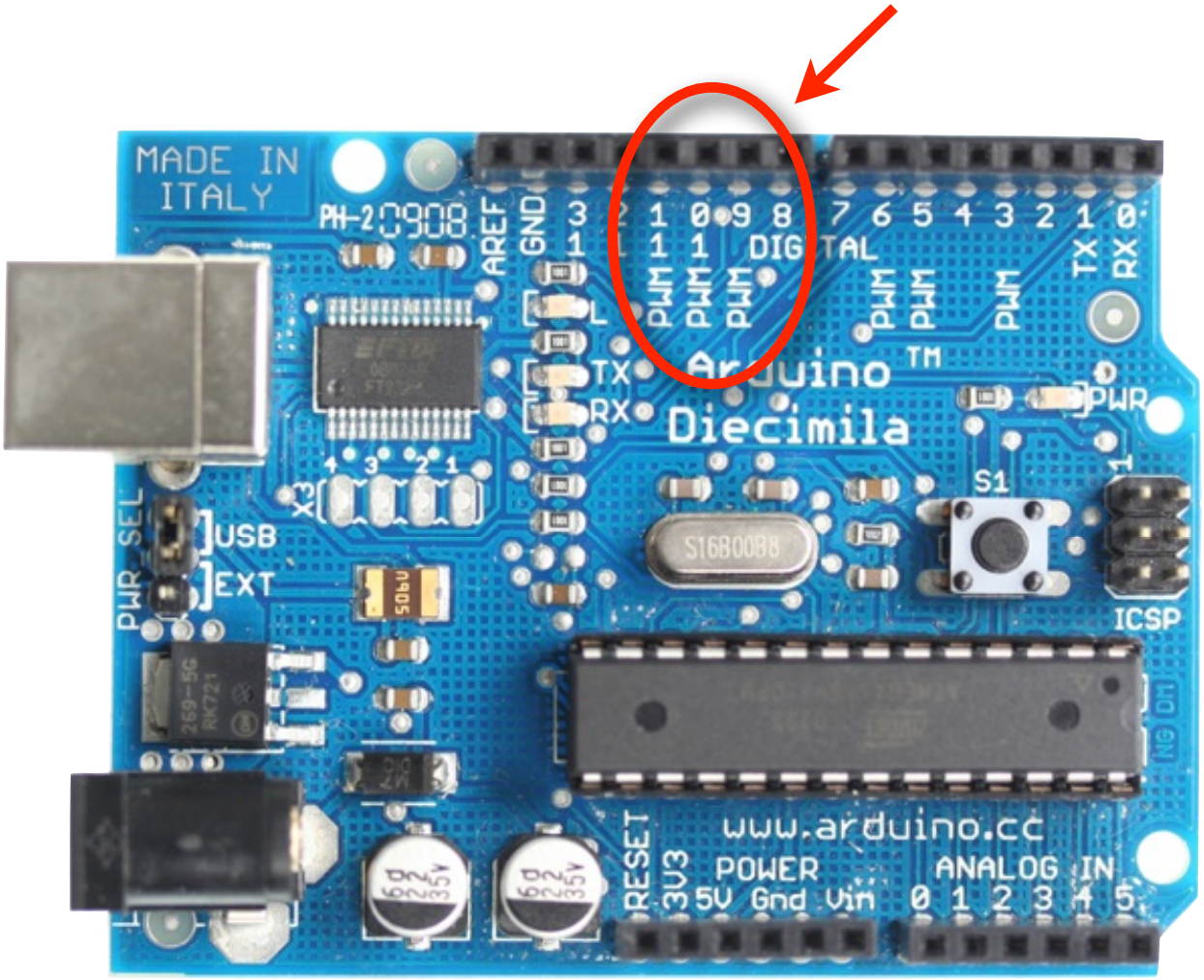
vroom....vroom...vroom

Pulse Width Modulation (PWM)



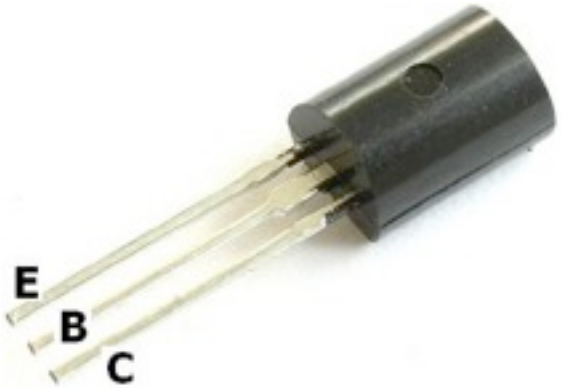


Low-current PWM

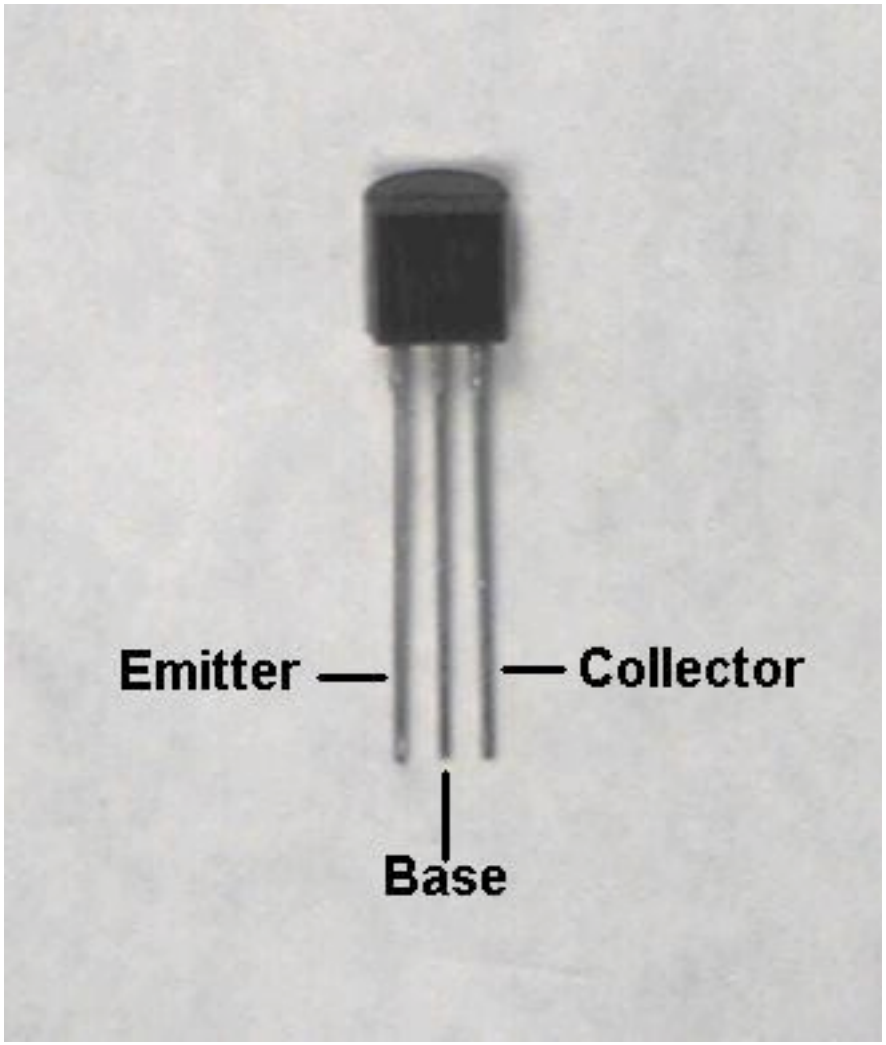


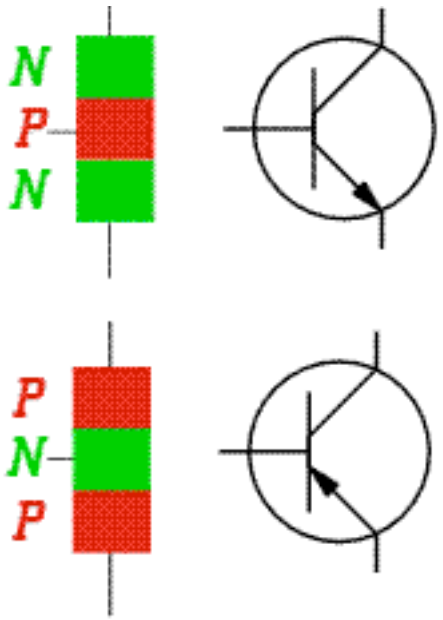
Transistors

- Use a smaller voltage to control a larger voltage



Base, Collector, Emitter





There are two types of transistors:

NPN - like normally open switch
PNP - like normally closed switch

Transistors have 3 pins:

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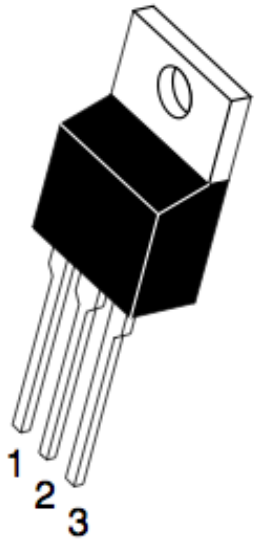
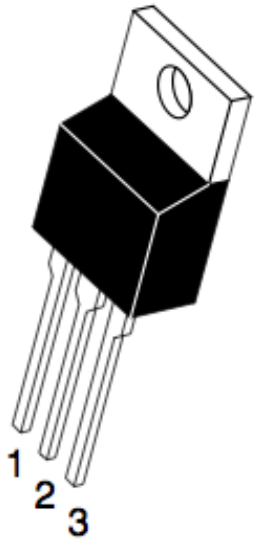
1. base
2. collector
3. emitter

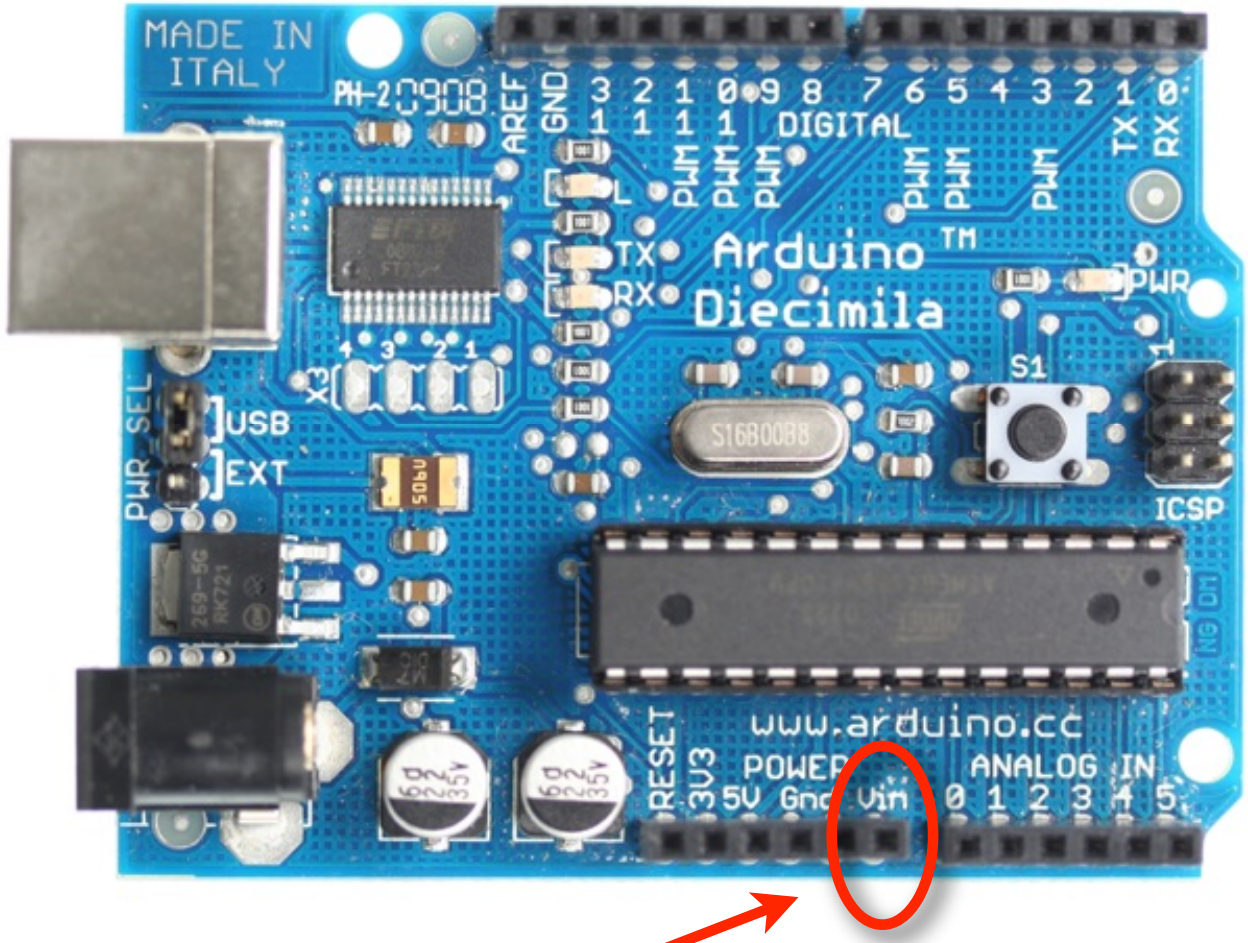


Transistors have 3 pins:

1. base
2. collector
3. emitter



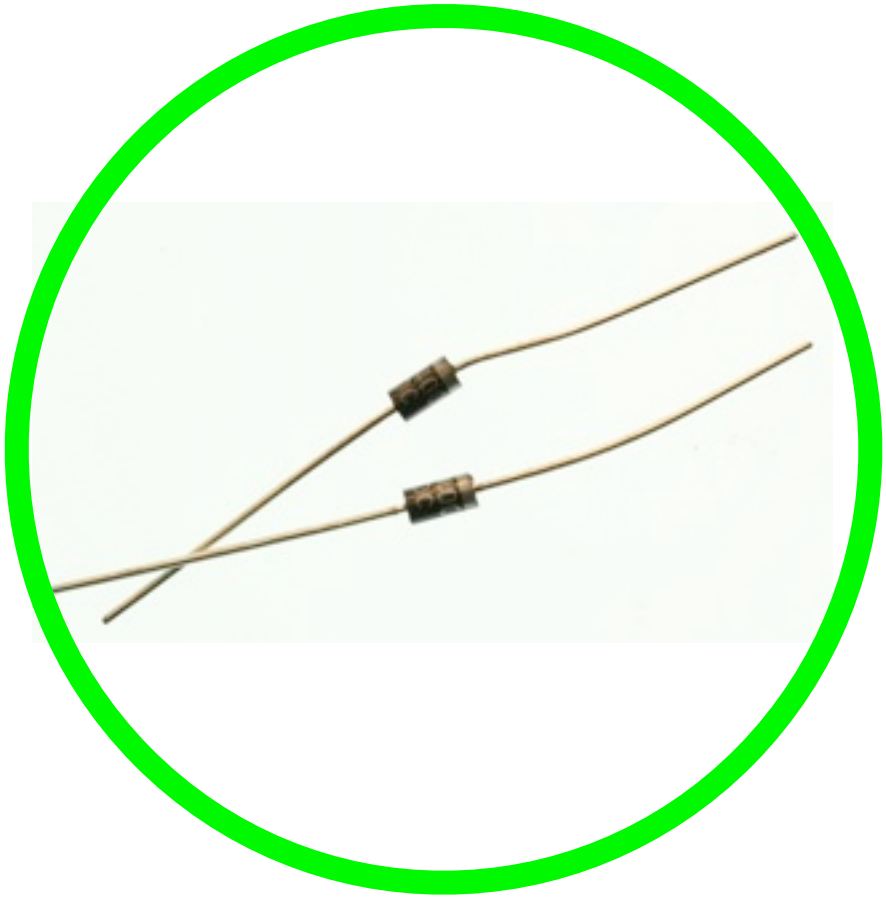
By putting a small voltage and current on the base, you allow a larger current to flow from the collector to the emitter.



Voltage In = Full Strength of Power Supply

diodes

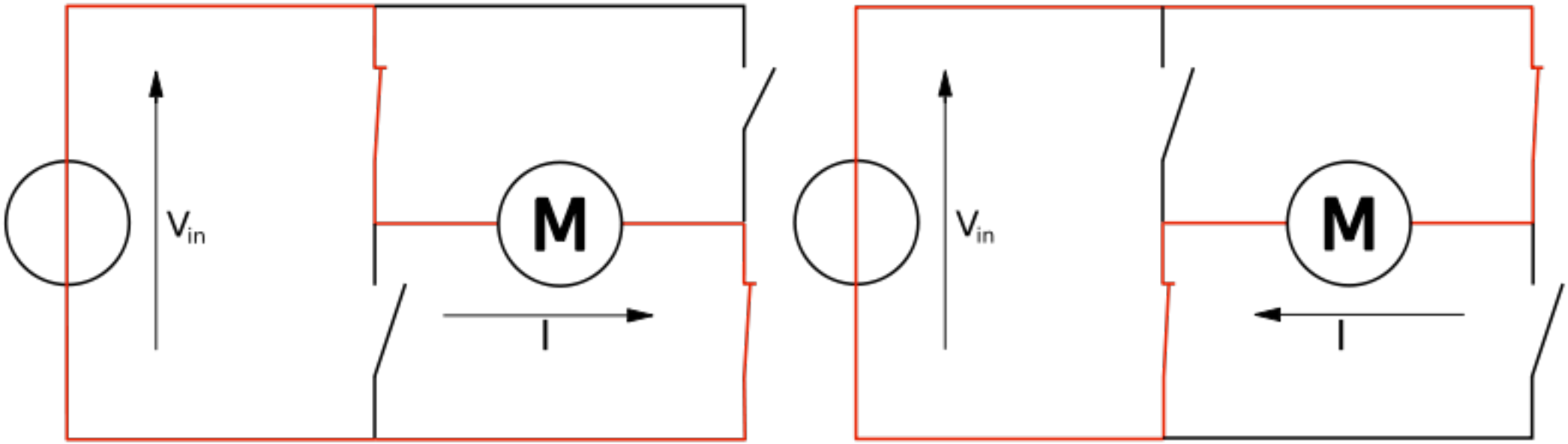
- prevent “blowback” voltage, when motor continues spinning



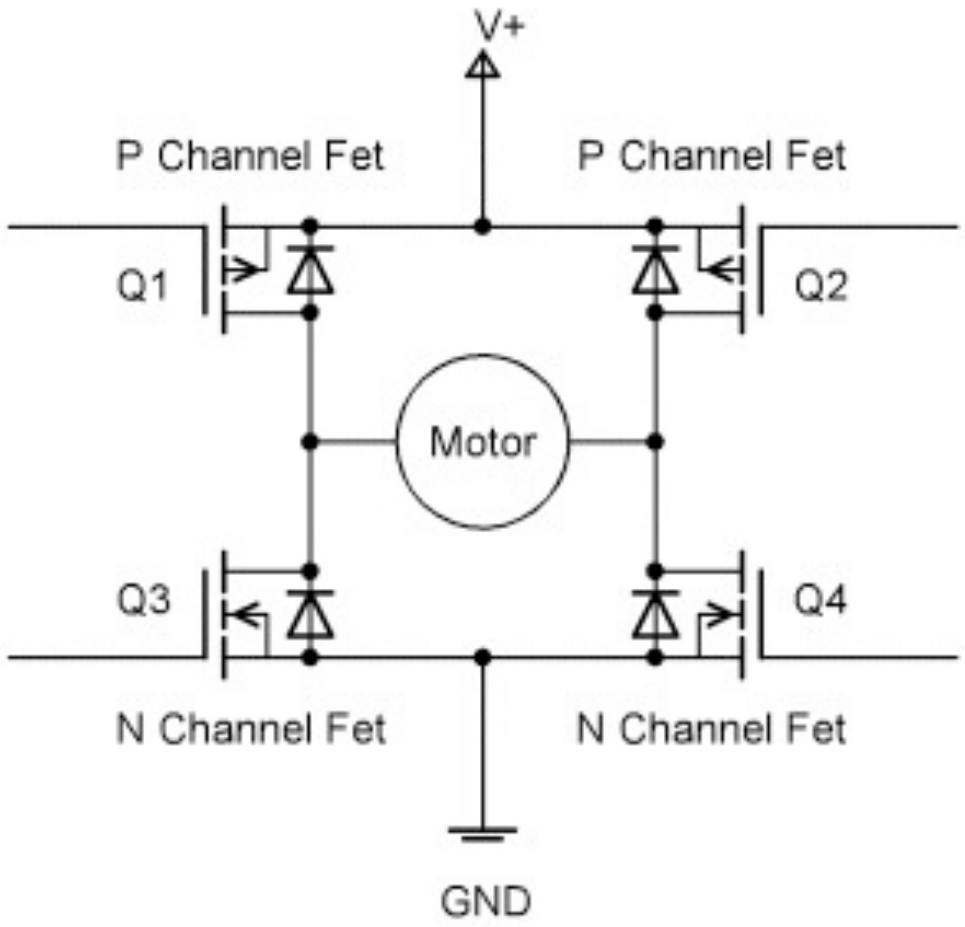
Changing Directions

- What controls a motor’s direction?
- How could we change that?

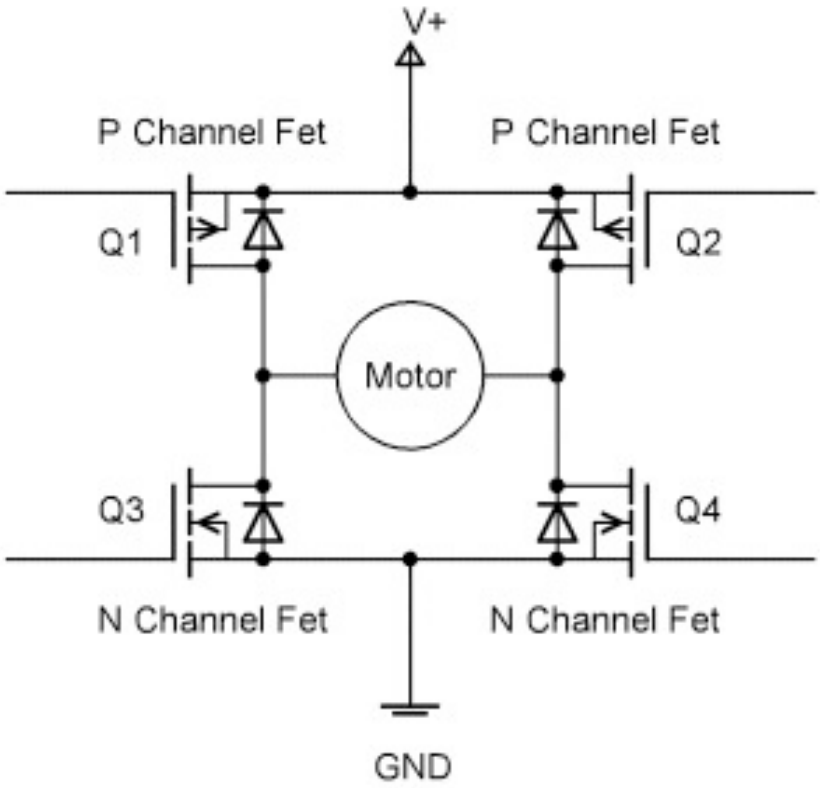
H-Bridge Concept

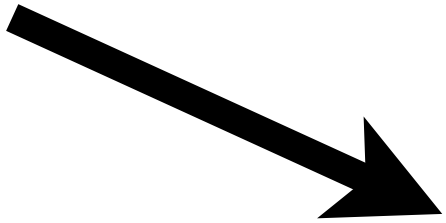


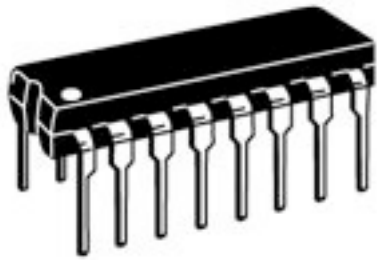
H-Bridge with Transistors



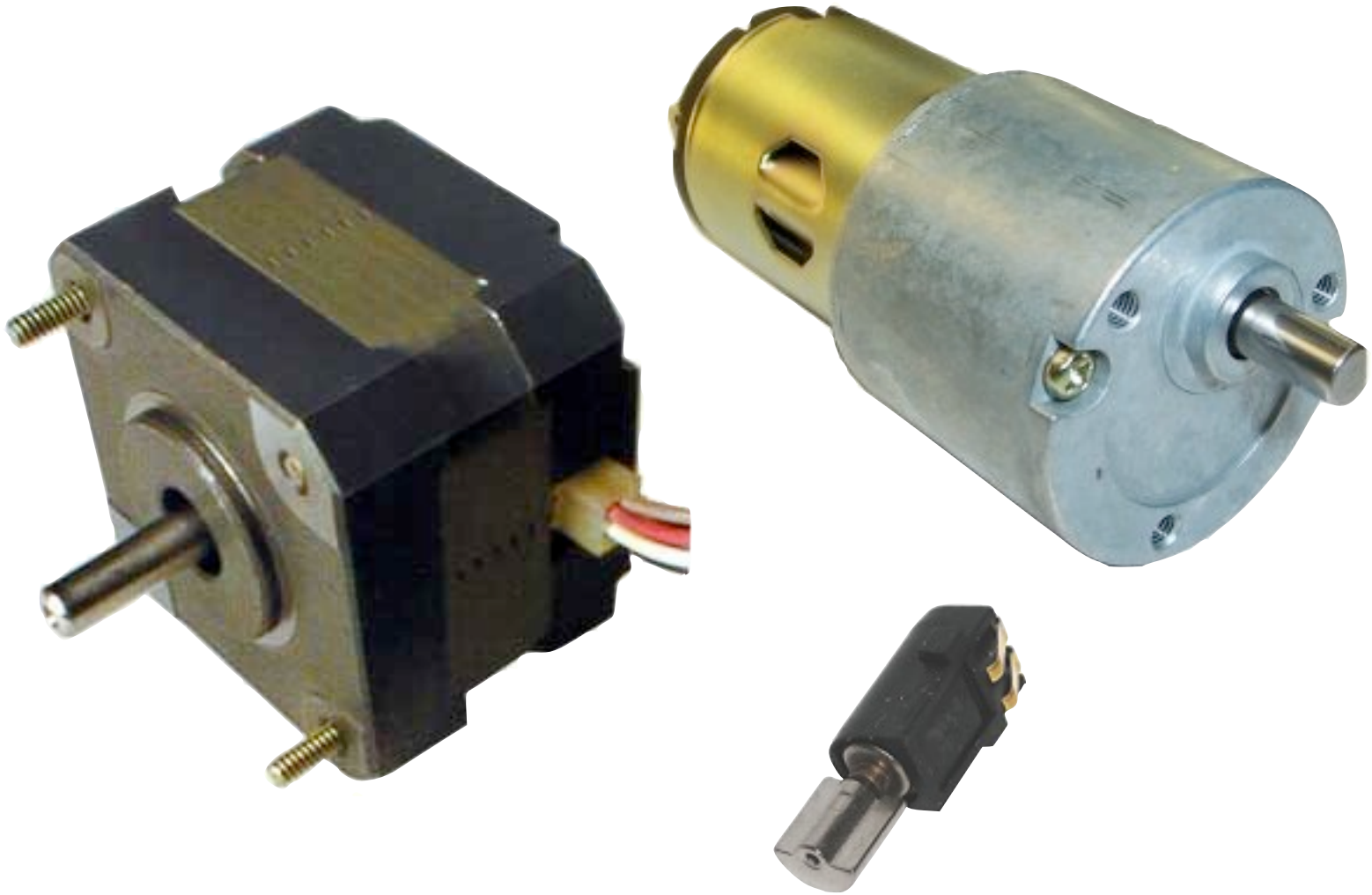
H-Bridge Chip



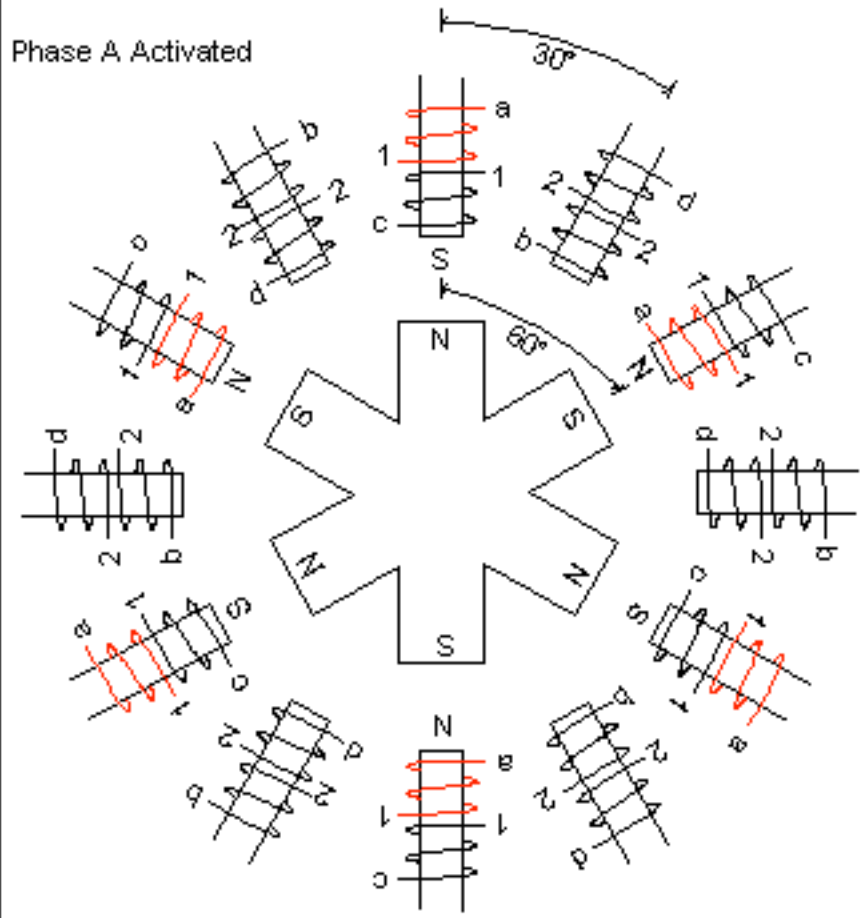


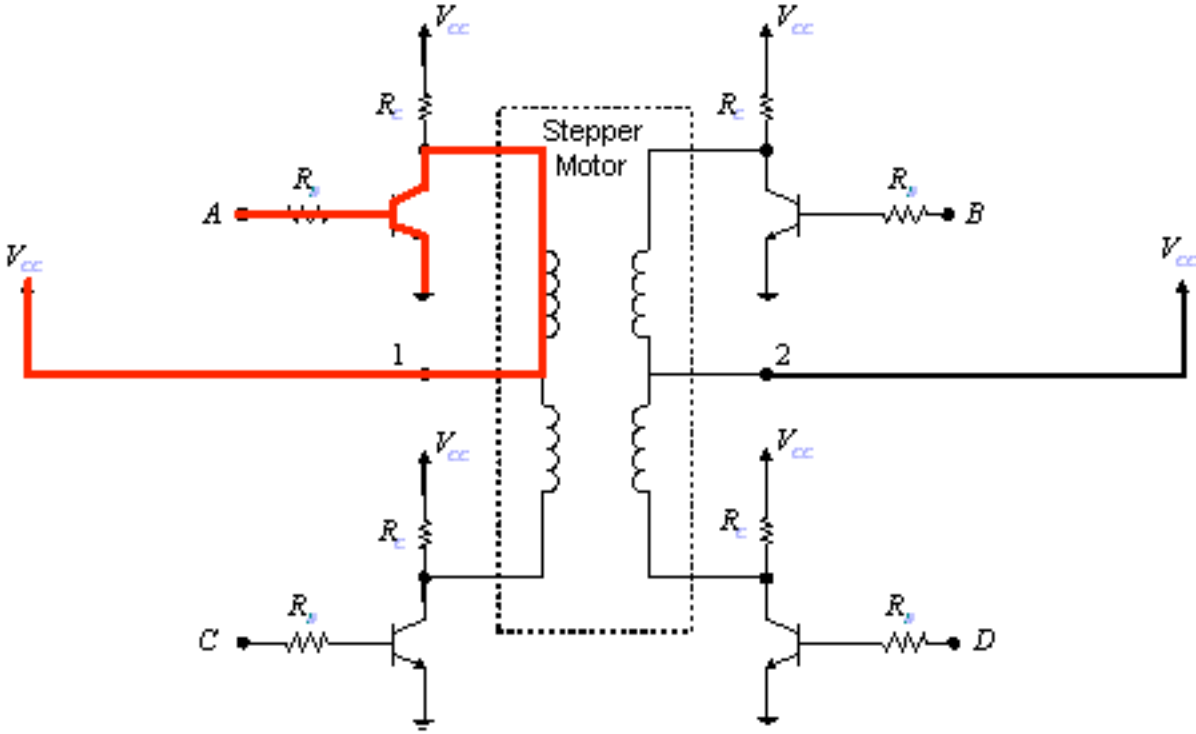


Other Motors: Steppers, Gearheads, Vibrating



Stepper Function

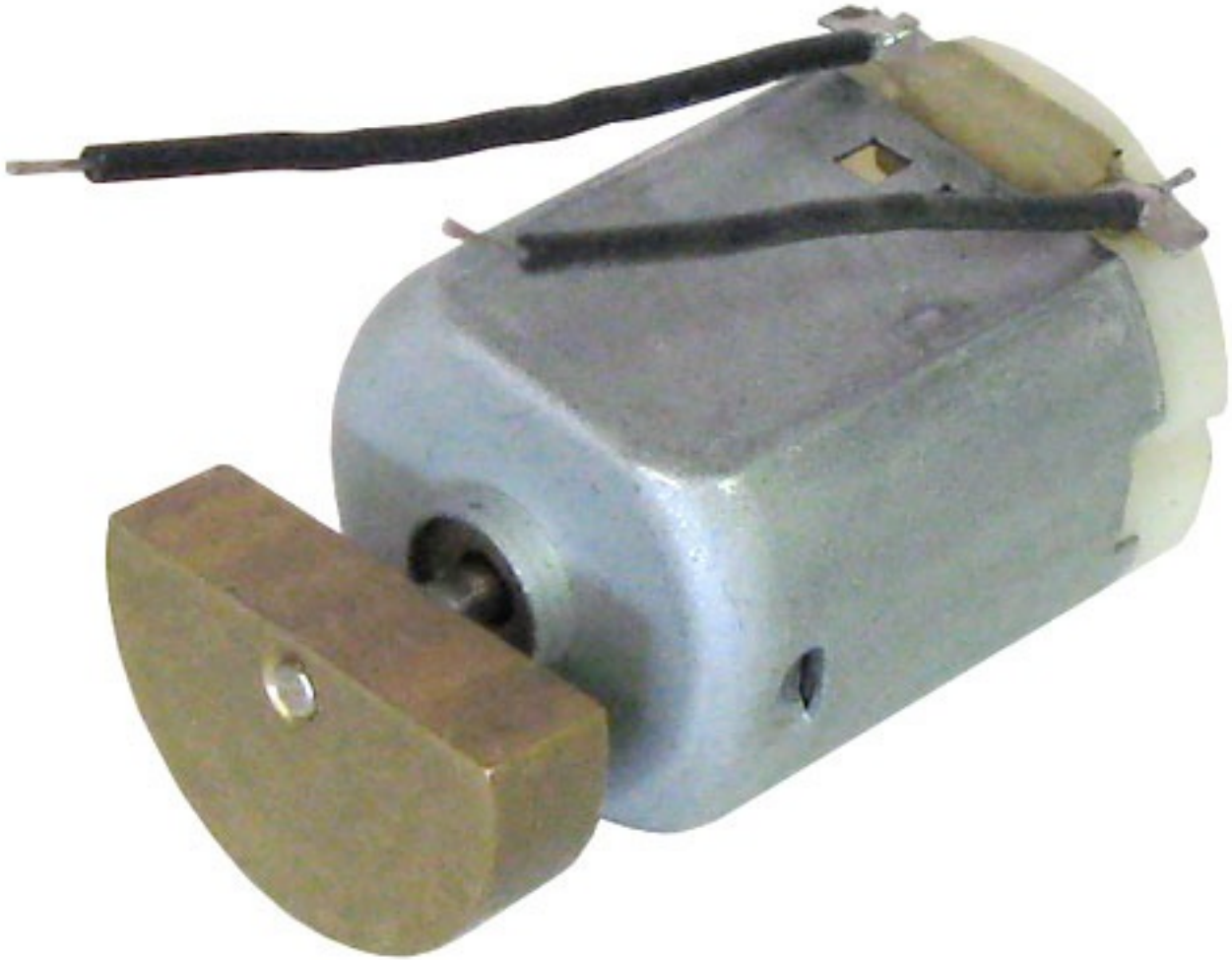


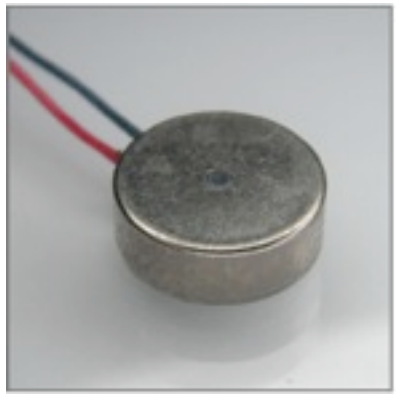


http://www.usna.edu/EE/ee461/Homework/StepperMotorConstructionAllPhases1.gif

Gearhead

Vibration Motors





Characteristics of Motors

- Rated Voltage: The voltage at which it operates at peak efficiency.
- Current: Depends on the load. Usually more load means more current.
- Stall Current: The current it draws when it’s stopped by an opposing force.
- Running Current: The current that it draws when it has no load.
- Speed: Given in RPM or RPS.
- Torque: The measure of how much force it can generate at a given distance from its center of rotation.

Readings and Assignments

- Readings
  - Physical Computing, chapter 10
- Assignment
  - Motor Lab
  - Prototyping for Midterm Project: *Design a new solution for an existing problem. Work in groups to observe the situation,* ***create an early prototype, test the prototype*** *and incorporate your findings into a revised solution system.*