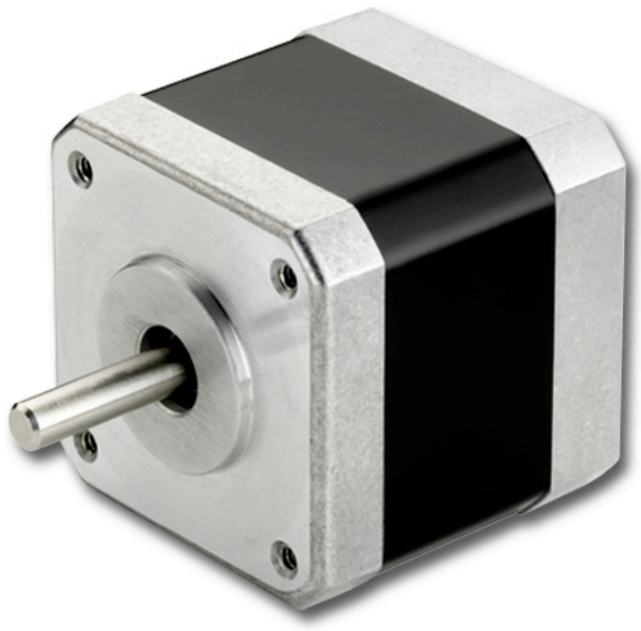
Actuators

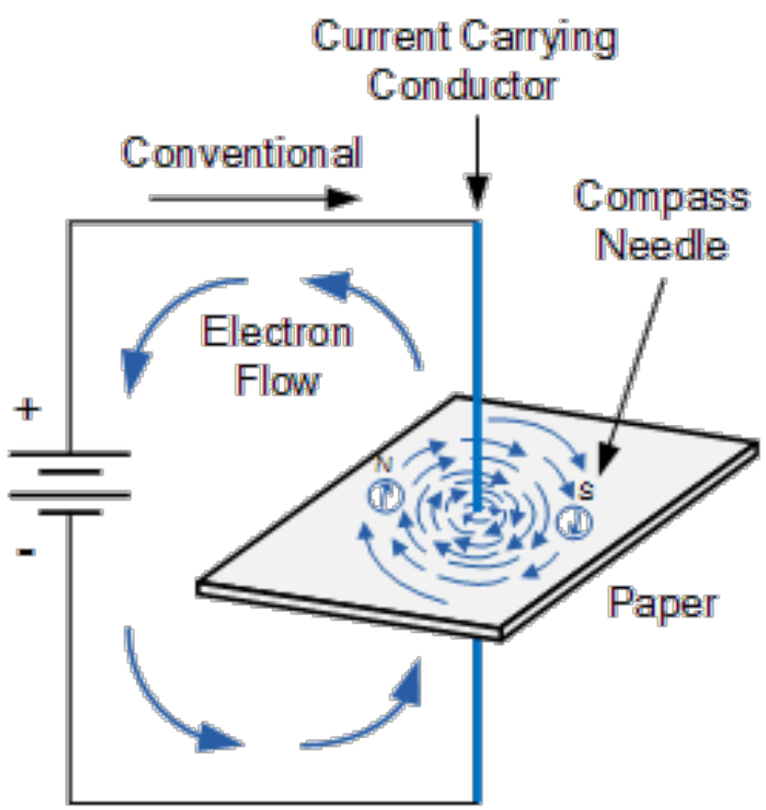
DfPI



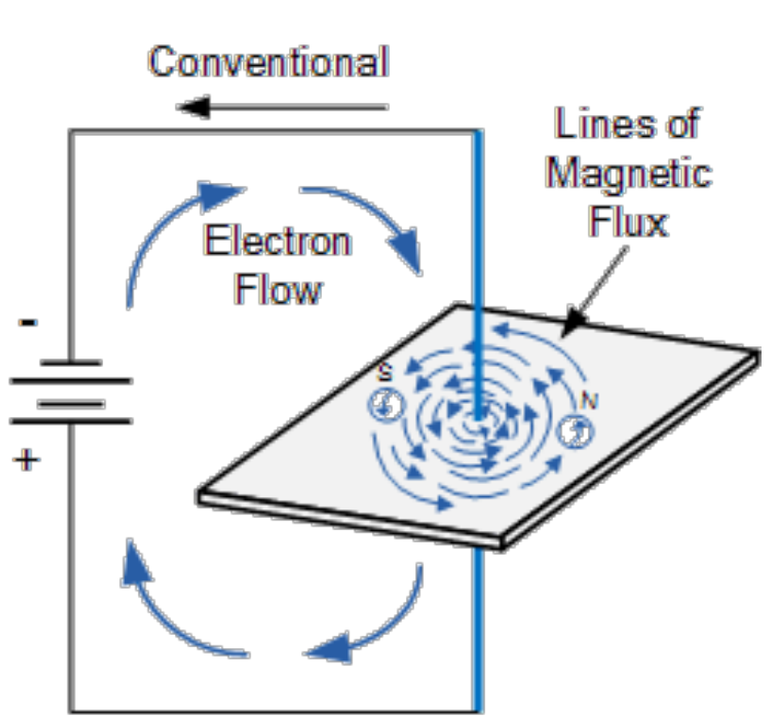
Electro magnetic field

A **Magnetic** field is created in the space surrounding a current carrying conductor. The strength and direction of this field are defined by the equation.

$$B = \frac{\mu_0 i}{2\pi r}$$



Electromagnetic Field
(Clockwise)



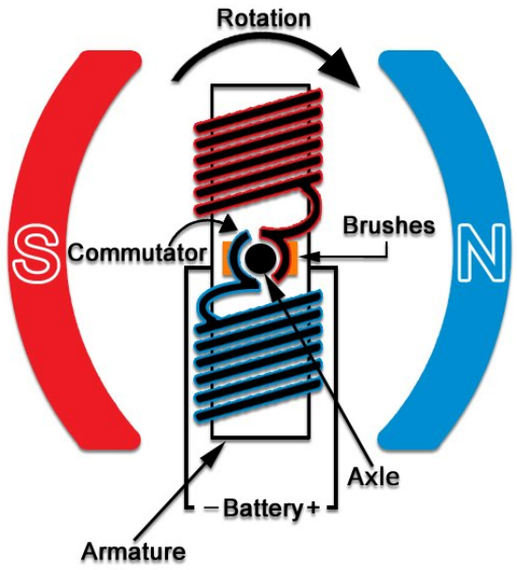
Electromagnetic Field
(Anticlockwise)

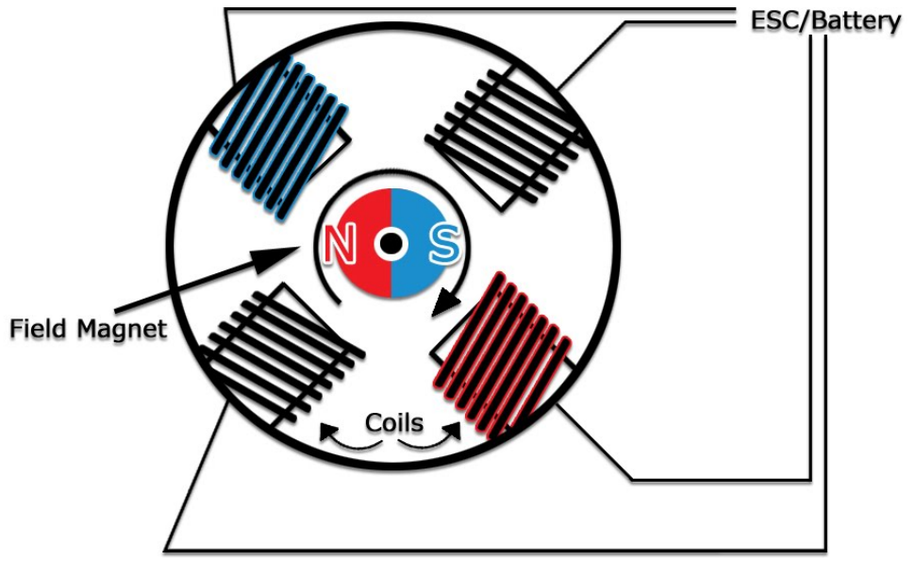
The **Electric Motor**

Brushed DC - Copper coils mounted onto rotating shaft, field direction created by copper coils alternated by brushed commutator.

Brushless DC - Permanent magnets fixed to rotating shaft, copper coils positioned around shaft, field directions switched by electronic speed controlled (ESC)

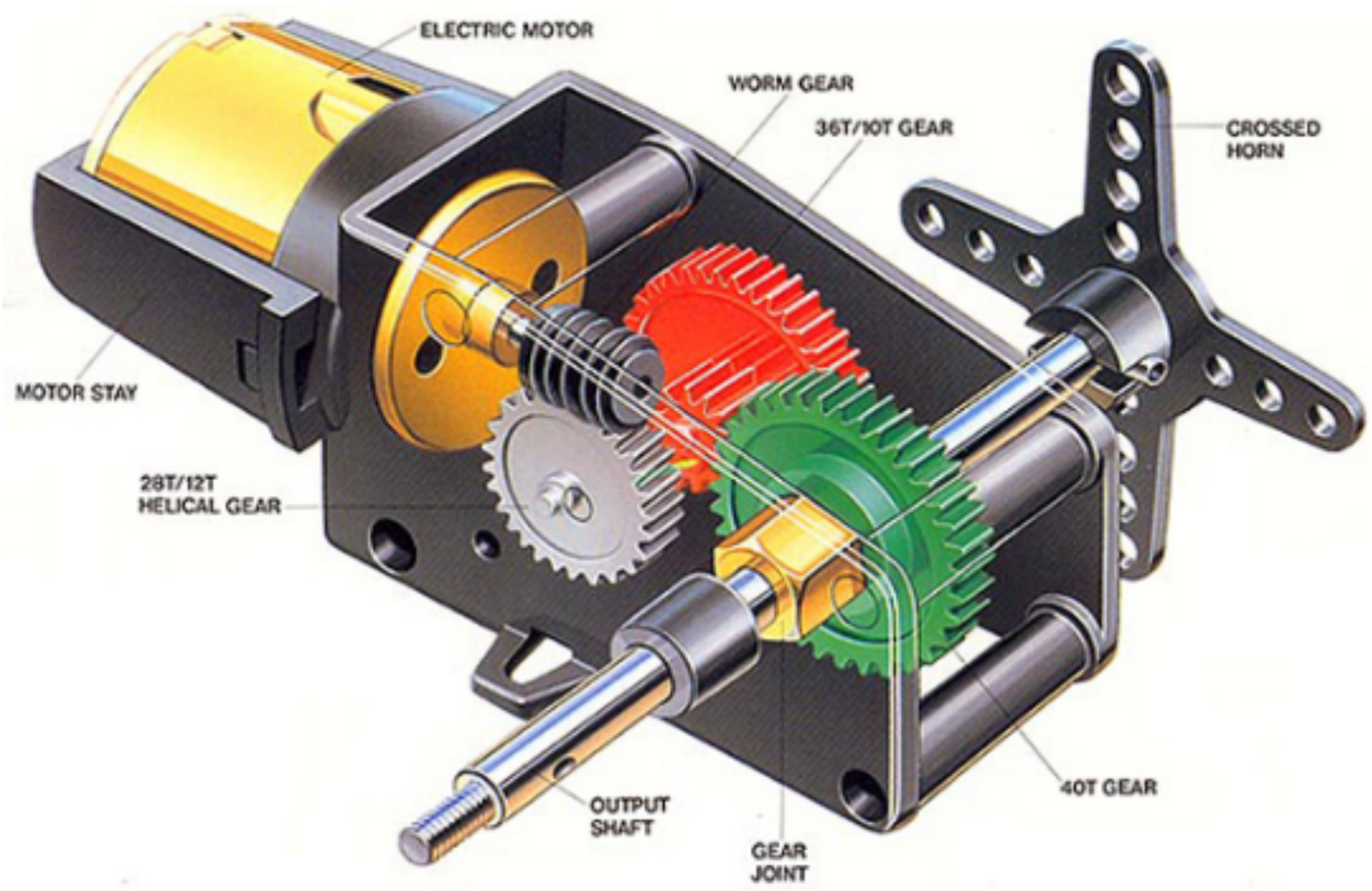
Brushed DC Motor VS Brushless DC Motor



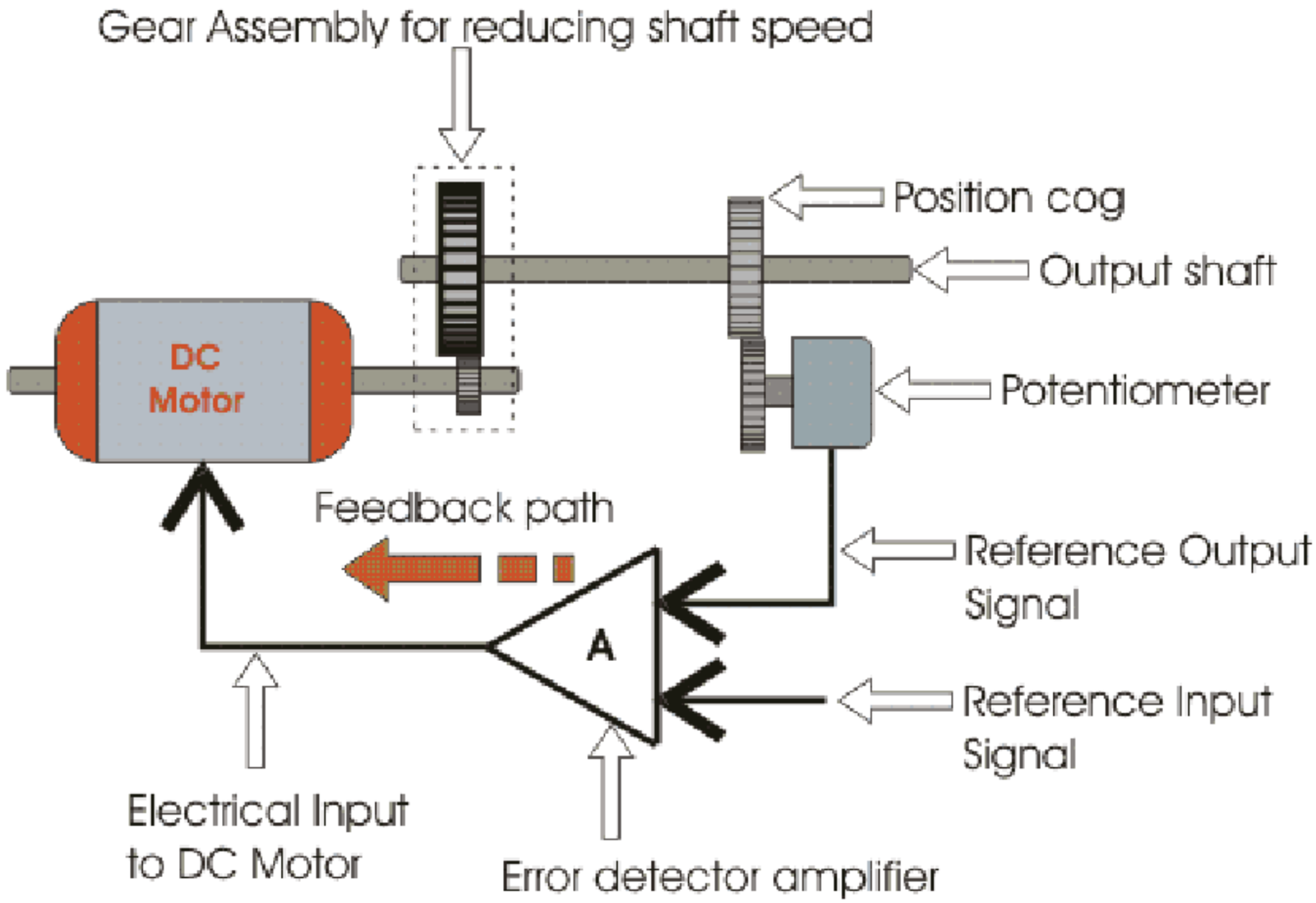


Servo Motor

Contains a **DC motor** with an integrated positional feedback control system. Allowing you to specify a specific angle for the servo to turn to.

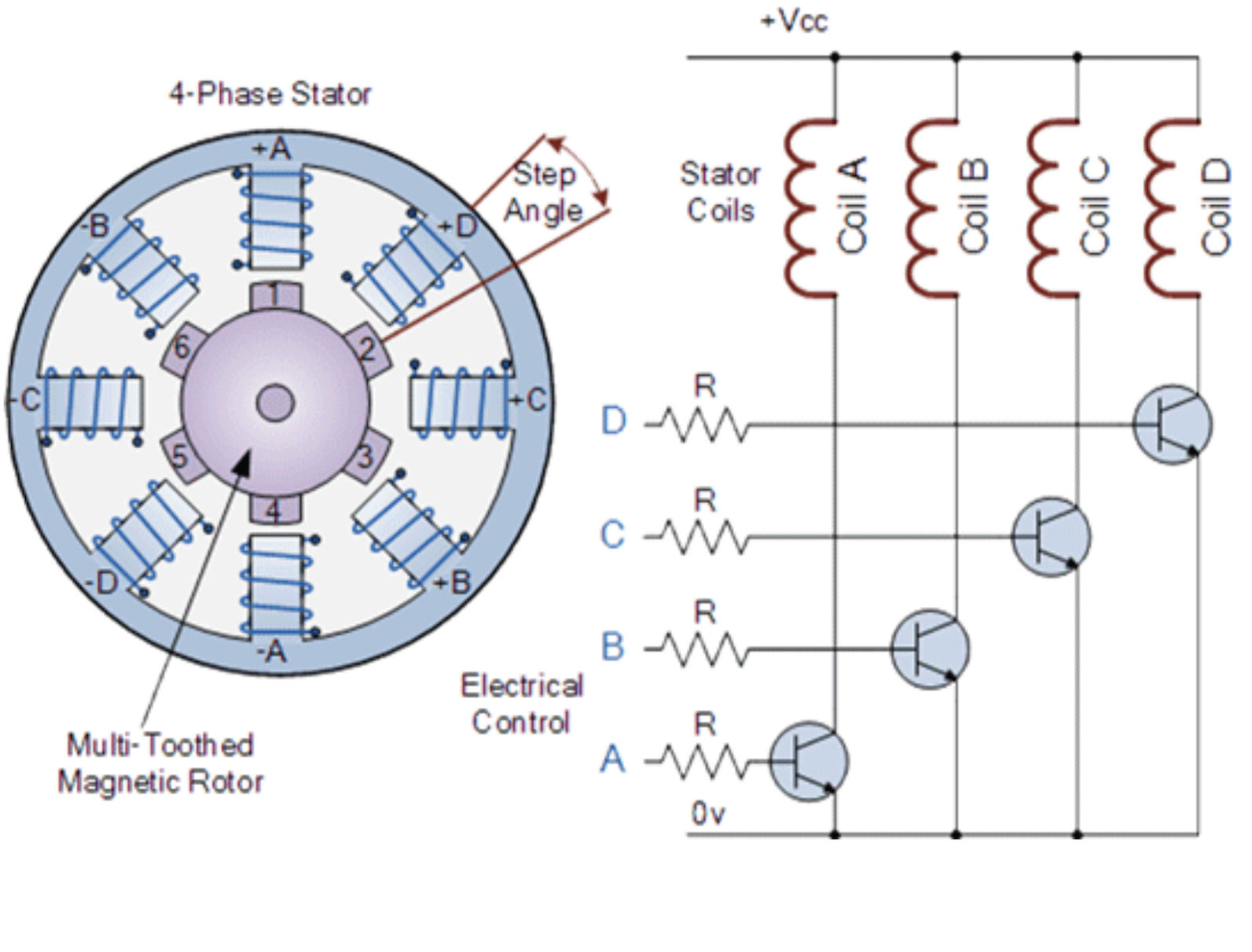


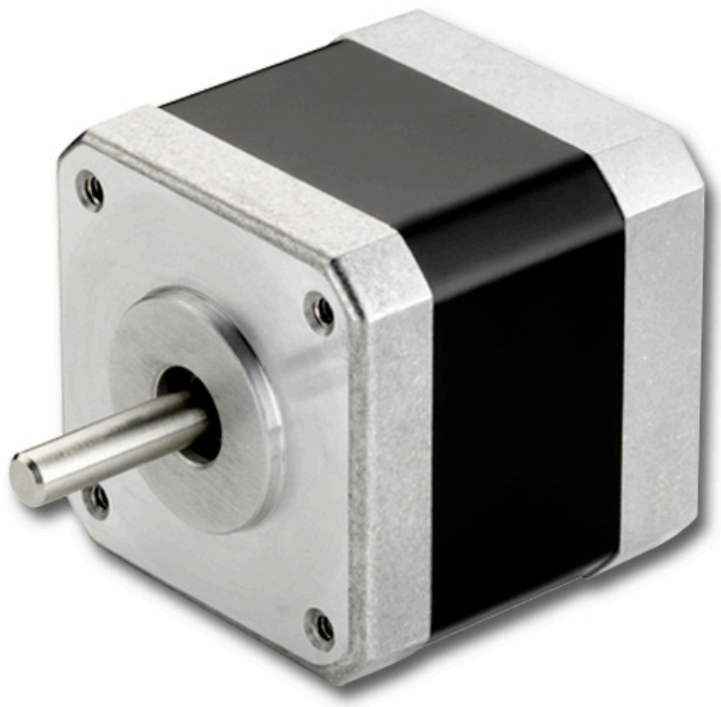
Servo Motor - feedback control



The **Stepper Motor**

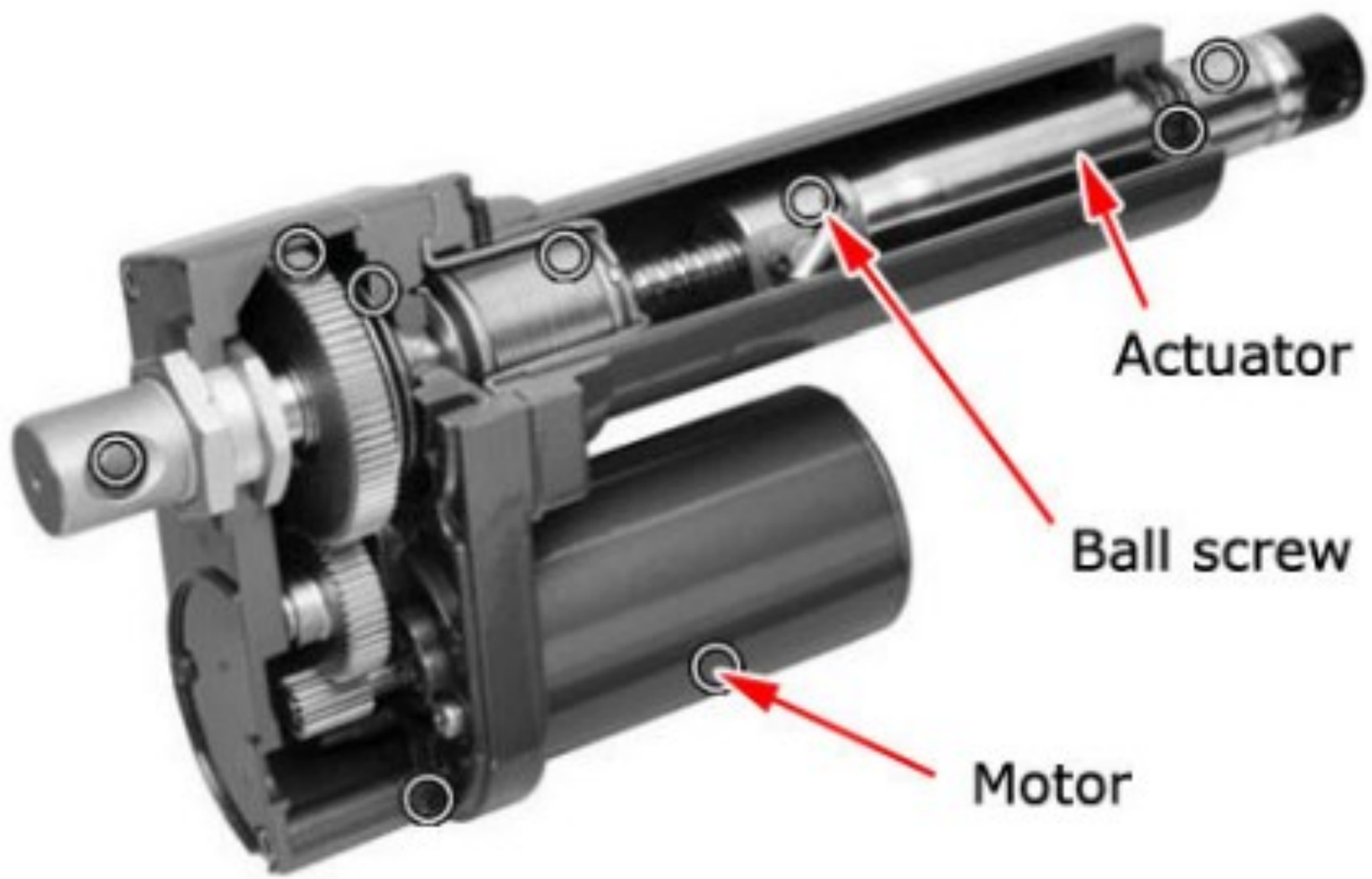
Motor contains a multi toothed permanent magnet rotor, and a number of copper coils situated around the rotor. Coils can then be pulsed in sequence, resulting is smooth accurate motion.





Linear **Actuators** (Electric)

Actuator contains a DC electric motor, and a **screw gear** system to convert rotational motion into a linear motion.

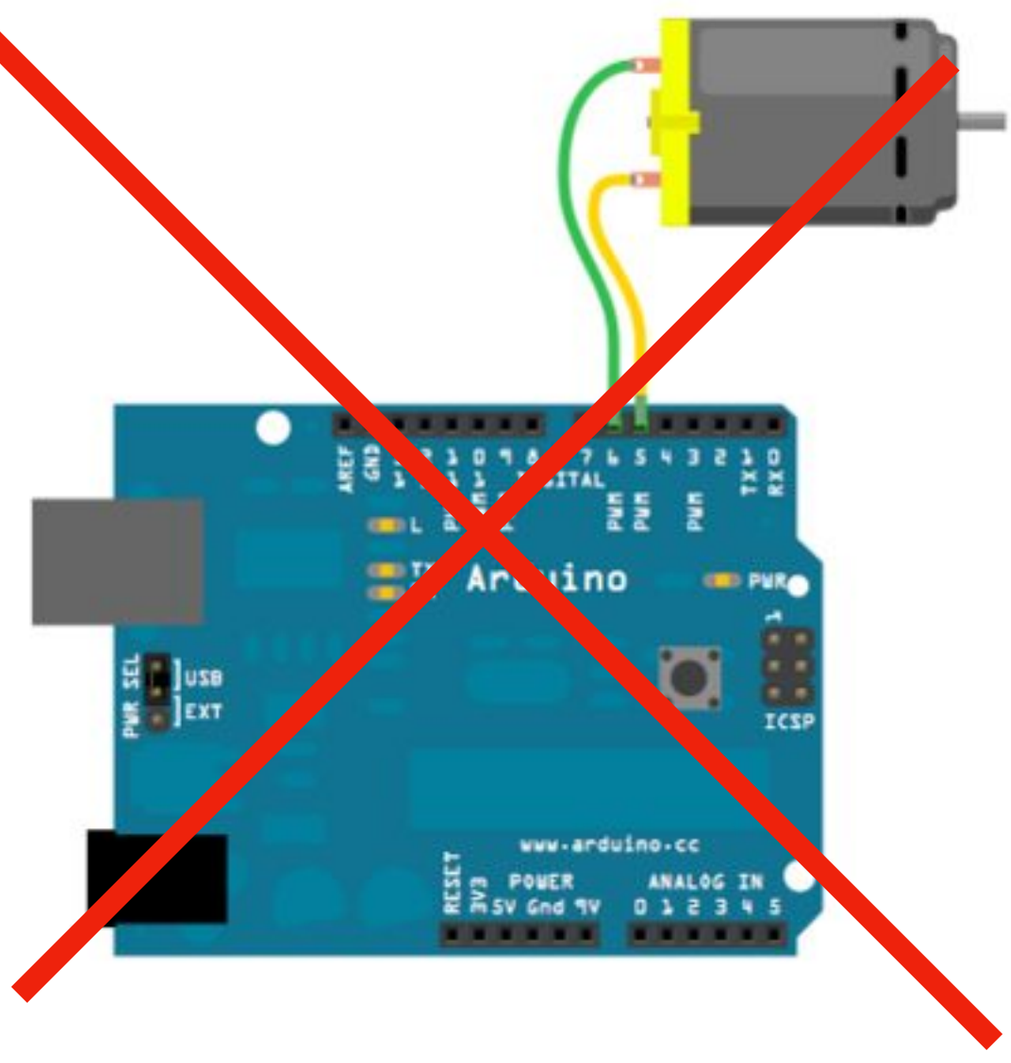


d. Repeated Linear Movement

You can also obtain linear actuators that operate with Hydraulic fluid or compressed air!

Motor Control

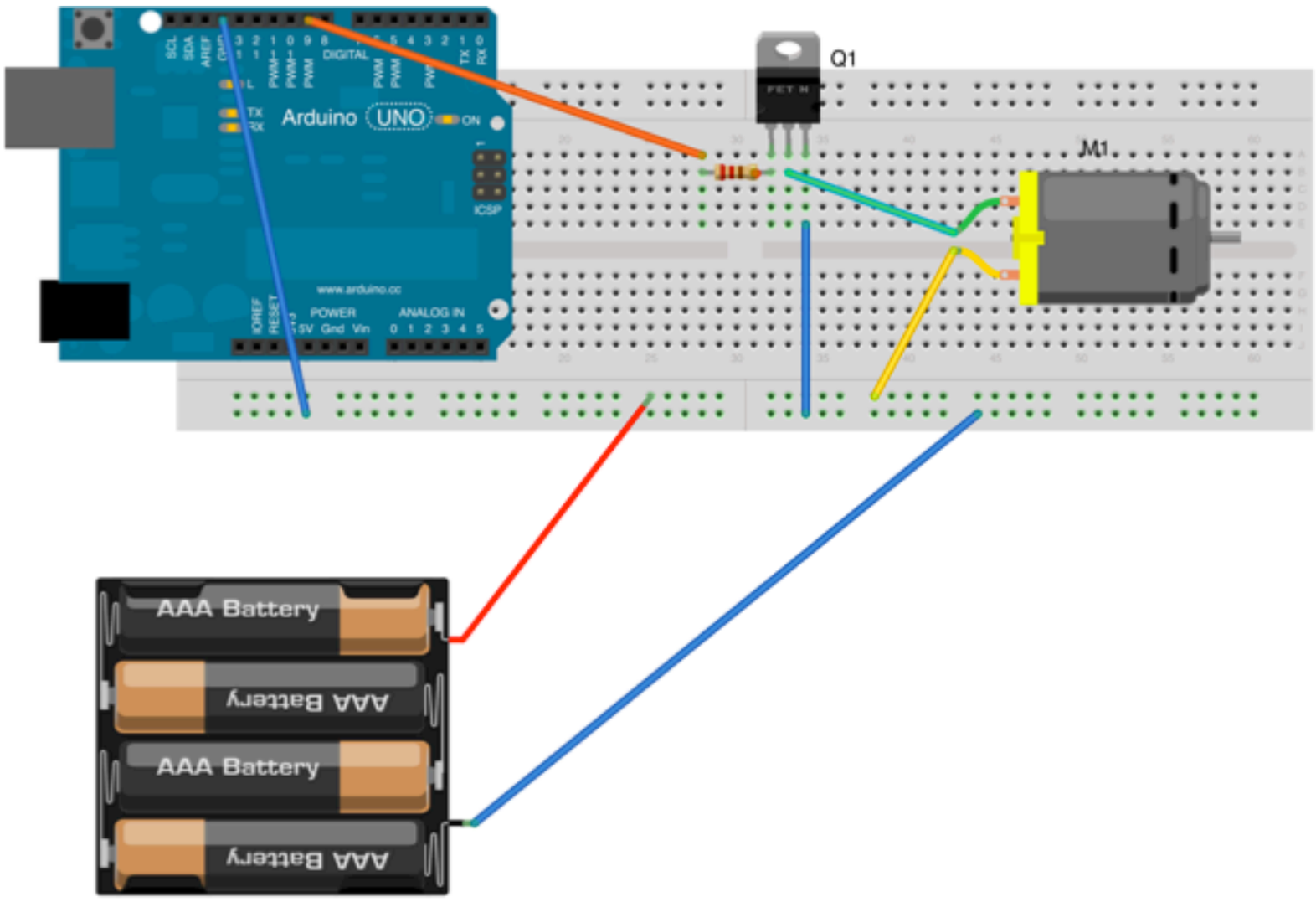
Due to the power requirements of DC motors, you cannot simply control them from the Arduino output pins. you need to use an alternate control method of which there are many!



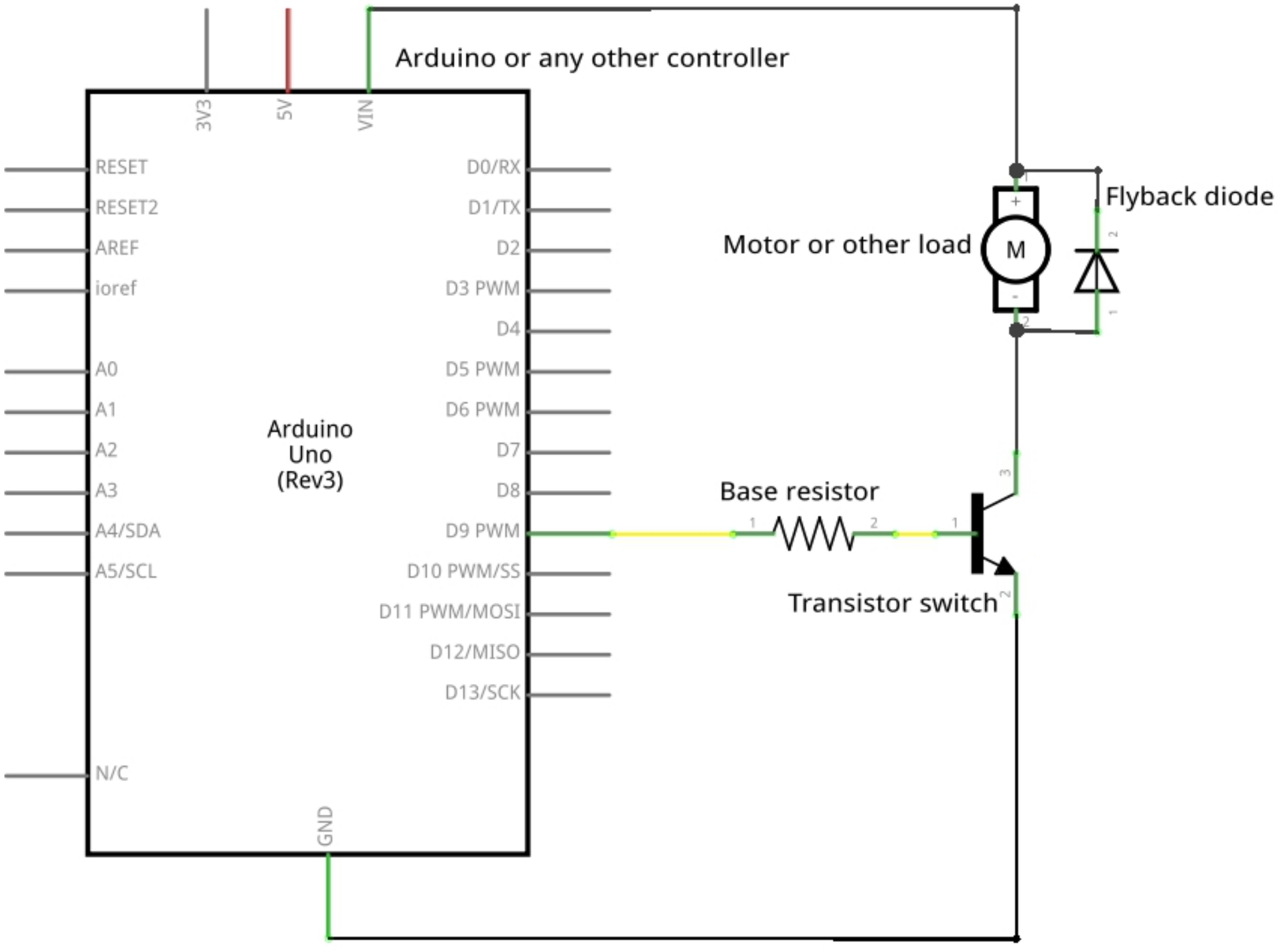
MOSFET - Motor control

One method of controlling a DC motor is with a MOSFET. This electrical component effectively allows you to switch devices that require a large amount of power to operate on and off, with a low power signal!

This method only lets you control the motors speed in a single direction

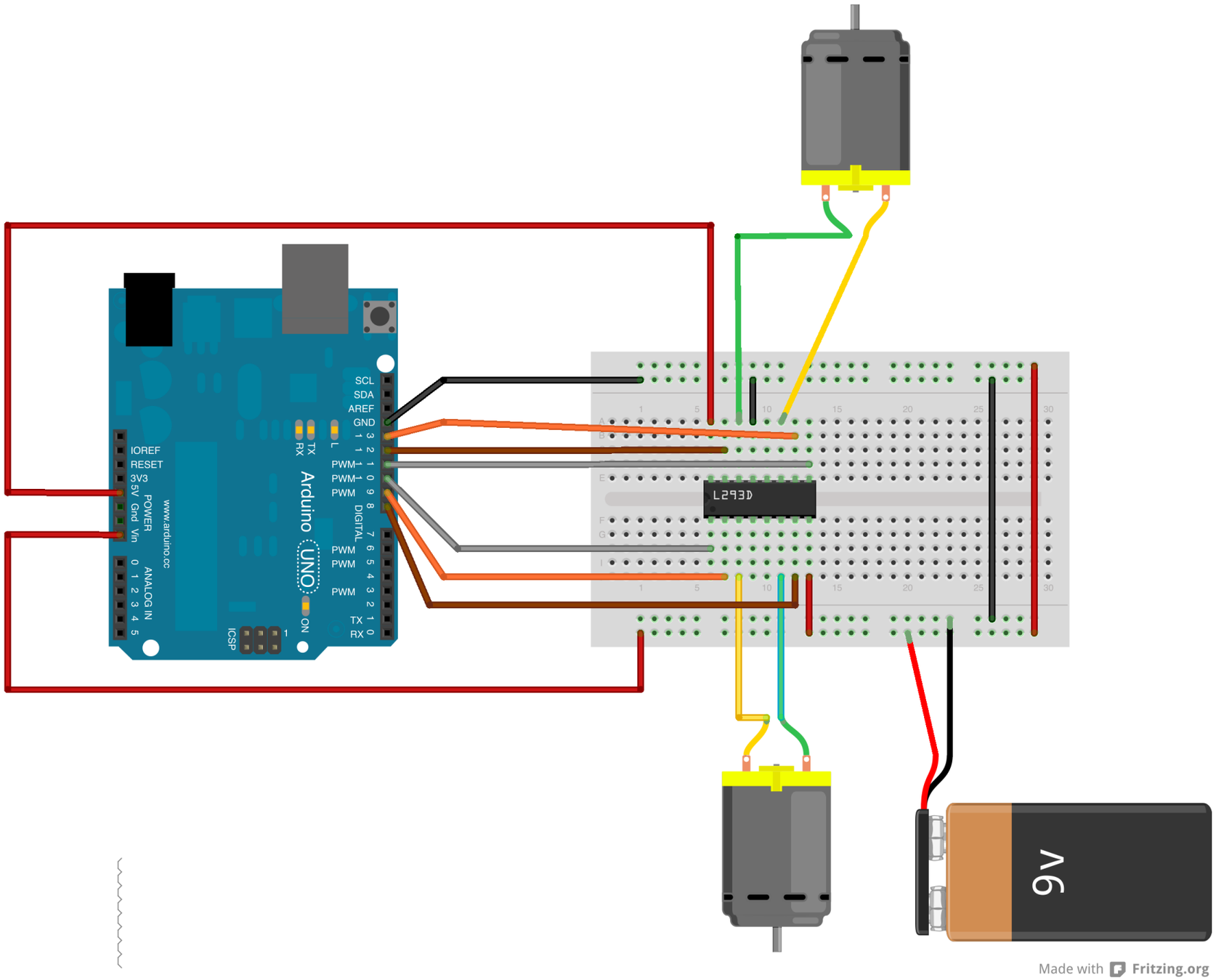


MOSFET - Motor control



H bridge - Motor control

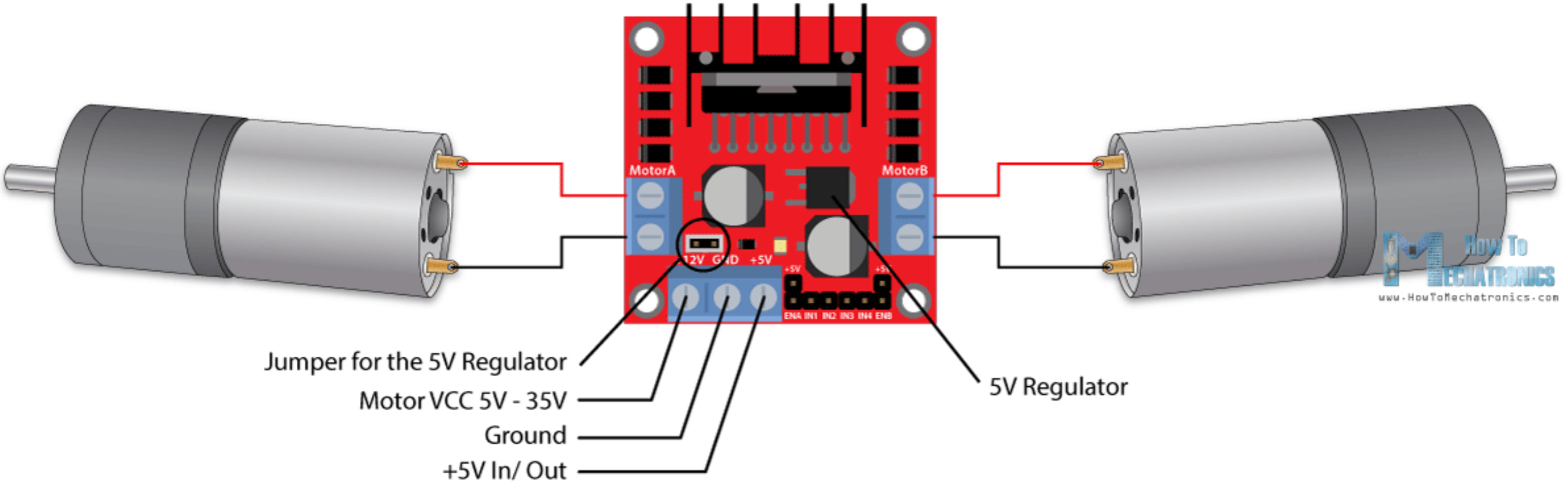
This method allows you to control the speed of a motor in both directions.



L298N - Motor control

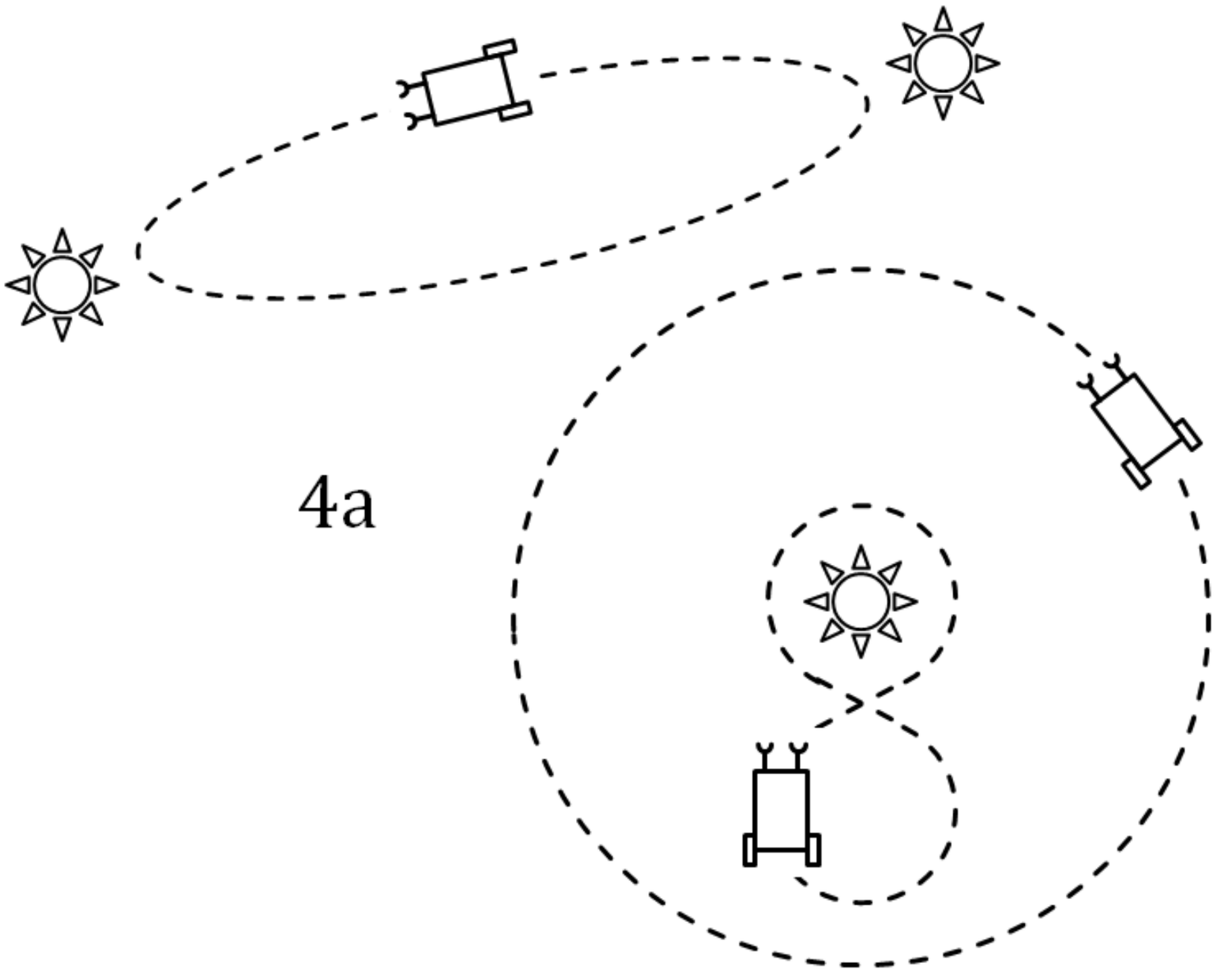
The control board we are using is a standard low cost motor controller that uses a H-Bridge to achieve Dual motor Bi - Directional motor control.

To control it with the Arduino you use 6 Digital output pins, 2 of with can be PWM pins to achieve speed control.



Todays exercise.

Today we will build and program a fully functioning Braitenberg vehicle.



4a

Something we missed!

Wire colouring:

VCC, 5V

GND, 0V

GND

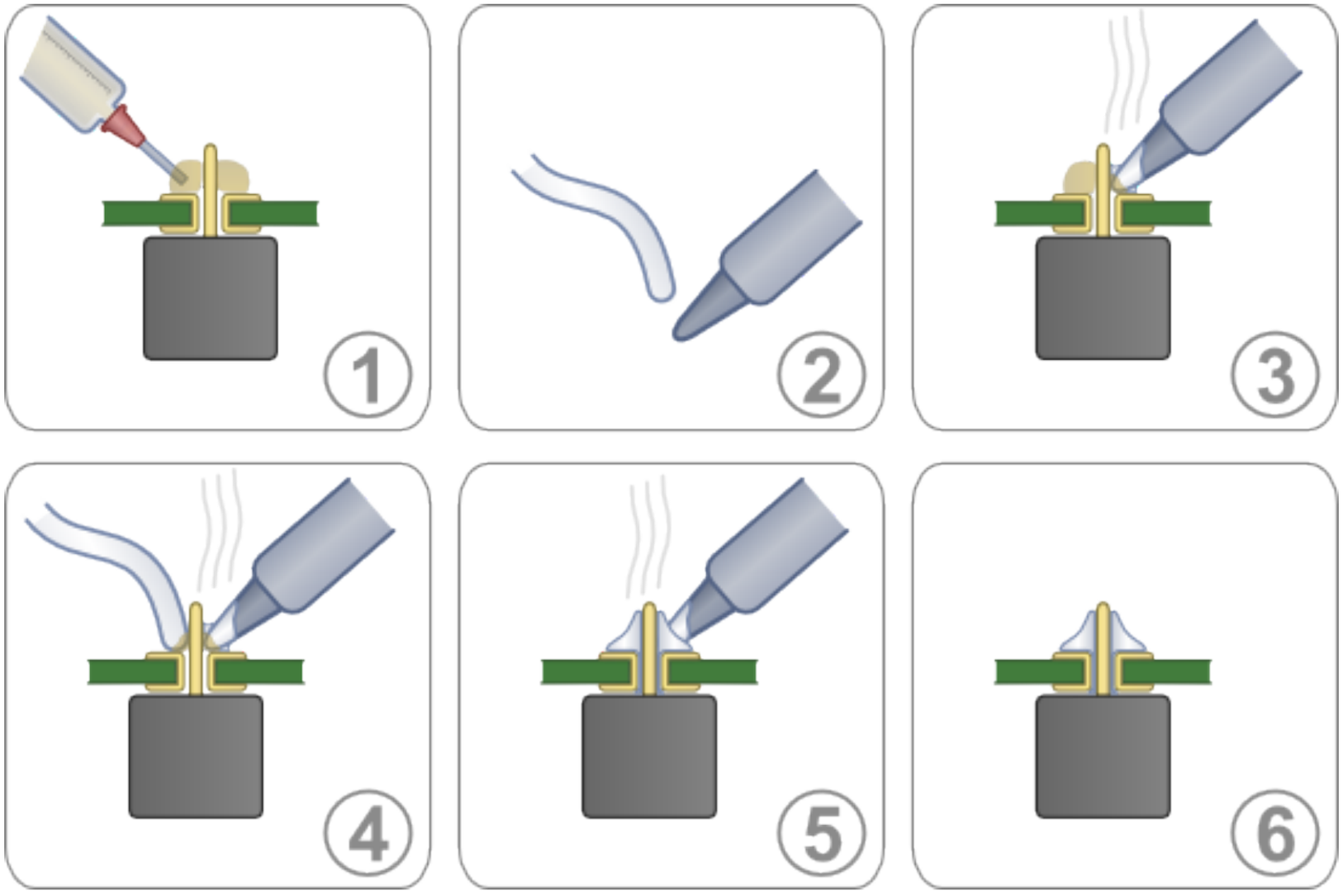
Signal

Signal

Notes on **Soldering**

Important to heat up the pins you want to solder for a few seconds, and then apply the solder. Also the solder should melt directly onto the pin. Not onto the Iron tip.

It helps to have some solder on the tip of the iron before soldering a joint.



Notes on **Soldering**