

# Arduino in Motion

Motors and Servos

Introduction to Robotics and  
Engineering



# Motor or Servo?

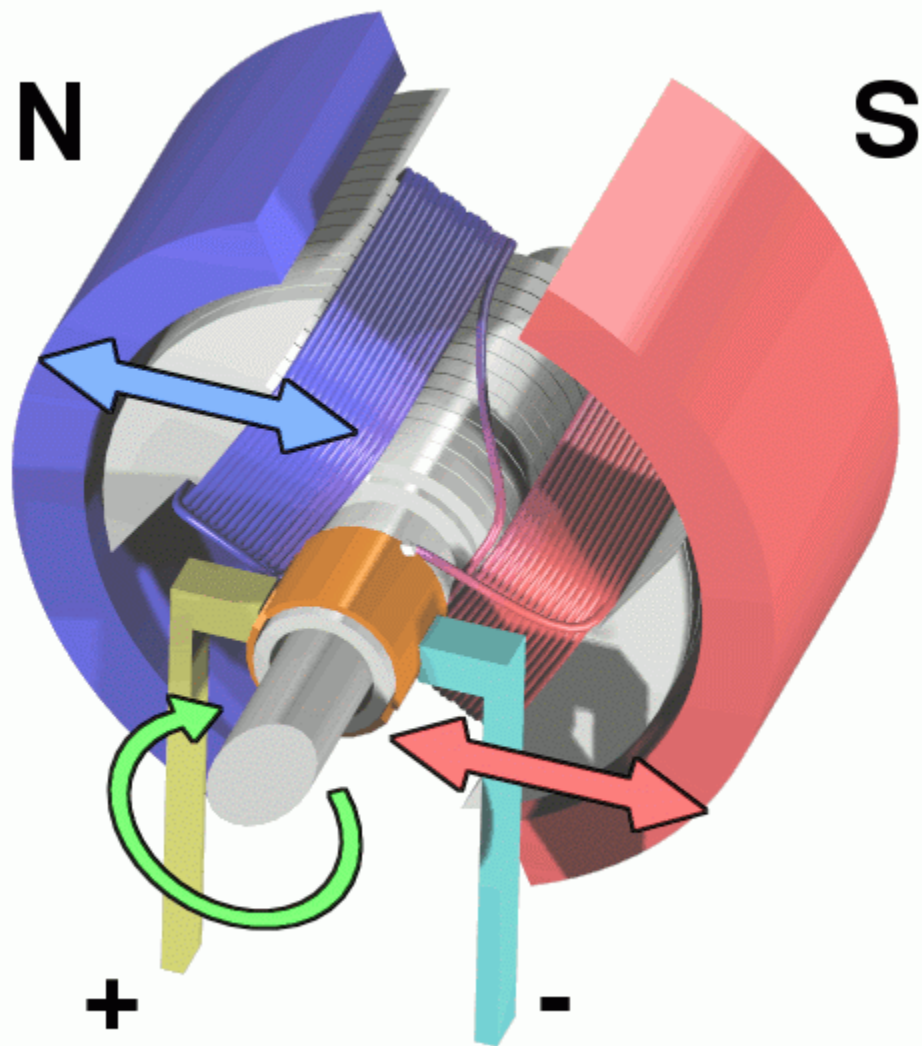


## Motor

- Faster revolution but less Power
- Speed controlled by varying voltage (Pulse Width Modulation)
- Powered from 5 Volt lead

## Servo

- Motor combined with encoder.
- More powerful, but slower
- Two types
  - Standard: 180 Degree Rotation
  - Continuous Rotation
- Three leads:
  - Signal (from pin)
  - 5 Volt
  - Ground



# Two Types of Servos

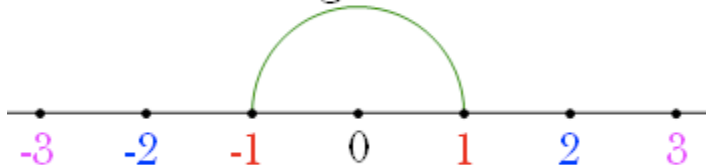
## Standard

- Only rotates within a 180 Degree range
- Write Value to Servo – holds the position
- Good for “Armatures”
  - Hands, Arms
  - Holding Devices

## Continuous Rotation

- Rotates like a motor – all the way around
- Values written to Servo set “speed”
  - 0 -> Full Counterclockwise
  - 180 -> Full Clockwise
- Good for drive systems
  - Wheels, Rollers

180 - Degree Rotation



# 393 and 292 VEX DC Motors

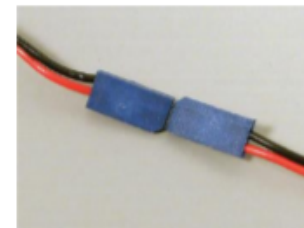
- Red Wire: Current
- Black Wire: Ground
- 1 Amp Max Current
- 0 to 7.2 Volts DC
- Uses Variable Voltage to control speed
- A change in direction of voltage will result in a change in motor direction
- Plug Directly into Motor ports 1 and 10
- Plug into M29 Controller and Motors Ports 2 through 9



Be careful with the pins as they will break off easily.

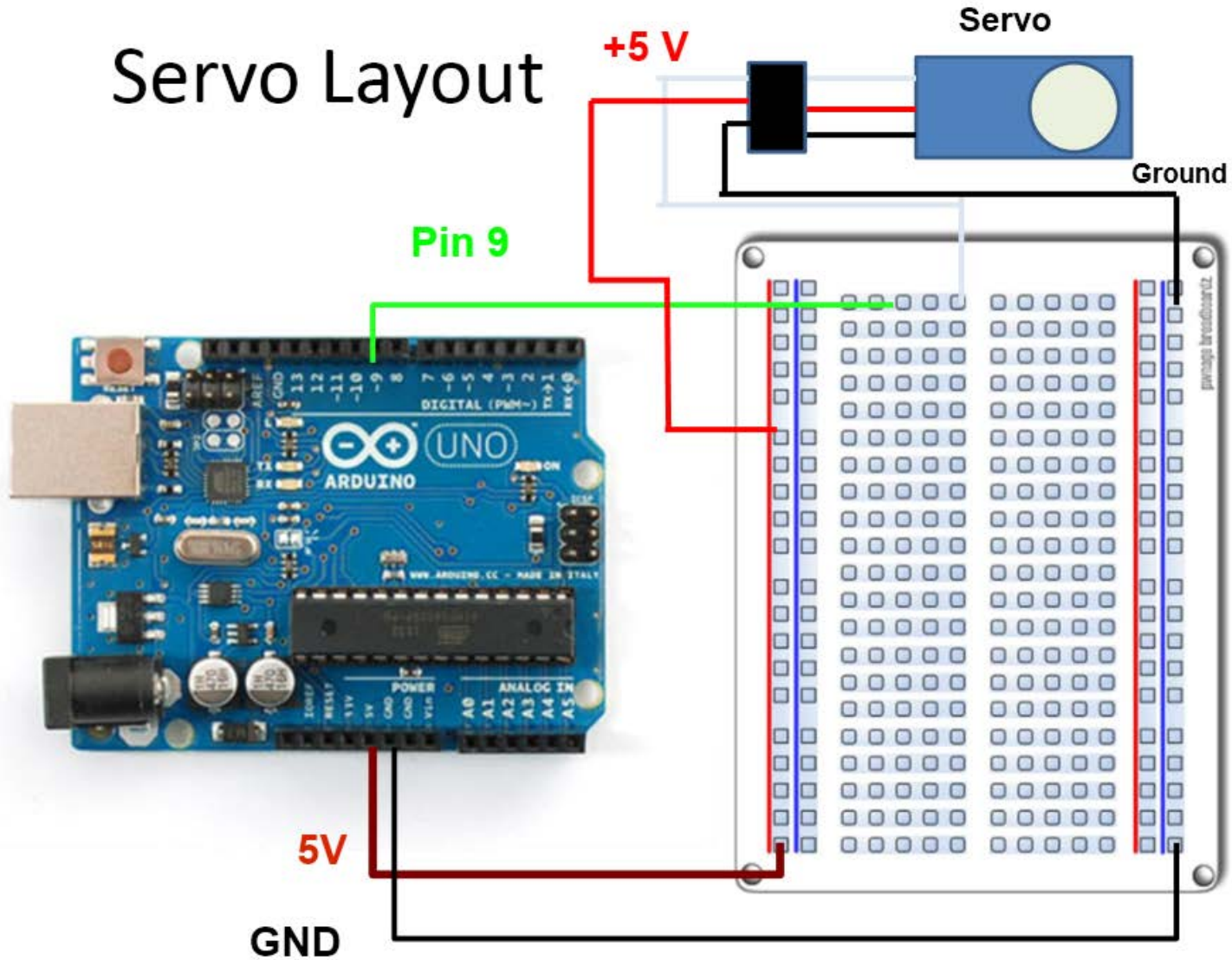
# M29 Motor Controller

- Used between Vex Cortex and Motor
- Converts Pulse Width Modulated (PWM) signal from Cortex to Voltage level and direction for Motor
- 3 Wires: (Into Cortex)
  - Red: Current
  - Black: Ground
  - White: Signal
- 2 Wires: (Into Motor)
  - Red: Current
  - Black: Ground
- Used with Motor ports 2 through 9

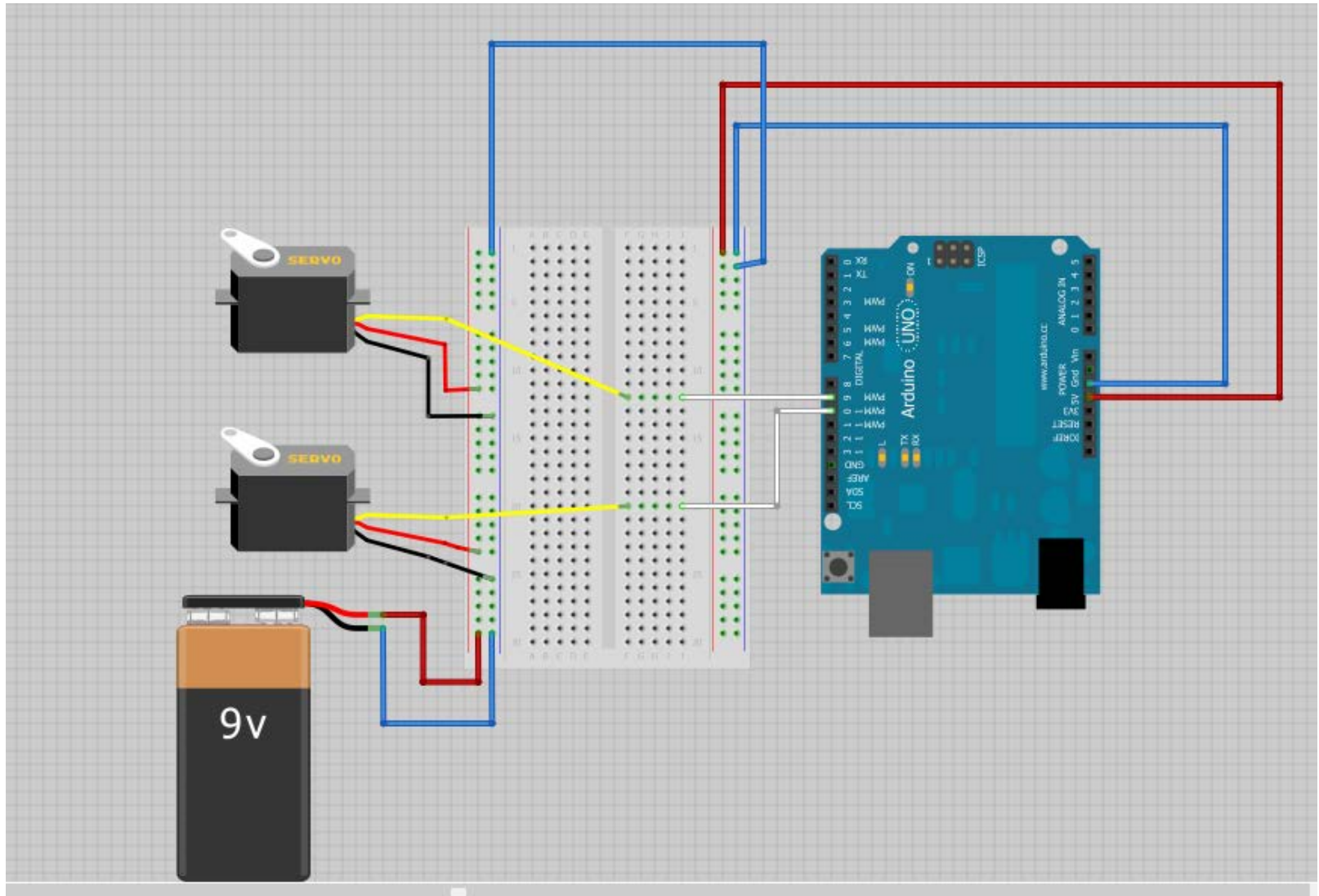


# Single Power Source Setup

## Servo Layout

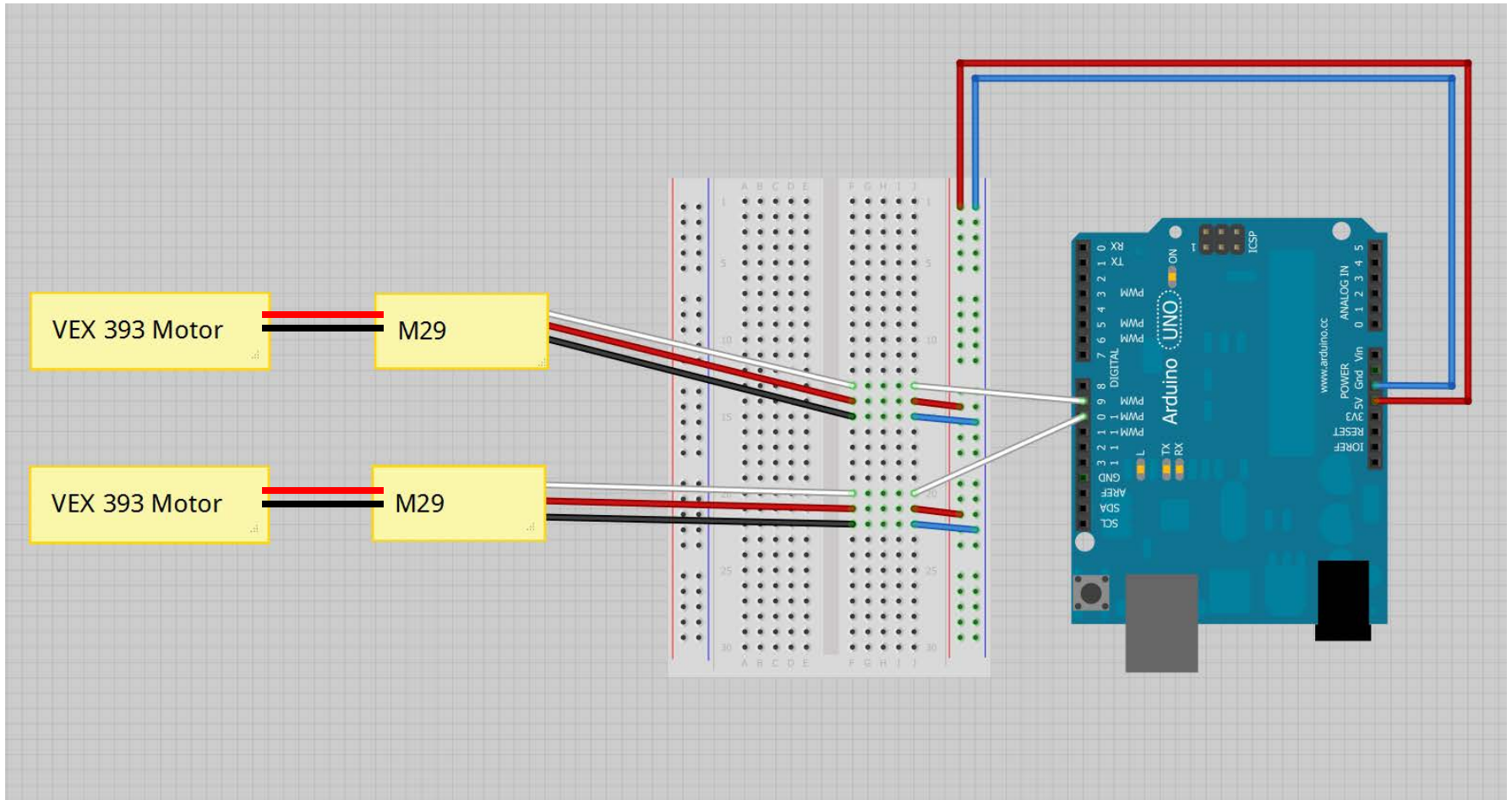


# External Power Source Servo Setup





# VEX Motor Servo Setup



# Servo Commands

**Servo Library: Must have this line in the beginning of each program**

```
#include <Servo.h>
```

**To Create Instance of Servo Object:  
(myServo can be any name)**

```
Servo myServo;
```

**To Attach a Servo to a Pin:**

```
myServo.attach(9);
```

**To Start Servo:**

```
myServo.write(0);
```

```
// Servo Test
// Range: 0 to 180

// Bring in Servo Object and Functions
#include <Servo.h>

// Create Instance of Servo Object
Servo leftWheel;

// Setup - Run One Time
void setup() {
  // Attach Servo to Pin 9
  leftWheel.attach(9);

  // Rotate Servo at 0 and 180
  leftWheel.write(0);
  delay(4000);
  leftWheel.write(180);
  delay(4000);
  leftWheel.write(95);
}

void loop() {
  // No Code Here
}
```

# Today's Goals

- Wire in one Continuous Rotation Servo
- Write program to spin Servo Clockwise and Counterclockwise for 4 seconds (Each lab partner should write their own program)
- Connect 2<sup>nd</sup> Continuous Rotation Servo
- Write functions to spin Both Servos
  - Same Direction
  - Opposite Direction
- Begin Building Vehicle Device