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# **Engineering Technology (ENGR 101)**

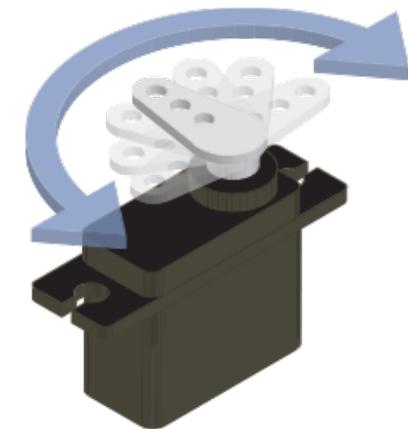
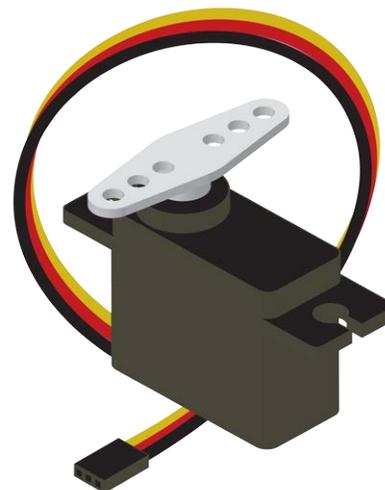
## **Arduino and servo motors**

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# Servo Motor

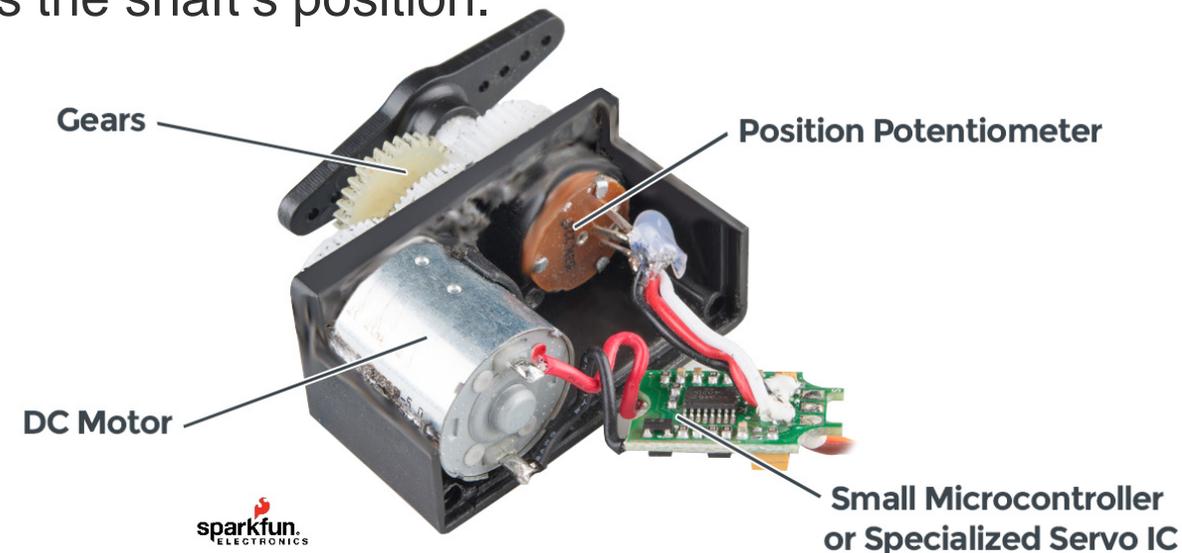
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- We can use a motor to move a mechanical equipment to a particular location.
- With a Servo motor (Servo)
  - We can rotate the shaft to a particular location and hold it there.
  - We cannot move the arm more that 180 degrees.
- Servos are very useful, if you need to make precise movements but do not need to something to fully spinning around.
  - Robotics arms and hands



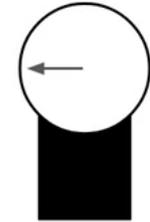
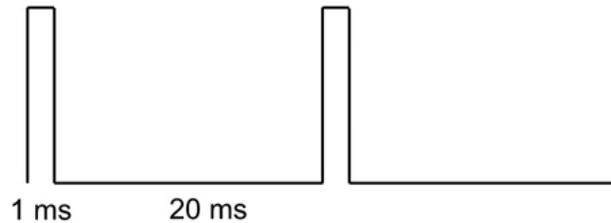
# How does a servo work?

- Servo has a DC motor, a specialized circuitry (controller circuit), and a potentiometer
  - The DC motor is attached to a gearbox and output/drive shaft.
  - The circuitry reads signals sent by Arduino and determines where the shaft needs to turn to.
  - It powers the DC motor which turns the main shaft.
  - This shaft turns the potentiometer that the circuitry reads.
  - The potentiometer tells the circuitry how far the shaft has turned and acts as feedback mechanism.
  - Once the desire angle is reached, the servo holds the shaft's position.



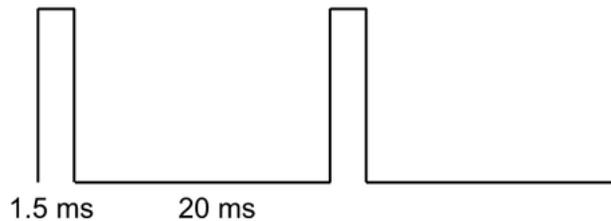
# Controlling a servo

- To control a servo, we send precisely timed pulses.
  - To turn it as far as it goes counterclockwise, we send it 1ms digital HIGH pulses following 20ms of digital LOW



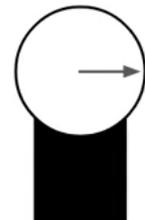
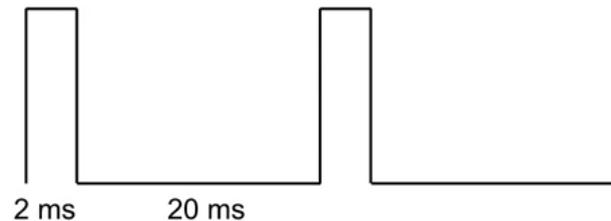
Full counterclockwise

- To centre the shaft, we send it 1.5ms digital HIGH pulses following 20ms of digital LOW



Centered

- To turn it as far as it goes clockwise, we send it 2ms digital HIGH pulses following 20ms of digital LOW



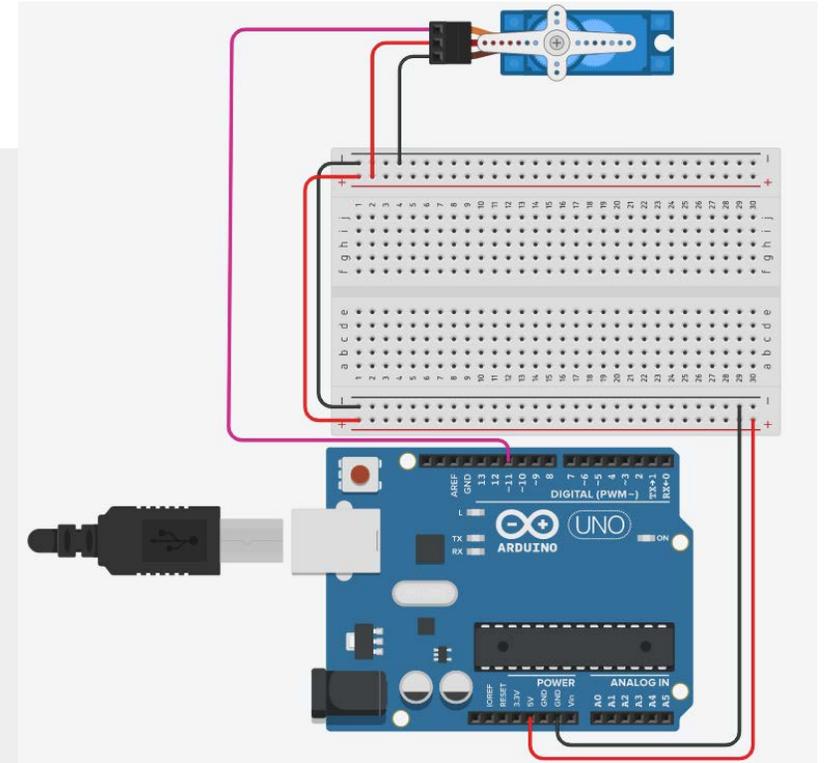
Fully clockwise

# Controlling a servo with Arduino

- Arduino Uno can use PWM pins to control a servo.

```
// Includes the Servo library
#include <Servo.h>
const int servo_pin = 11;
Servo servo;
void setup() {
  // Attach pin to the servo motor
  servo.attach(servo_pin);
}

void loop() {
  servo.write(0);    // set servo to Fully clockwise
  delay(1000);
  servo.write(90);  // set servo to Centre
  delay(1000);
  servo.write(180); // set servo to Full counterclockwise
  delay(1000);
}
```



# Controlling a servo with Arduino

- Arduino Uno can use PWM pins to control a servo.

```
// Includes the Servo library
#include <Servo.h>
const int servo_pin = 11;
Servo servo;
void setup() {
    // Defines on which pin is the servo motor attached
    servo.attach(servo_pin);
}

void loop() {
    for(int pos = 0; pos <=180; pos++){
        servo.write(pos);
        delay(50);
    }
}
```

