A servo motor (or servo for short) is a motor that rotates to a specified position between ~0° and ~180°.

Servos are great for raising an arm or closing a claw to grab something.

Servo motors look very similar to non-servo motors, but there are differences...

- A servo has **three wires** (orange, red, and brown) and a **black plastic plug**.
- A non-servo motor has **two gray wires** and a **two-prong plug**.
KIPR Robotics Controller servo ports

Servo Ports 0, 1, 2, and 3
• The KIPR Robotics Controller has 4 servo ports numbered 0 (left) & 1 (right) on the left, and 2 (left) & 3 (right) on the right.

• Notice that the case of the KIPR Robotics Controller is marked:
  • (S) for the orange signal wire, which regulates servo position
  • (+) for the red power wire
  • (−) for the brown ground wire (“the ground is down, down is negative”)

NOTICE: orientation plugging in the servos is very important
• Think of a servo like a protractor...
  • Angles in the \(~180^\circ\) range of motion\ (between \(~0^\circ\) and \(~180^\circ\)\) are divided into \textbf{2048 servo positions}.
  • These \textbf{2048 positions} range from 0 to 2047, but due to internal mechanical hard stop variability you should use \(~150\) to \(~1900\) \ (remember: computer scientists start counting with 0, not 1).
  • This allows for greater precision when setting a position (you have \(~2048\) different positions to choose from instead of just 180).

• The default position is \textbf{1024} (centered).
Use the Servo widget
Testing Servos with the Servos screen

Select the servo port

The current servo position

Enable servos
Use your finger to move the dial.

Servo @ 2047 (maxed out)

Servo @ 1513

Servo @ 537

Do **not** push a servo beyond its limits (less than ~150 or more than ~1900). This can burn out the servo motor!
Currently the Disable button does NOT disable the newer servos. To disable it you will have to unplug the servo.
• The Servo motor only has a range of motion (rotates) ~180 degrees, but you cannot see by looking at the motor where this range of motion is located in relation to your robot.

• Using the Servo Widget, enable the servo on your robot. When you enable it, it will go to 1024. You can unscrew the servo horn on your arm or claw and place it in the center of the rotation if it is not already in the correct position.
Servo functions

• To help save power, servo ports by default are **not** active until they are **enabled**.
• Functions are provided for **enabling** or **disabling** all servo ports.
• A function is also provided for **setting the position** of a servo.

```c
enable_servos(); // Enable (turn on) all servo ports.

set_servo_position(2, 925); // set servo on port #2 to position 925.

disable_servos(); // Disable (turn off) all servo ports.
```

• **Note:** it takes the servo TIME to move to a position so if you set it to another position without giving it TIME the CODE runs very fast and does not wait for the servo to move.
• The **default position** when servos are enabled is **1024 (centered)**, which means that all **servos will automatically move to this position** when `enable_servos` is called.
• You can “**preset**” a servo position by calling `set_servo_position` **before** calling `enable_servos`. This will make the servo move to this position rather than center.