

Arduino servo

Attaching and controlling a servo motor to cause mechanical movement

Due Thursday 4/21/22 (6th period) Friday 4/22/22 (7th period)

Today you are going to connect a servo motor to your Arduino. A servo motor is a smart motor. Regular hobby motors start turning when you apply power to them and keep going in the same direction until you disconnect the power. A server works differently: instead of simply turning it on or off, we will tell the motor where to turn using degrees. Our servo motors can be told to go to anywhere from zero to 180 degrees. If you're rusty on degrees, remember 90 degrees is a right angle (square corner.)

You and your partner will together make a single circuit and write a single program.

Find your servo and your capacitor, as shown here (the servos are either black or blue and the capacitor is the thing on the right).



Now carefully do exactly what I say here:

Everyone:

Attach a wire from Arduino pin 9 over to a13 on the breadboard.

Connect a17 to GND on the Arduino.

Attach the capacitor to e15 and e17 with the long leg on e15.

Attach a wire from 5V on the Arduino to a15.

If you have a black servo:

Attach a wire from b13 to the white wire on the servo motor.

Attach a wire from b15 to the red wire on the servo motor.

Attach a wire from b17 to the black wire on the servo motor.

If you have a blue servo:

Attach a wire from b13 to the orange wire on the servo motor.

Attach a wire from b15 to the red wire on the servo motor.

Attach a wire from b17 to the brown wire on the servo motor.

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Open the file `day88_servo_start.ino` in the Google Classroom. Do this on one computer; you and your partner only need to make one program for today.

Debug and upload the program. If it is running properly your servo should sweep a half circle, then go back to where it started, pause, and then repeat.

Let's look at our new commands:

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

These lines allow the Arduino to talk to the servo, specifically by including the servo library (a bunch of pre-made code that helps take care of the details of how a servo works; under the hood there are some pretty crazy commands going on to control it. Thankfully we get to use very simple commands, see below.) The second line above creates a servo object named "servo".

The following line in `setup()` tells Arduino that the servo is on pin 9:

```
servo.attach(9);
```

If you used a different pin, obviously you'd use a different number.

Finally, this command tells the servo to go to position "angle", where angle is an integer from 0 to 180:

```
servo.write(angle);
```

I put this into a for loop so that angle goes from 0 to 180, then the servo goes back to 0 and pauses for 1 second.

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Do a Save as... and make a second program (you can add "part2" to the name if you want.)

Remove the following code:

```
for(angle = 0; angle < 180; angle++)
{
  servo.write(angle);
  delay(15);
}
servo.write(0);
delay(1000);
```

You will put new code in there as follows:

1) Build the LDR circuit on an empty part of the board. To get 5V for the LDR run a wire from c15 or d15, as the 5V pin on the Arduino is already bringing the power over to the board at pin a15. (Both the servo and the LDR can use 5V at the same time).

2) Use the LDR numbers to control the servo. Set up a Serial.println() call to print the value of the LDR variable as you read it to get a feel for the range of values you are seeing. Remember it should go from 100 or so when fully covered to close to 1023 when under bright light. After you verify that your LDR is giving you appropriate values use the map call to convert your LDR variable to the proper range for the servo and then call the servo with your mapped x (these two lines go into the loop function after the analogRead(0) call:

```
int x = map(val,0,1023,0,180);
servo.write(x);
```

The above two lines assume that you have read the value of the LDR into the variable val like we did with the LDR program (see your code from that day if you're not sure what I'm talking about.) Cover the LDR to see the servo turn towards zero degrees, and let it be hit with light to move towards 180 degrees.

Get a popsicle stick from Mr. Hays if your box doesn't have one in it already and tie it to your servo with wire that he gives you. Attach a drawing or picture with tape that makes something funny happen (I've got colored paper). Can you think of something interesting to make this do? Show me when you are done. Get your classmates to come by and see the cool thing you created.