Timeless Lifeskills
FOUNDATION
www.TimelessLifeskills.org

ARDUINO Simple Projects

Instructor Guide

Topics Covered

1. Arduino Board
2. Installing Arduino IDE
3. Transferring Code from Tinkercad to Arduino IDE
4. Servo Motor
5. RGB LED
6. Servo Motor with PIR sensor
7. Measuring Distance with Ultrasonic Sound sensor
8. Controlling Servo Motor with Ultrasonic Sound sensor

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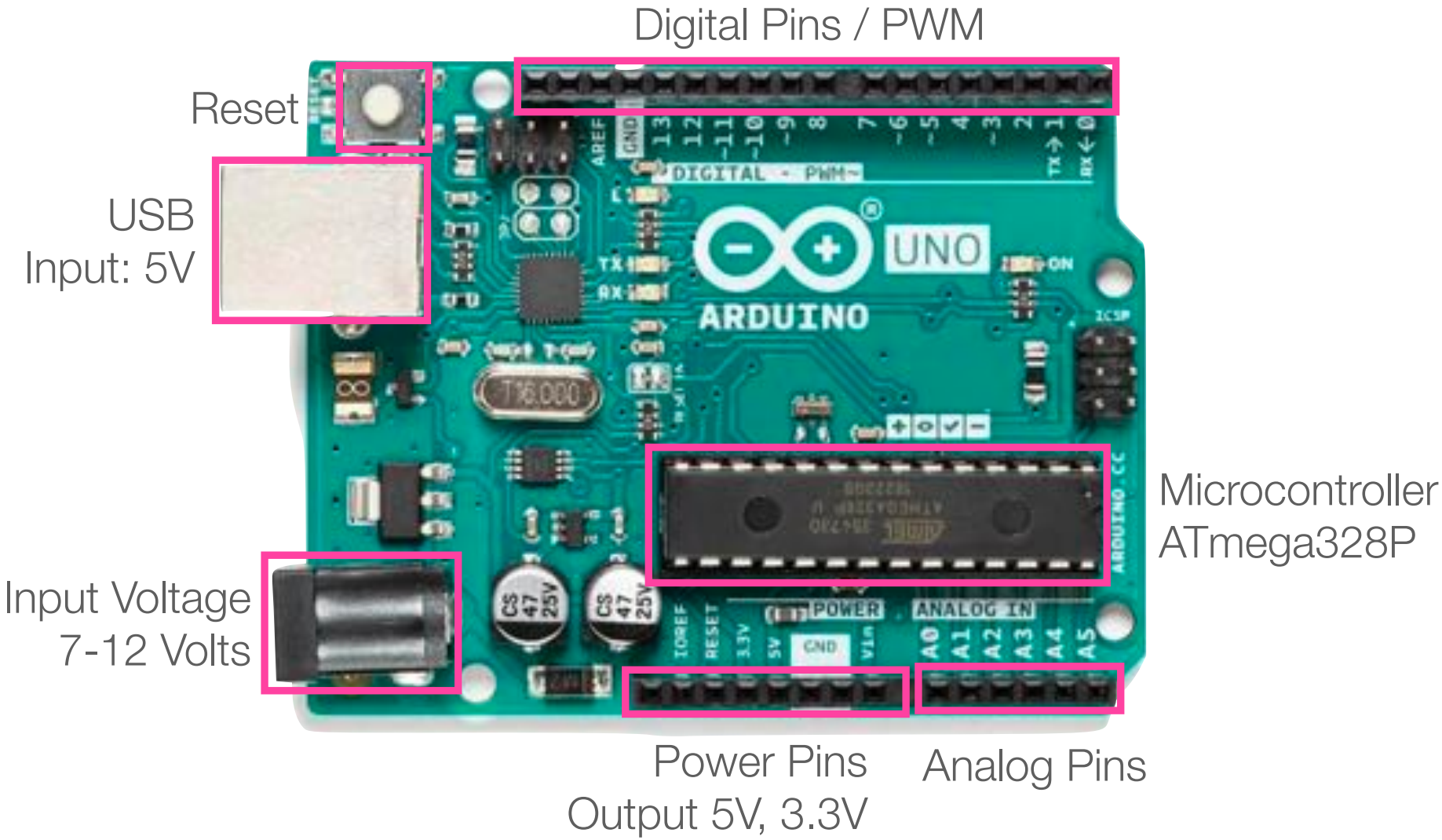
Digital Pins / PWM
Reset
USB
Input: 5V
Microcontroller
ATmega328P
Input Voltage
7-12 Volts
Power Pins
Output 5V, 3.3V
Analog Pins
UNO
ARDUINO
DIGITAL ~ PWM~
POWER
ANALOG IN

Installing Arduino IDE

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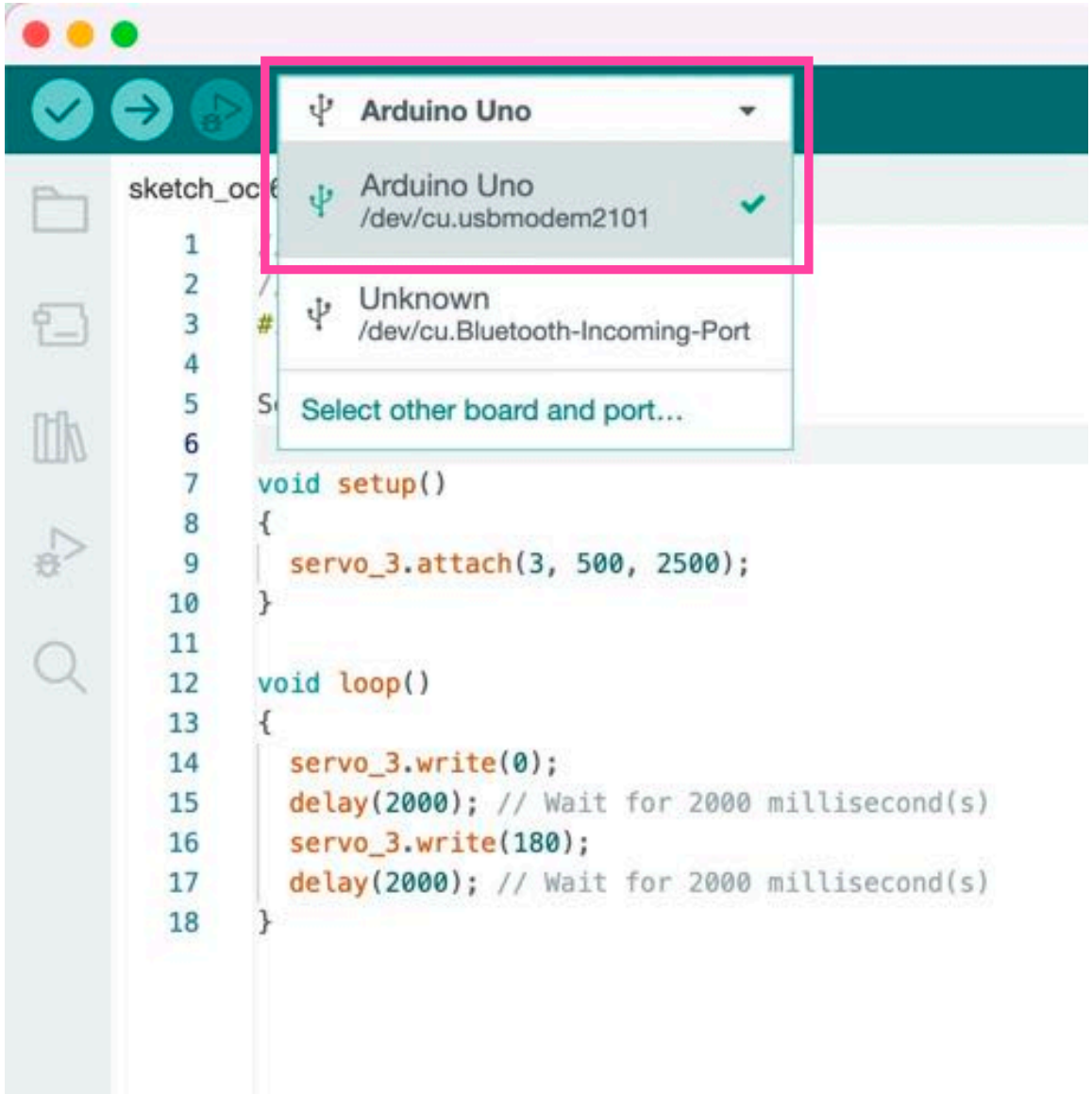
Steps:

1. Goto: https://www.arduino.cc/
2. Select ‘Software’
3. Download IDE file based on your operating system (Windows)
4. Install the downloaded file

This is how a new file in the IDE looks like.

Programmes in Arduino are called ‘Sketch’



1. Connect your Arduino to your PC/laptop
2. Select the right board from the dropdown

Transferring Code from Tinkercad to Arduino IDE

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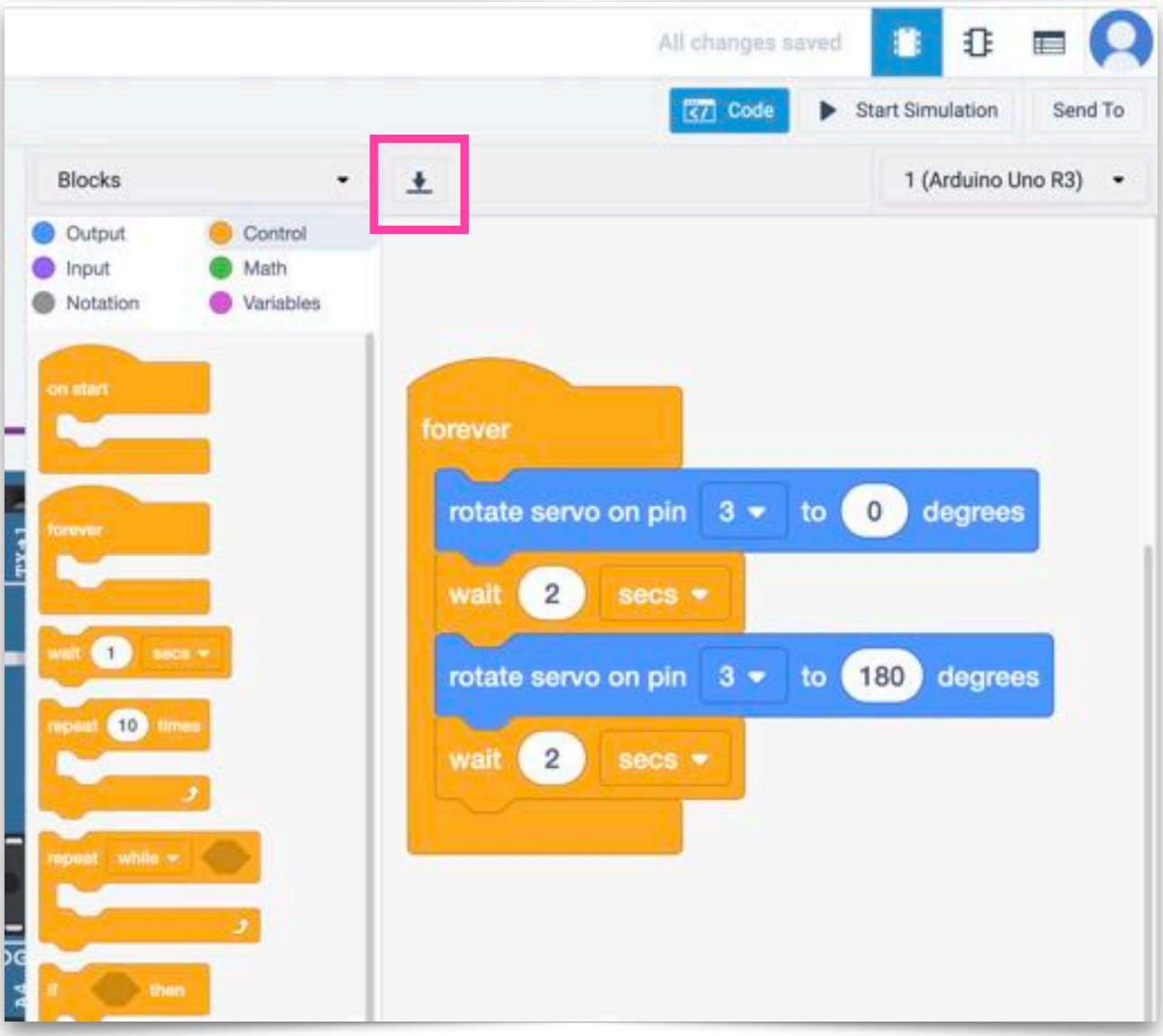
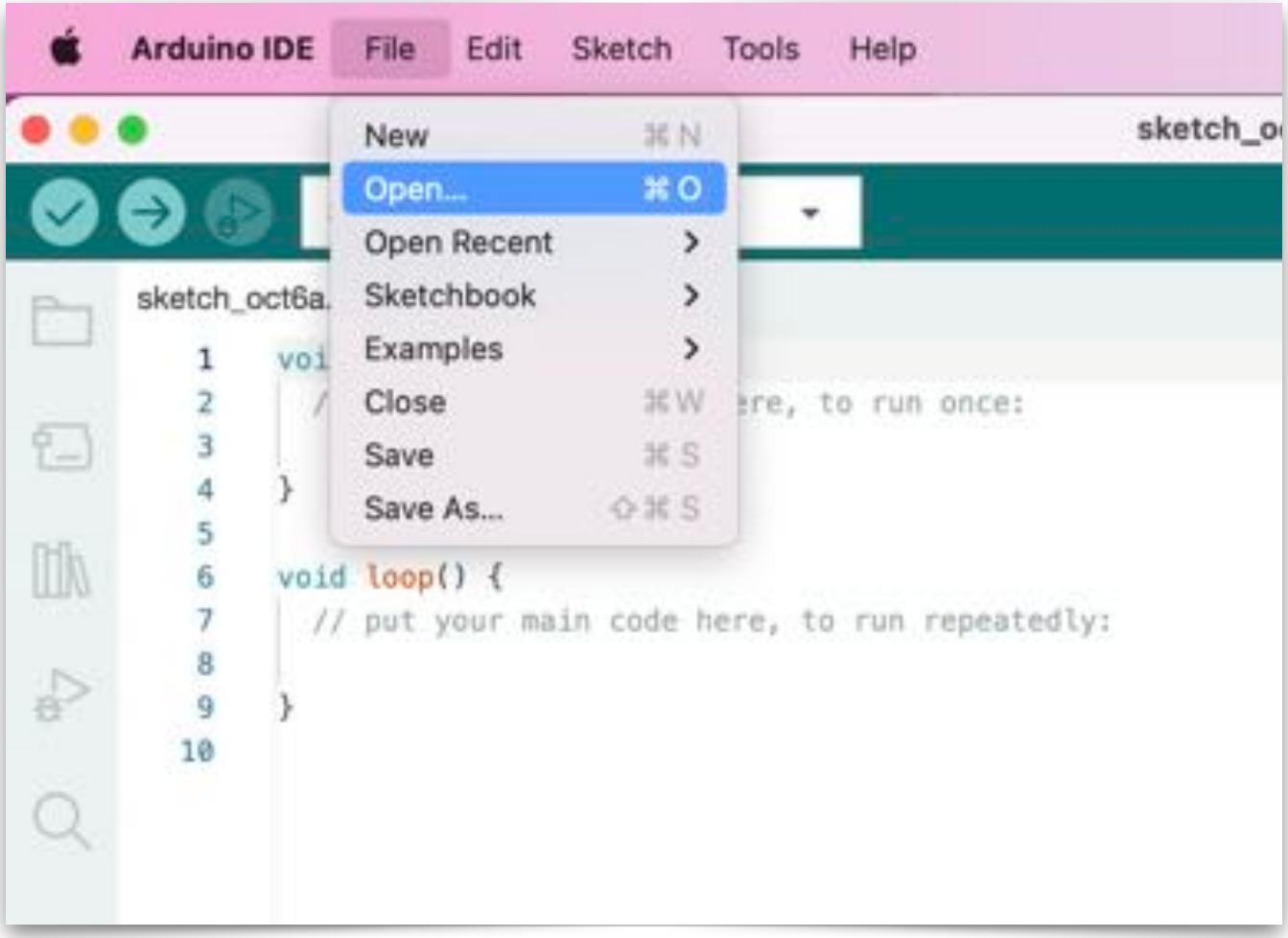


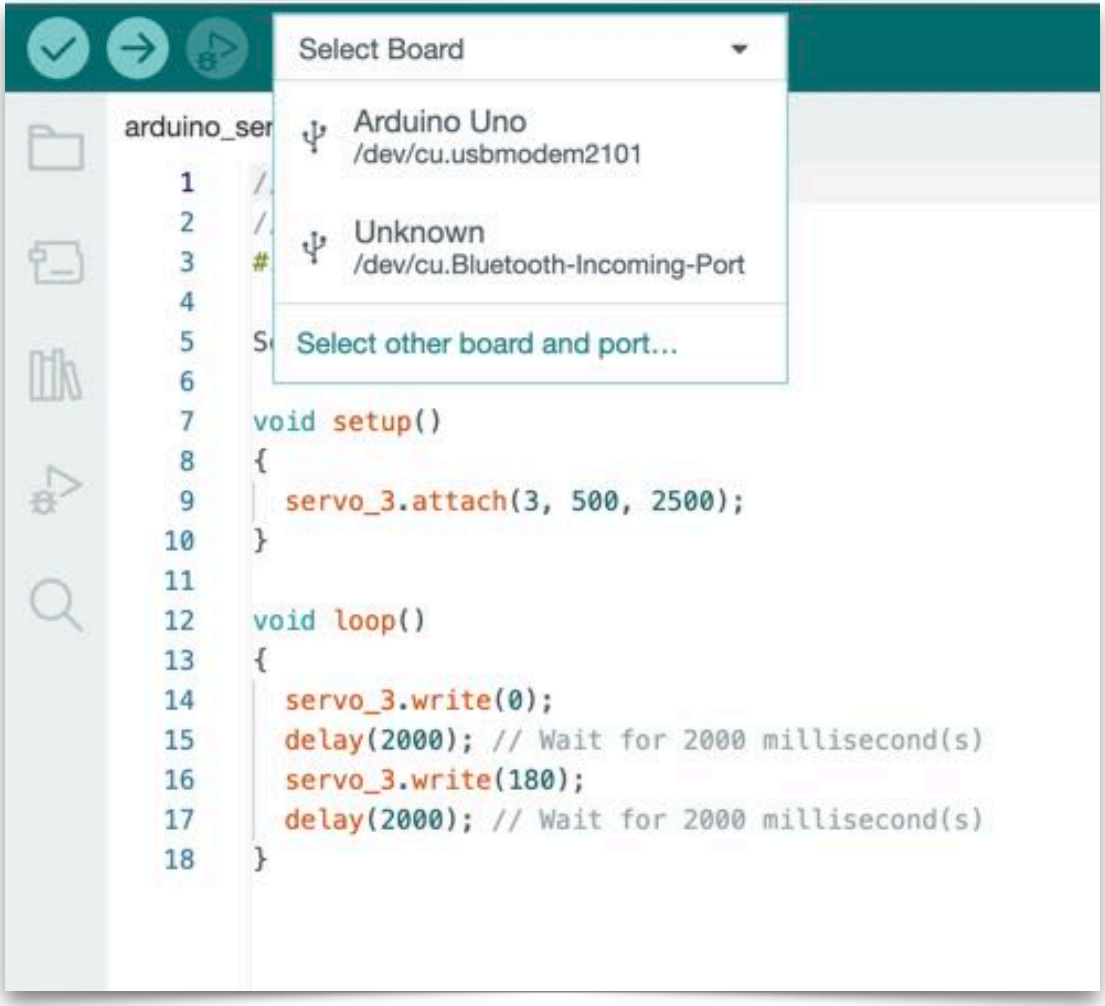
Steps:

1. Click the Download Code button in Tinkercad
2. This will download a .ino file

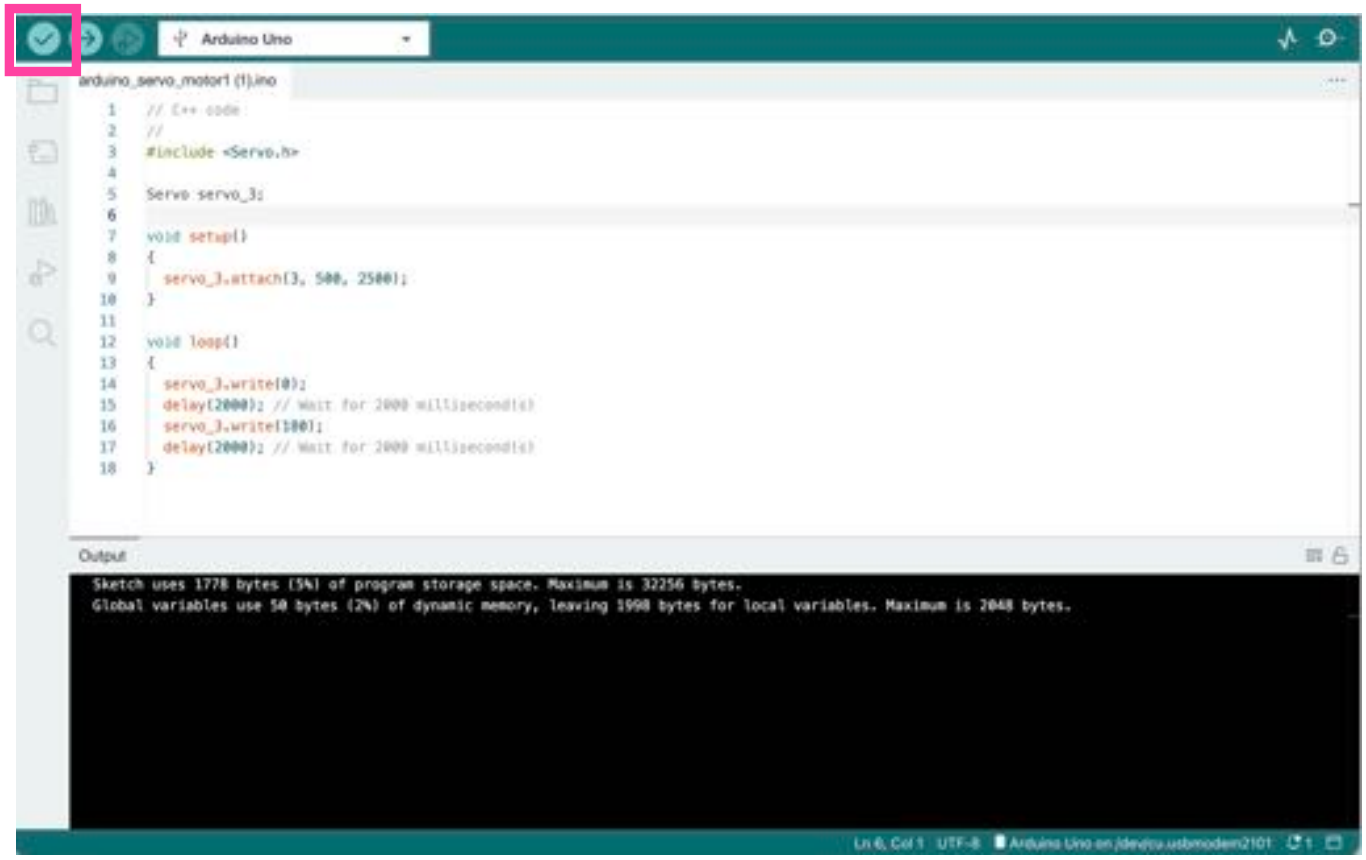


3. In the Arduino IDE, go to File > Open
4. And open the .INO file that you downloaded from Tinkercad

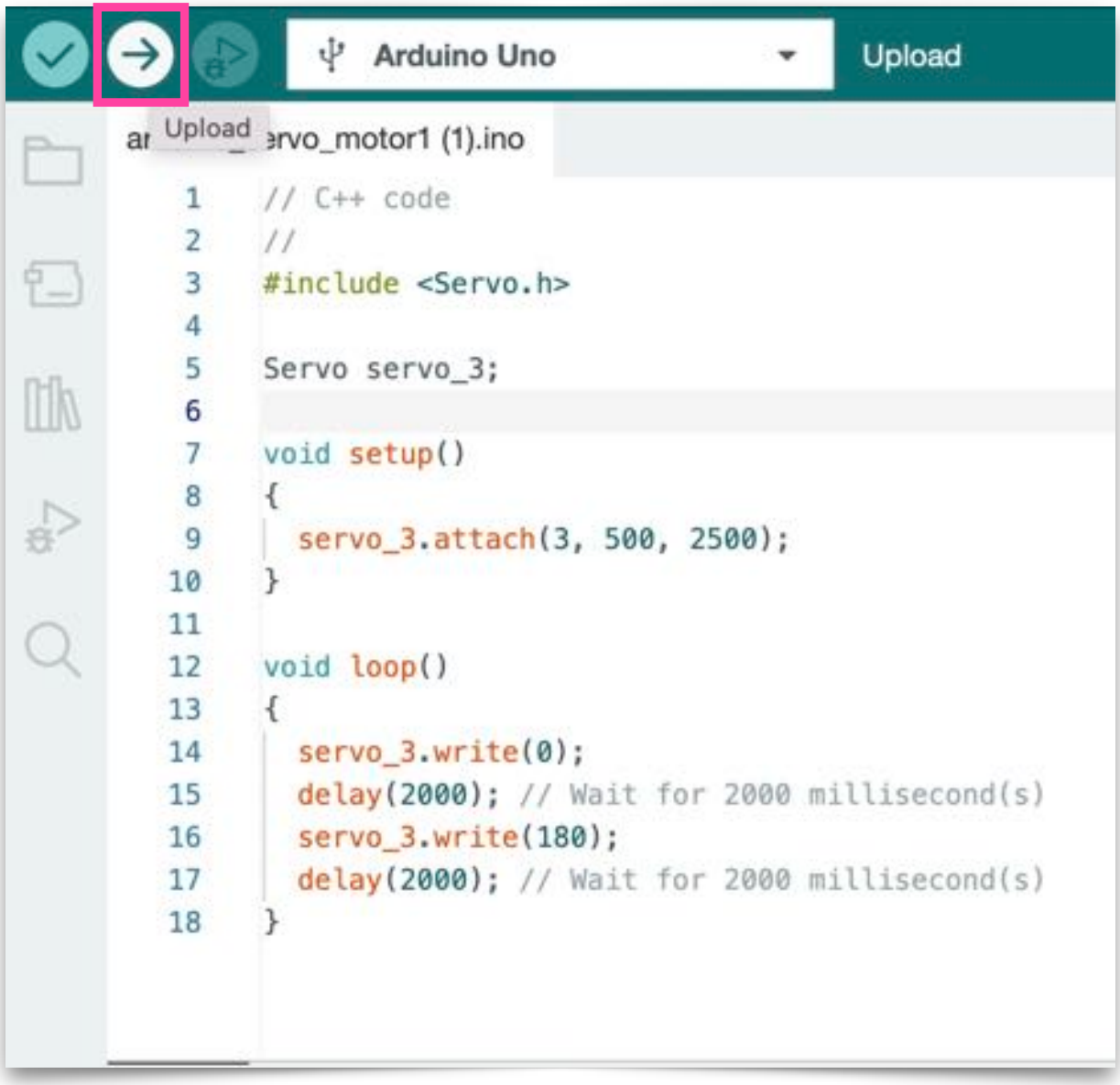
5. You will get a message to create a folder, click OK



6. The programme you wrote in Tinkercad will now open. In Arduino a programme is called a ‘Sketch’
7. From Select Board dropdown menu, select the Arduino board that is connected to your laptop or PC



8. Click the tick icon on top left (Verify icon) to validate your code.
9. If your code has no bugs (you will get error message in the new window that will open in the bottom), you can transfer the code to your Arduino. If there is a bug you will have to rectify it first.



10. Click the arrow icon on top left (Upload icon) to transfer the code to your Arduino.
11. Connect the Servo to your Arduino (as described earlier).
12. The Servo should now rotate to and from - from 0° to 180°

Servo Motor

Arduino in Tinkercad

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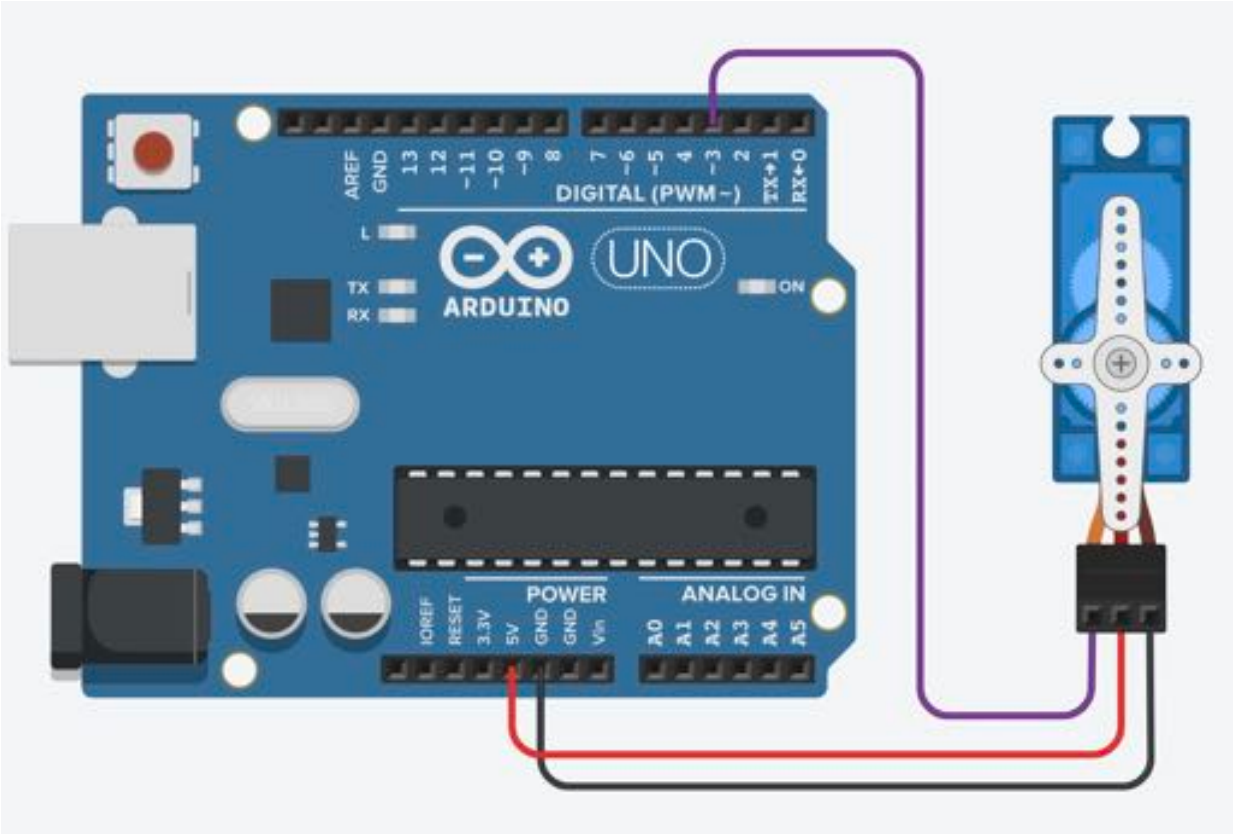
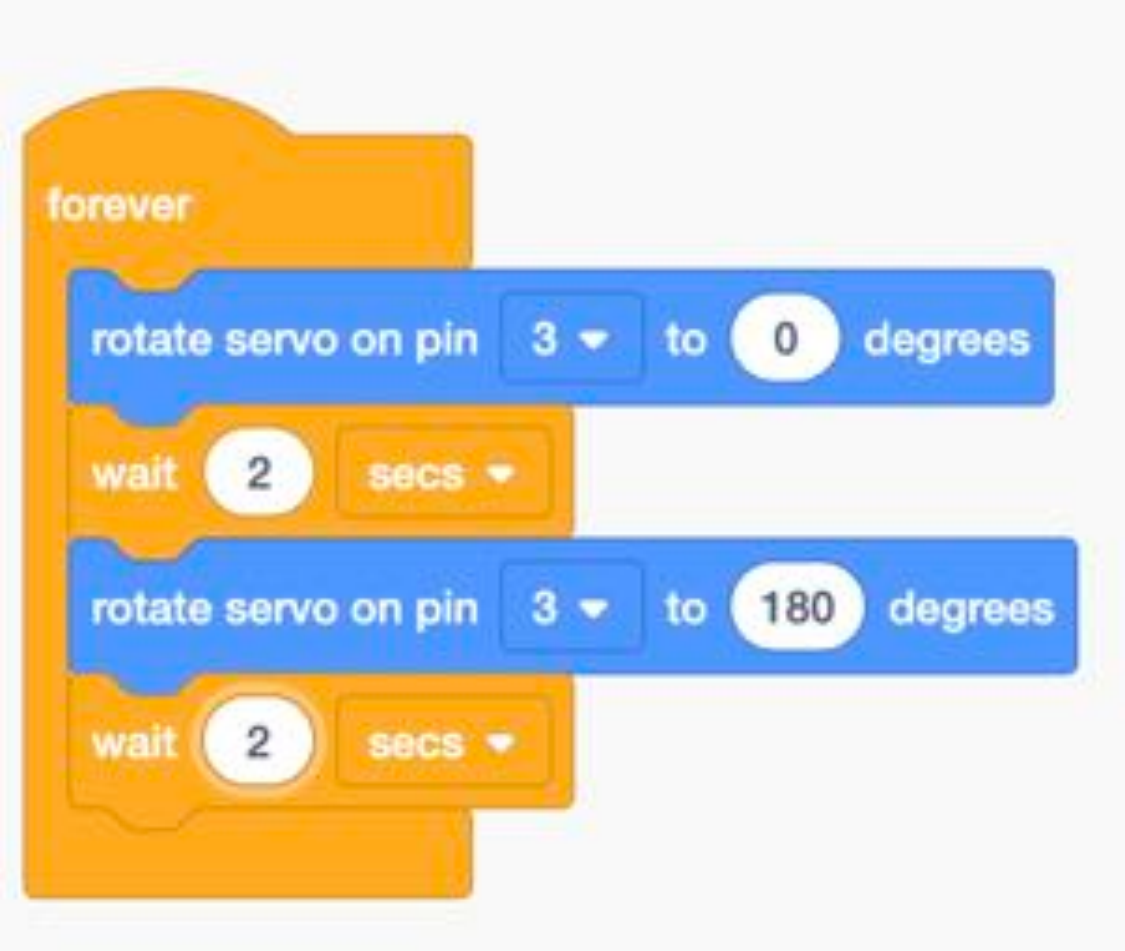


STEPS:

1. Connect servo ground pin to Arduino ground pin
2. Connect servo power pin to Arduino 5V pin
3. Connect servo signal pin to Arduino pin 3



CODE

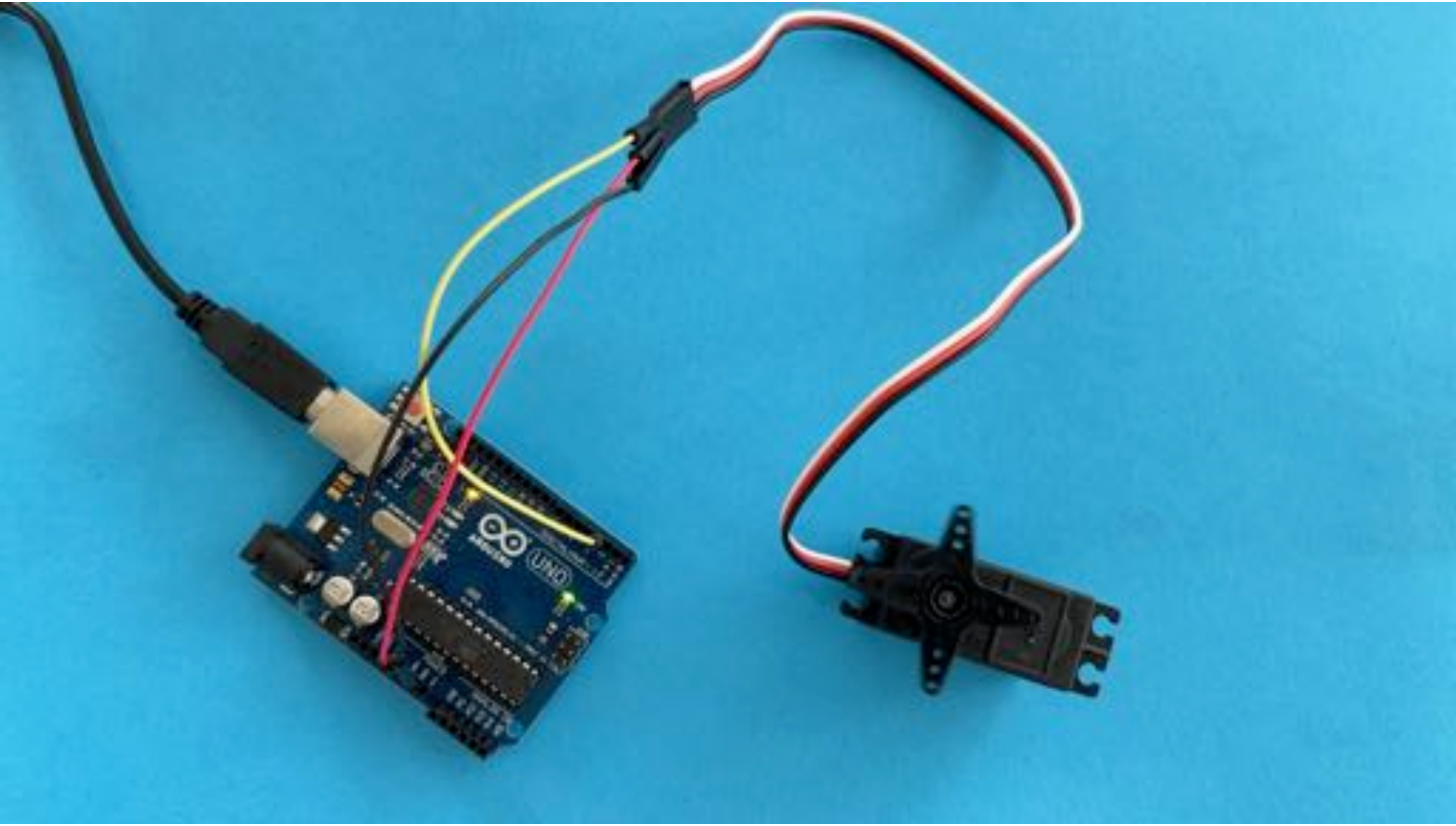
Inside a forever loop:

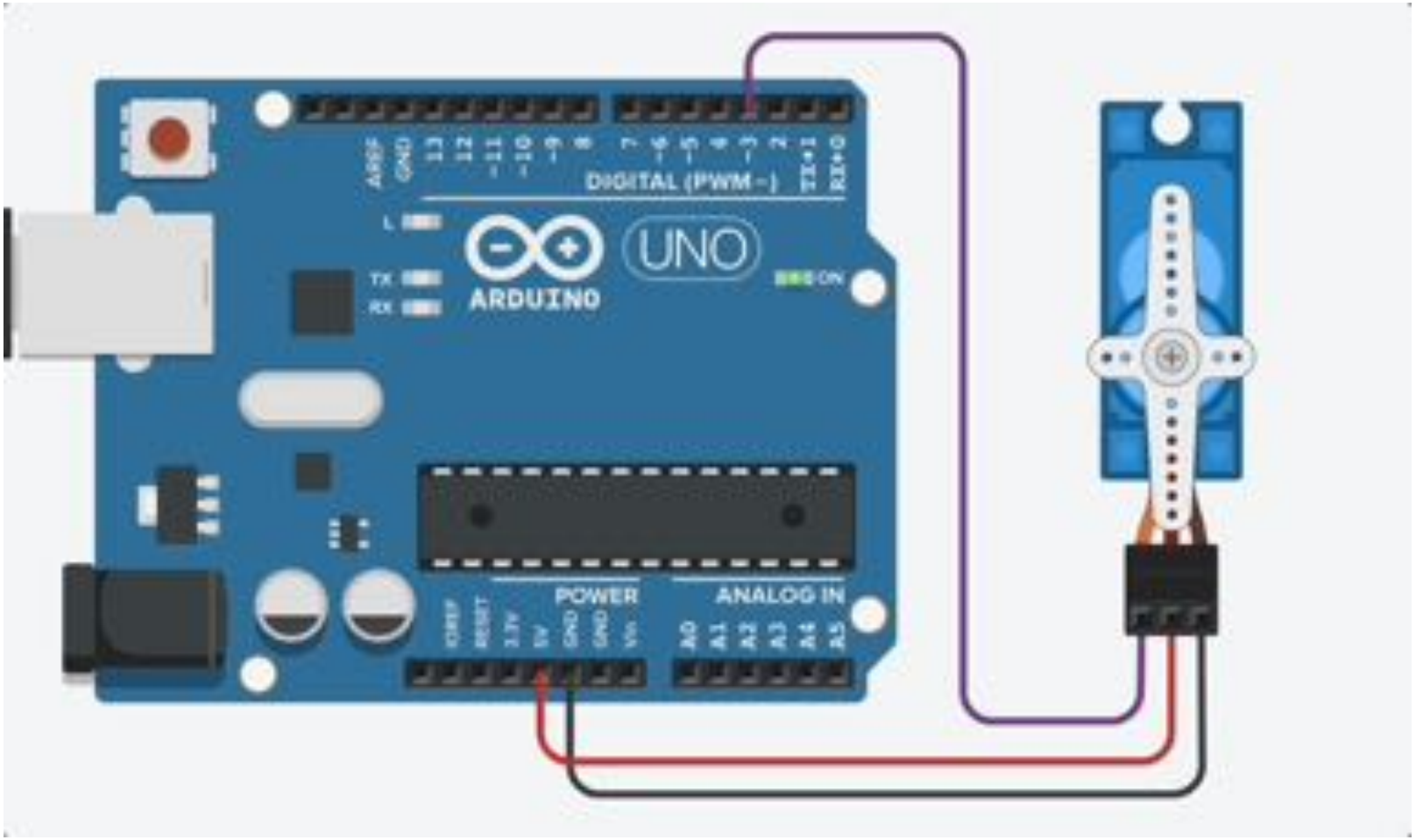
1. From Output blocks, get Rotate Servo command, set the pin to 3 and degrees to 0
2. Add a Wait of 2 seconds
3. Add another Rotate Servo command and set pin to 3 and degrees to 180
4. Add a Wait of 2 seconds
5. What happens if you change to wait to 1 second or less? Experiment and find out! Think of the reason why the servo is behaving the way it is.

Arduino Code

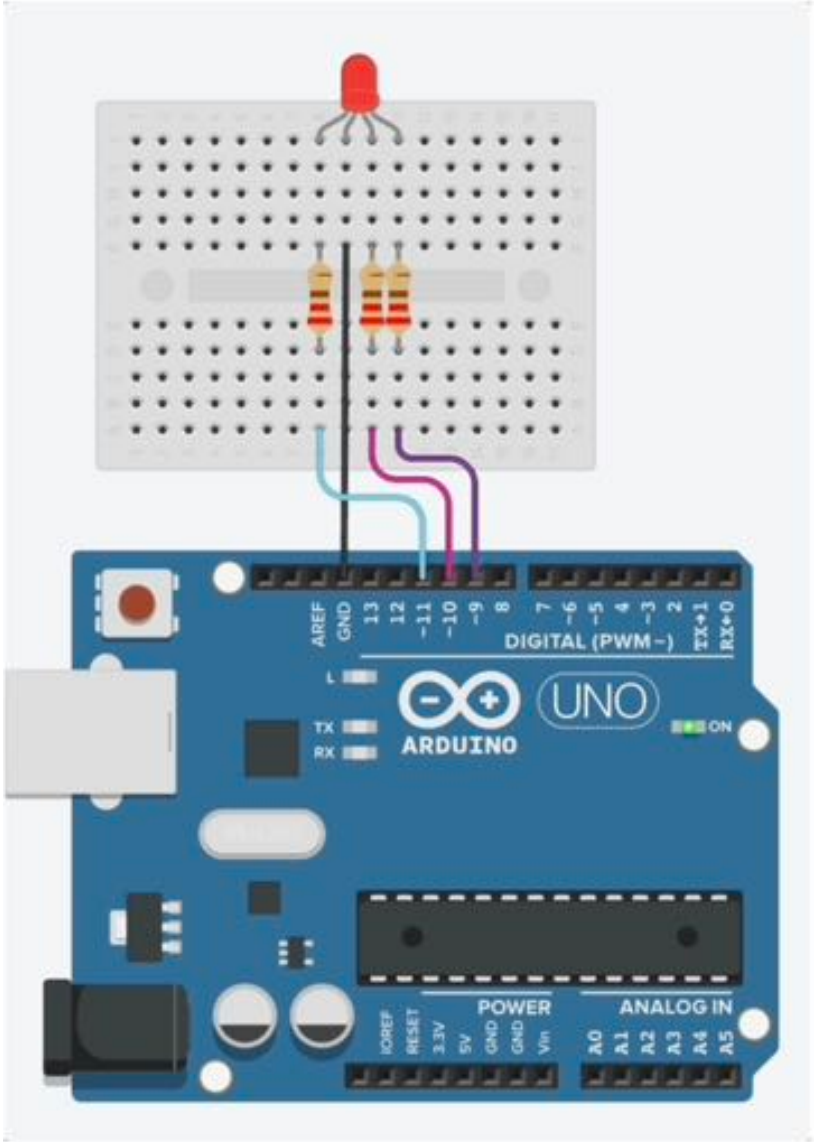
```
// C++ code
#include <Servo.h>
Servo servo_3;
void setup()
{
  servo_3.attach(3, 500, 2500);
}
```

```
void loop()
{
  servo_3.write(0);
  delay(2000);
  servo_3.write(180);
  delay(2000);
}
```

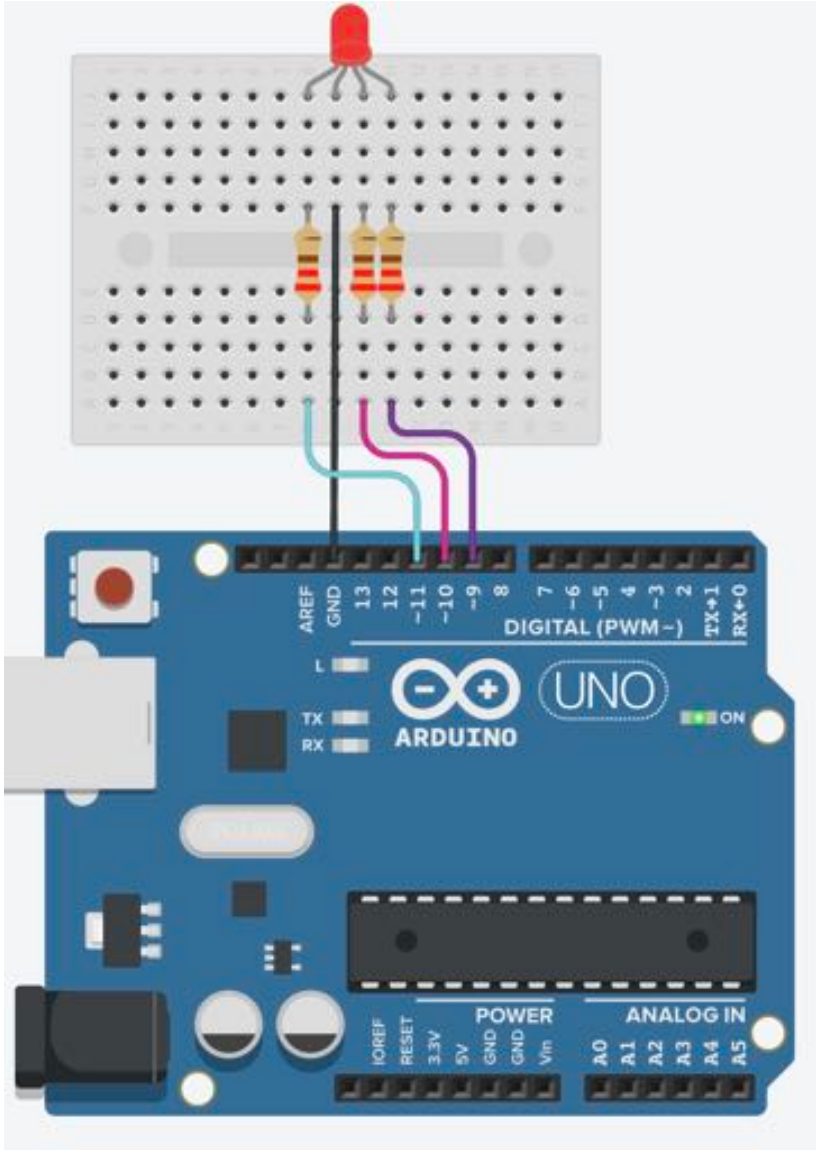

UNO



Tinkercad Project Link: https://www.tinkercad.com/things/doSdIRubMz8

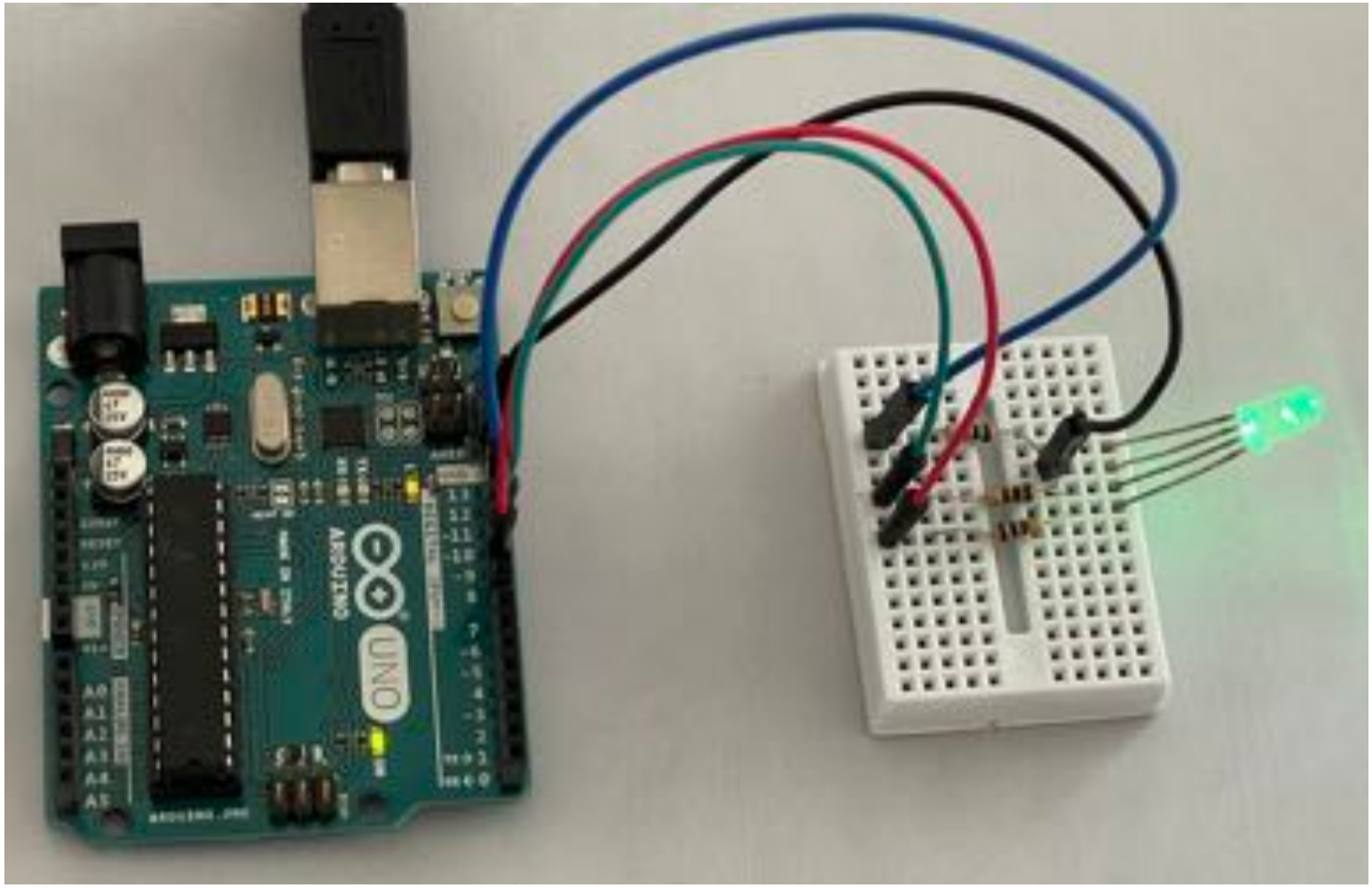

AREF
GND
13
12
~11
~10
~9
8
7
~6
~5
4
~3
2
TX→1
RX←0
DIGITAL (PWM~)
L
TX
RX
ARDUINO
UNO
ON
IOREF
RESET
3.3V
5V
GND
GND
Vin
POWER
ANALOG IN
A0
A1
A2
A3
A4
A5

RGB LED



STEPS:

1. Connect RGB LED cathode terminal to Arduino ground pin
2. Connect each of the remaining three LED terminals to 220 ohm resistor
3. Connect the three resistors to Arduino pins 9, 10 and 11



How to Connect the Components

CODE

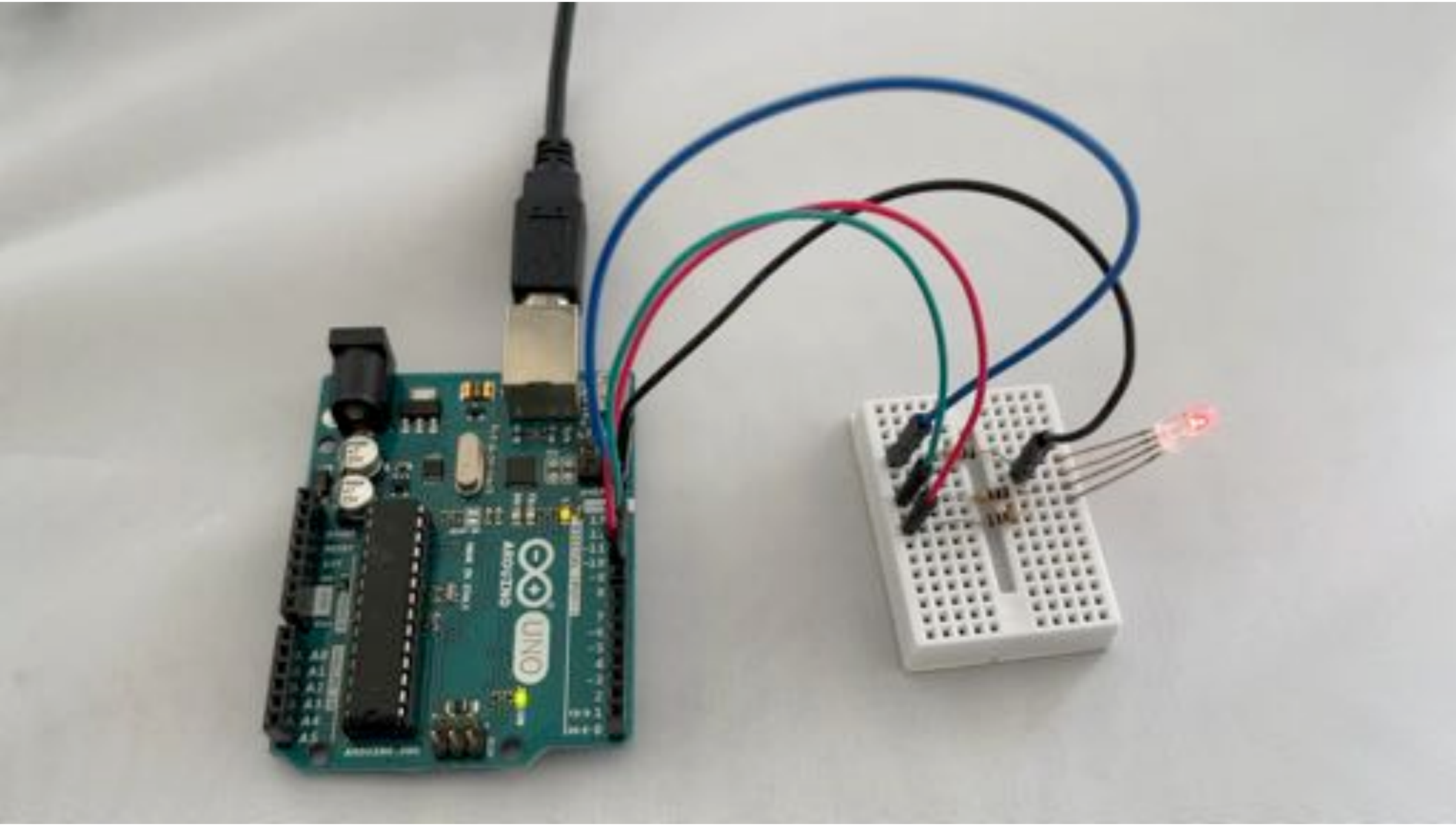
Inside a forever loop:

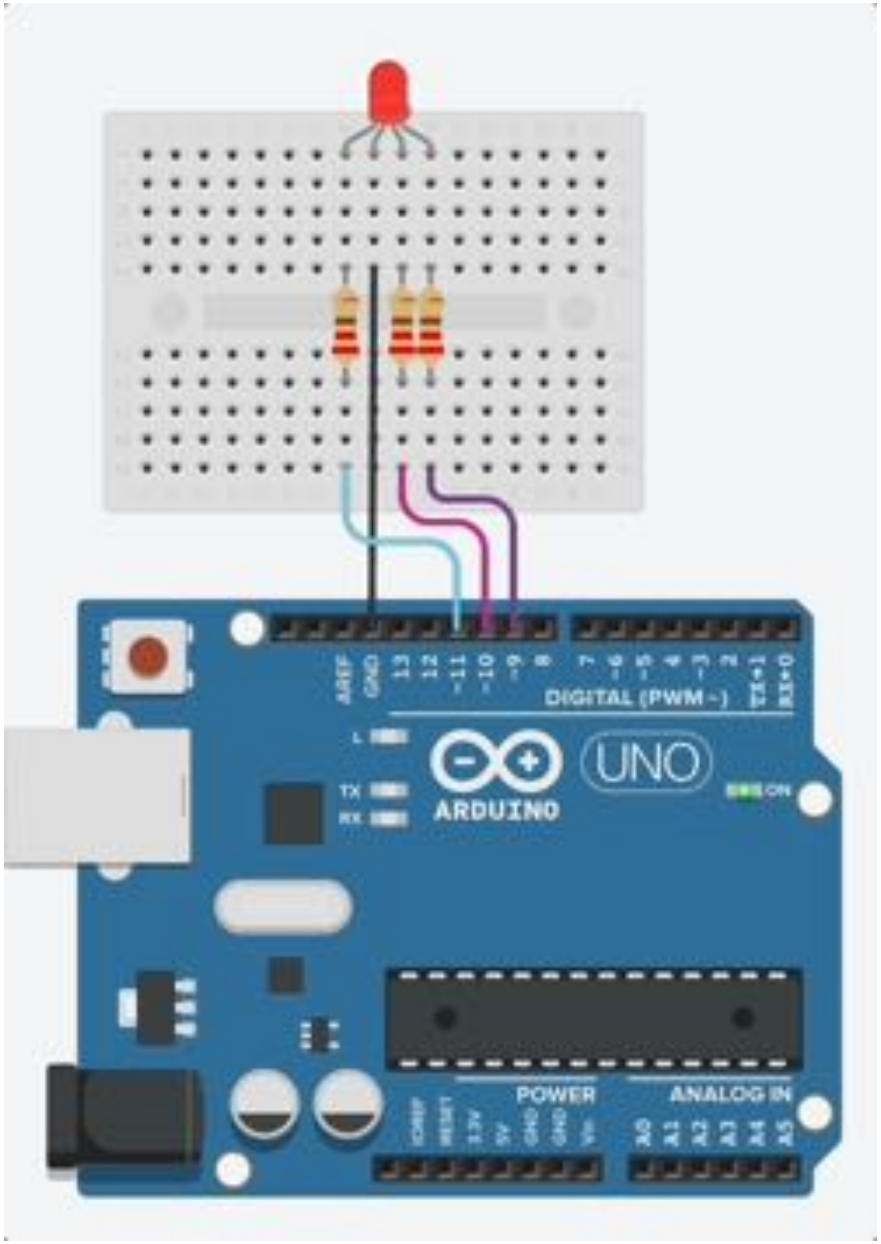
1. Set Arduino pin 9 to High
2. Add a Wait of 500 milliseconds
3. Set Arduino pin 9 to low and pin 10 to high
4. Add a Wait of 500 milliseconds
5. Set Arduino pin 10 to low and pin 11 to high
6. Add a Wait of 500 milliseconds
7. Set Arduino pin 11 to low

Arduino Code

```
// C++ code
//
void setup()
{
  pinMode(9, OUTPUT);
  pinMode(10, OUTPUT);
  pinMode(11, OUTPUT);
}
```

```
void loop()
{
  digitalWrite(9, HIGH);
  delay(500);
  digitalWrite(9, LOW);
  digitalWrite(10, HIGH);
  delay(500);
  digitalWrite(10, LOW);
  digitalWrite(11, HIGH);
  delay(500);
  digitalWrite(11, LOW);
}
```


UNO
ARDUINO



Tinkercad Project Link

https://www.tinkercad.com/things/7Kfd1msMK3A

Servo Motor
with PIR Sensor

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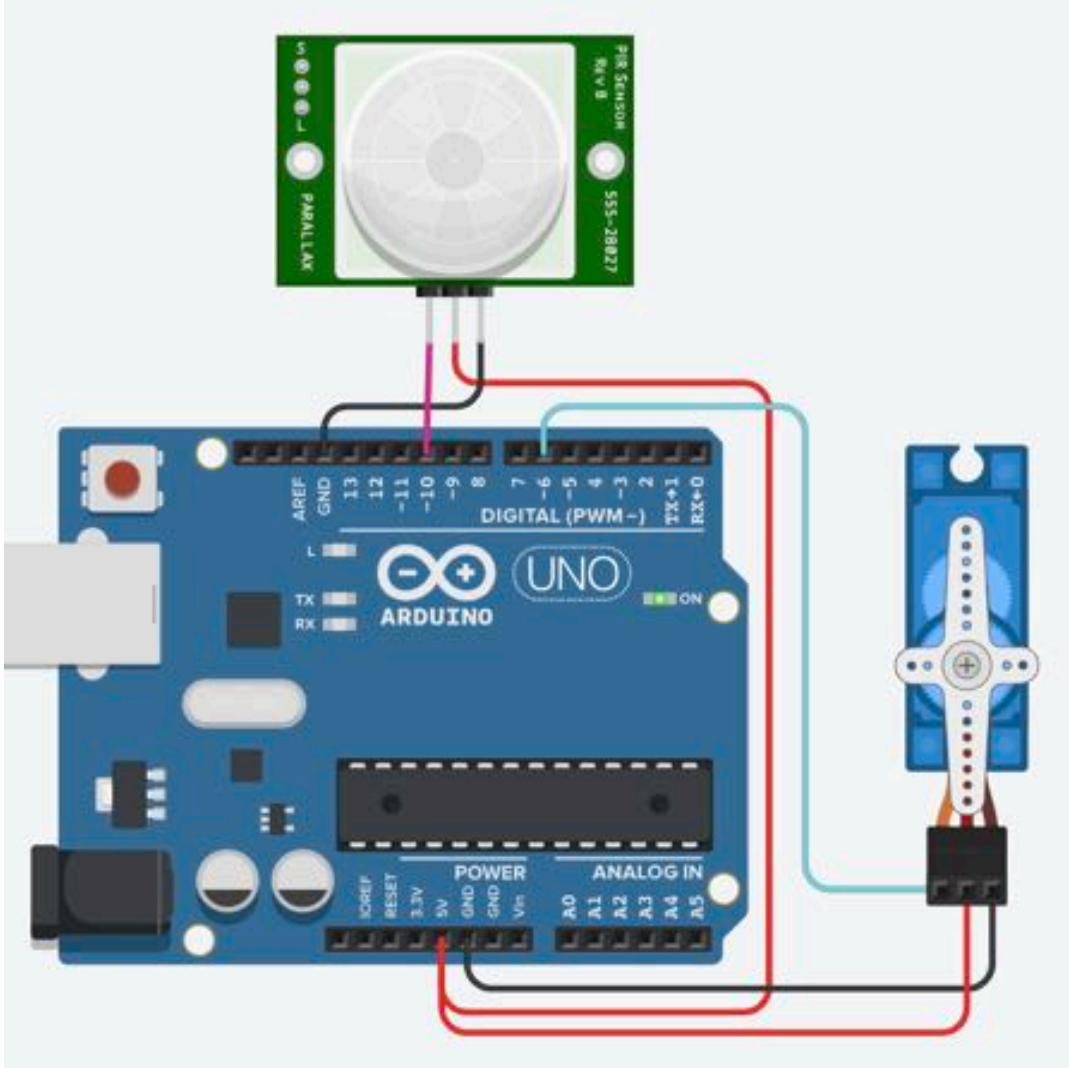
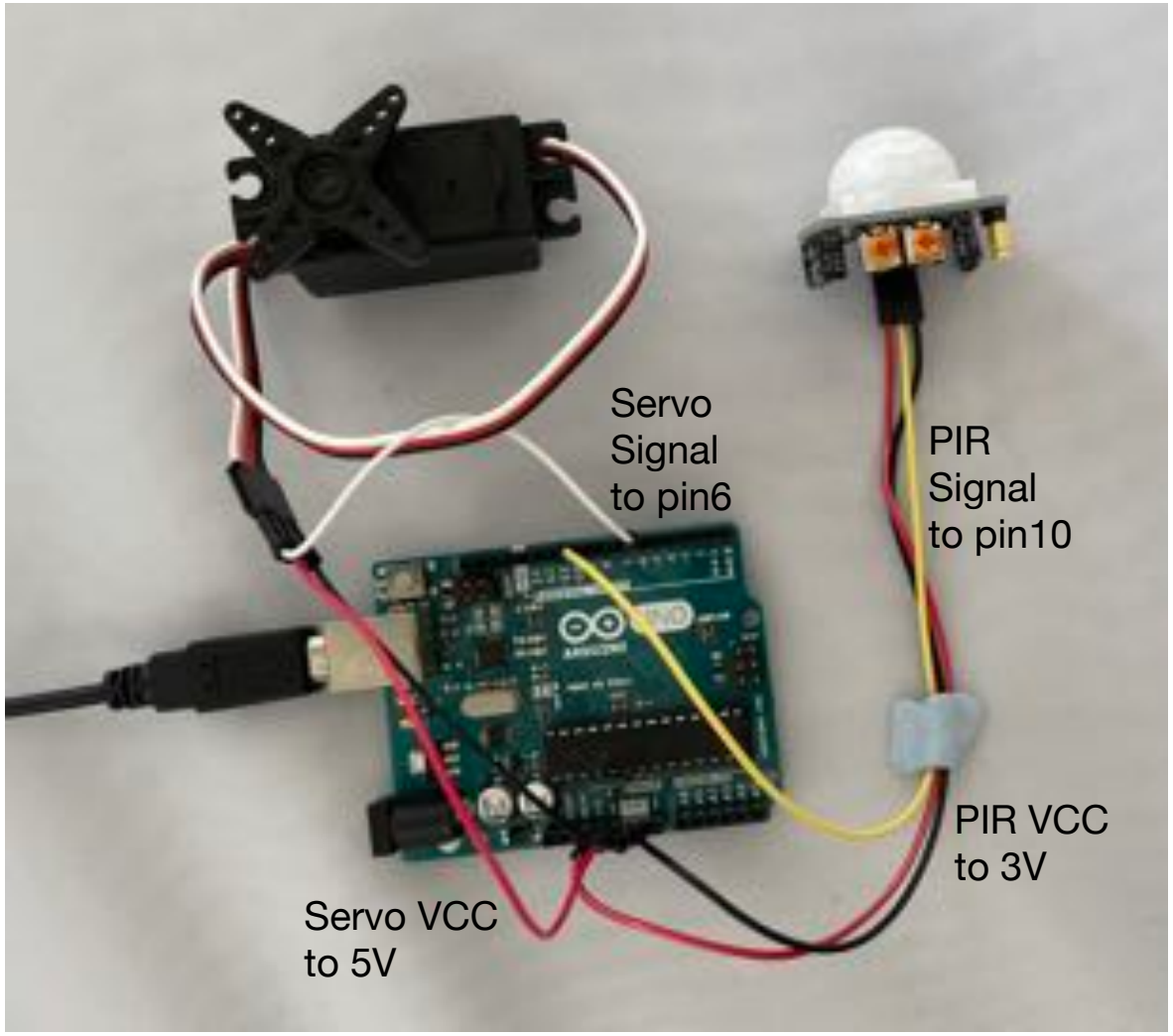
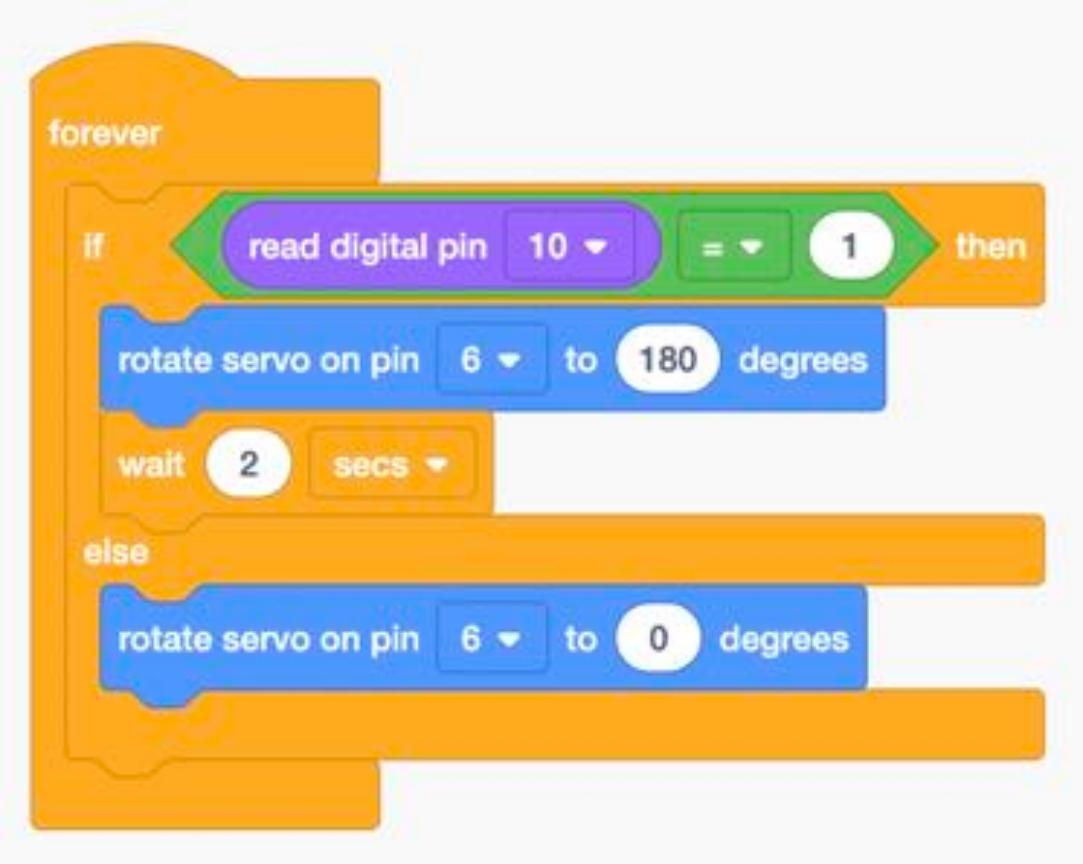


STEPS:

1. Connect servo ground pin to Arduino ground pin
2. Connect servo power pin to Arduino 5V pin
3. Connect servo signal pin to Arduino pin 6
4. Connect PIR ground pin to Arduino ground pin
5. Connect PIR power pin to Arduino 5V or 3V pin
6. Connect PIR signal pin to Arduino pin 10



How to Connect the Components



CODE:

Inside a forever loop:

1. From Control blocks, get If-Else command
2. From Math blocks get an equality command and put it under If
3. From Input blocks get Read Digital Pin command, set it to pin 10 and set the equality to 1 (value will be 1 when the PIR signal pin is high i.e. movement has been detected)
4. From Output blocks get Rotate Servo command, set pin to 6 and degrees to 180
5. Under Else, put another Rotate command, set pin to 6 and degrees to 0 (if no motion is detected by the PIR sensor, servo will go to 0 degree position).

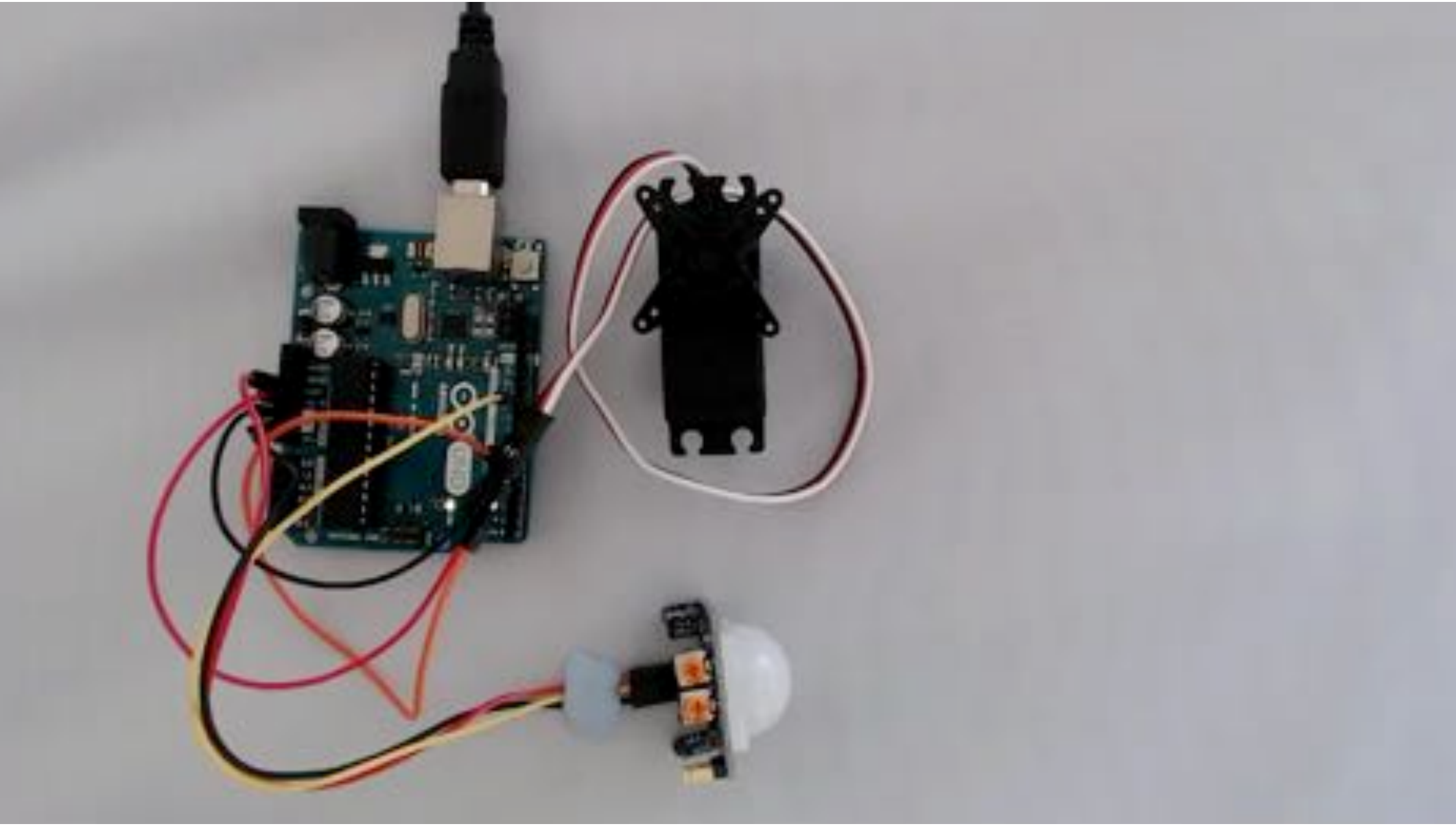
Arduino Code

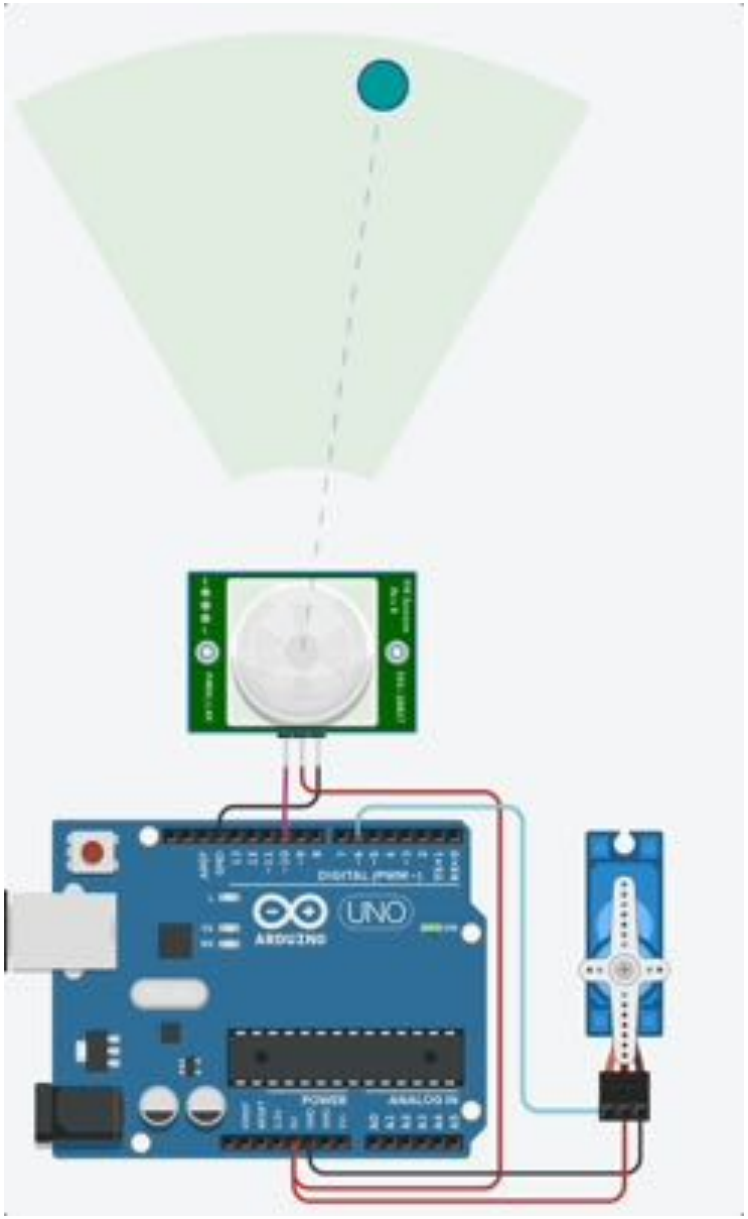
```
// C++ code
//
#include <Servo.h>

Servo servo_6;

void setup()
{
  pinMode(10, INPUT);
  pinMode(LED_BUILTIN, OUTPUT);
  servo_6.attach(6, 500, 2500);
}
```

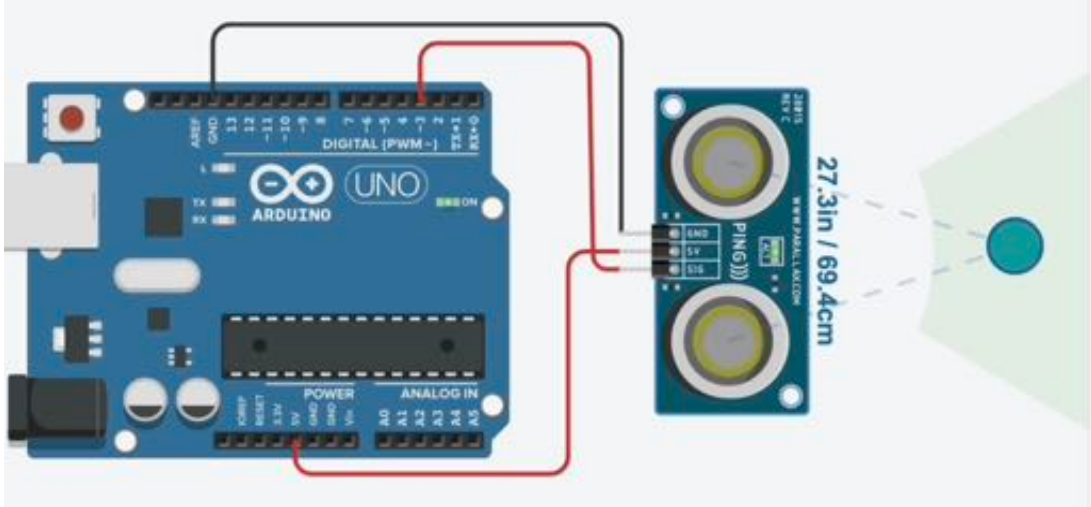
```
void loop()
{
  if (digitalRead(10) == 1) {
    digitalWrite(LED_BUILTIN, HIGH);
    servo_6.write(180);
    delay(2000);
  } else {
    digitalWrite(LED_BUILTIN, LOW);
    servo_6.write(0);
  }
}
```





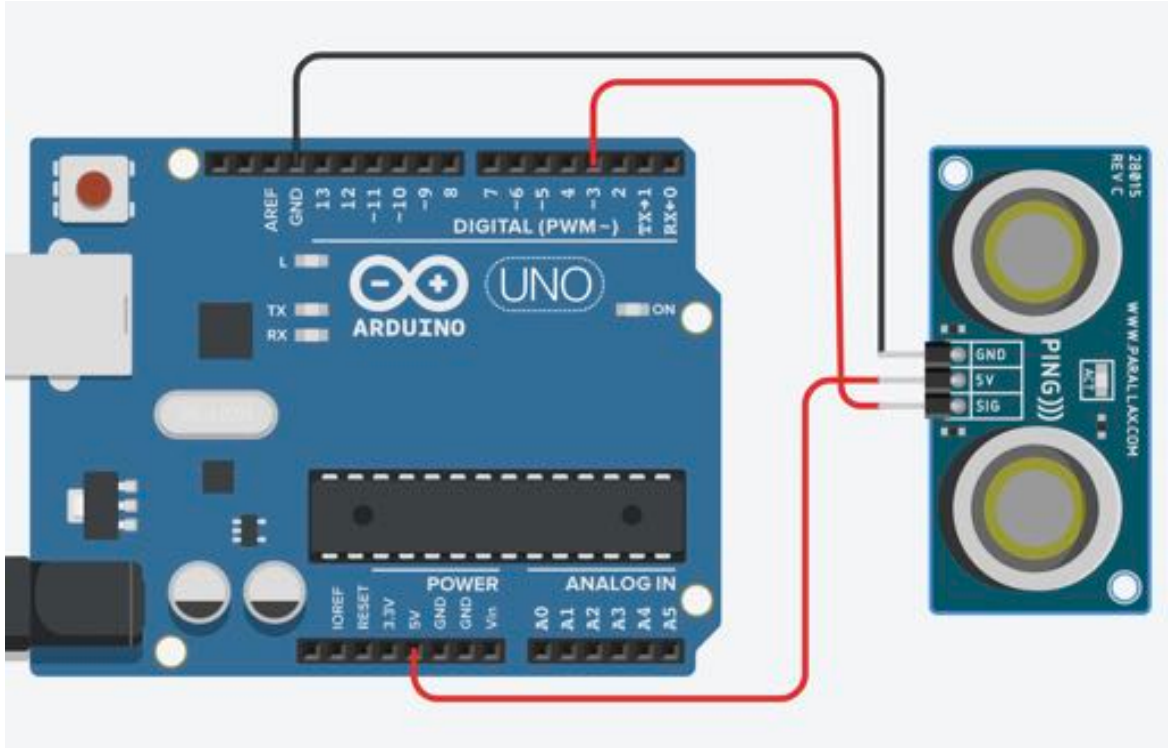
Tinkercad Project Link

https://www.tinkercad.com/things/aftqPoYAvTq



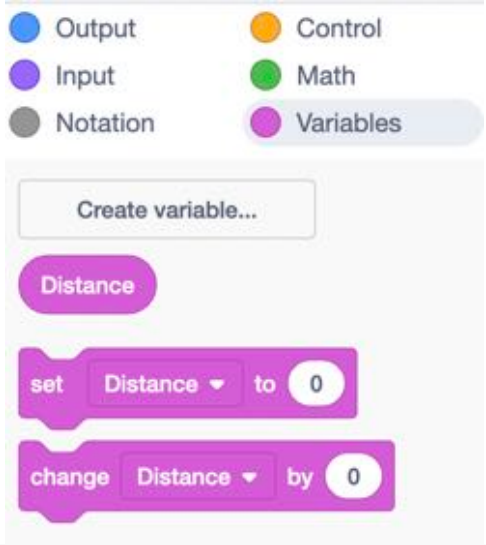
Measuring Distance

Ultrasonic Sound Sensor



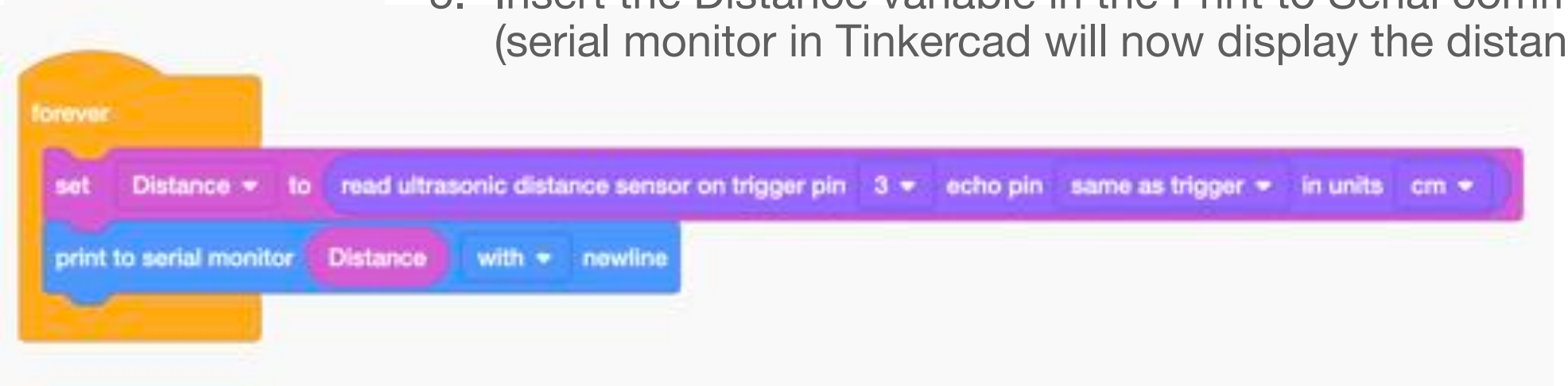
STEPS:

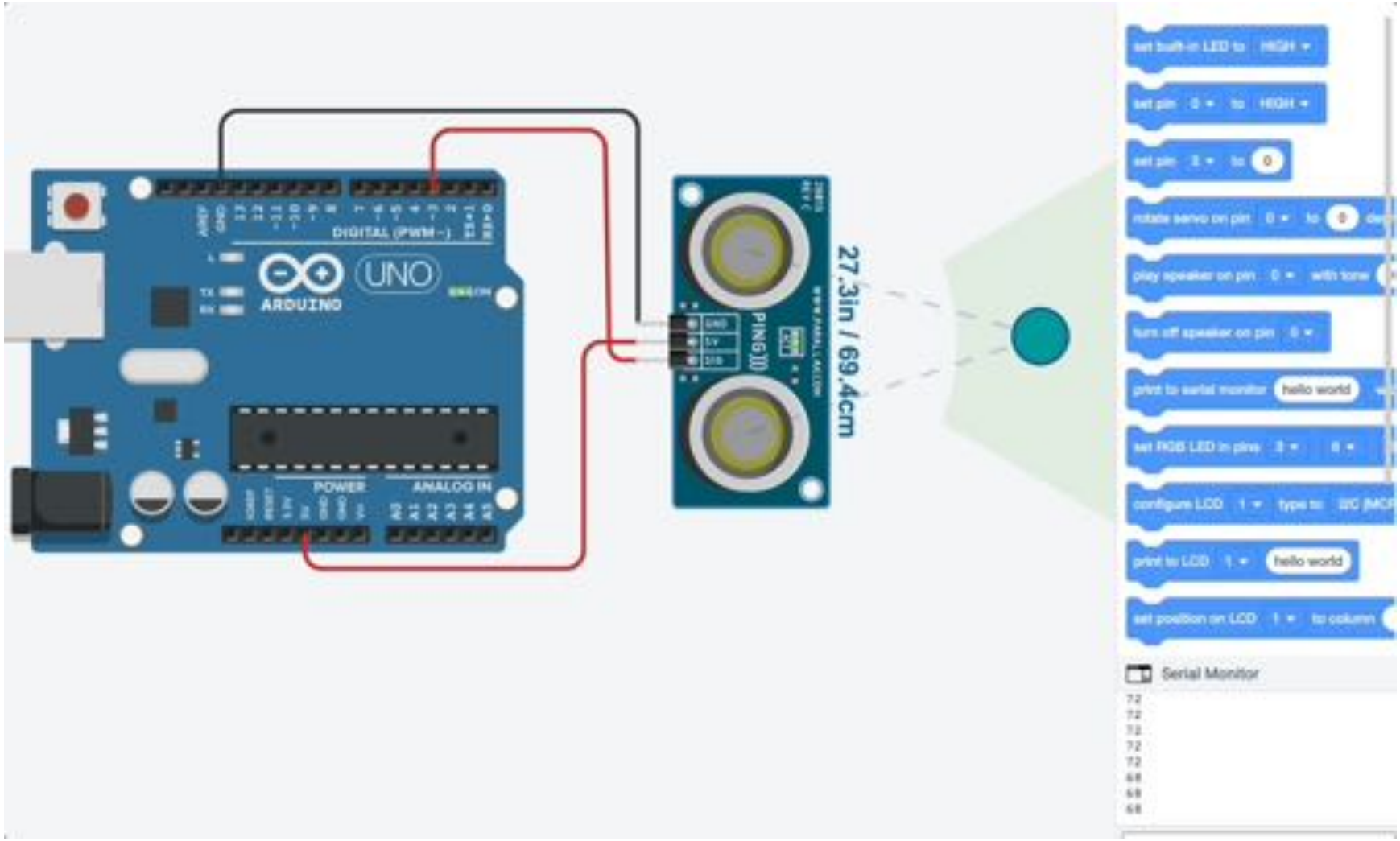
1. We are using the 3-pin sensor in this example
2. Connect sensor ground pin to Arduino ground pin
3. Connect sensor power pin to Arduino 5V pin
4. Connect sensor signal pin to Arduino pin 3



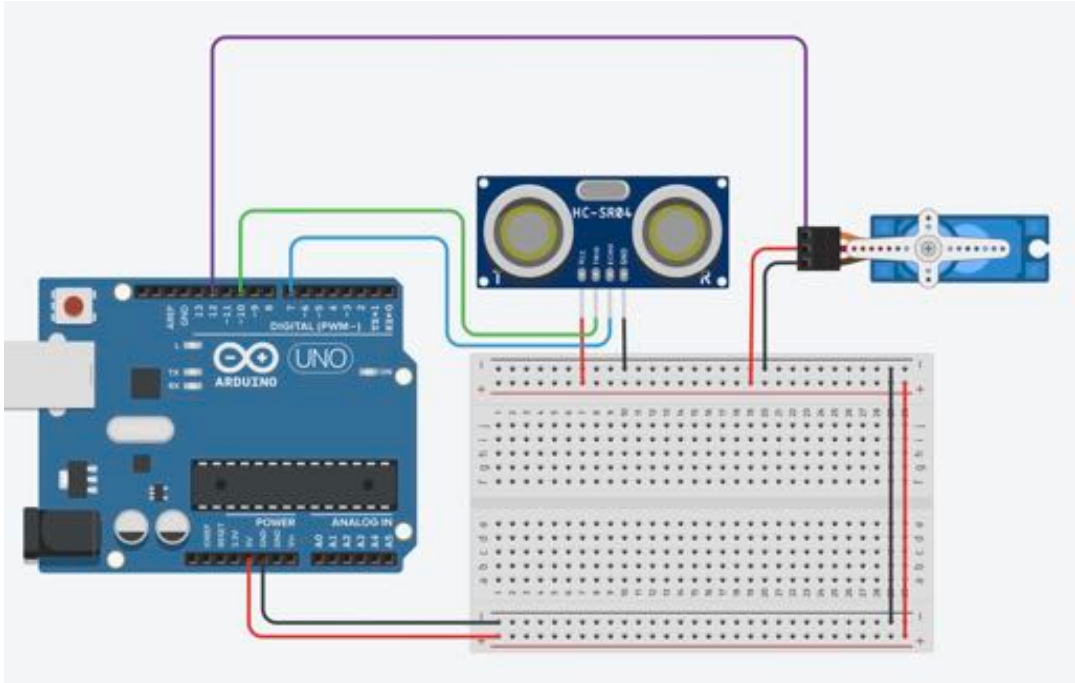
CODE

1. Create a new Variable. Name it ‘Distance’
2. Bring out Read Ultrasonic sensor command from Input
3. Inside a Forever loop, use the Set Distance command and insert the Read Ultrasonic command. Set trigger pin to 3 and echo pin to ‘same as trigger’.
4. From Output, bring out Print to Serial Command
5. Insert the Distance variable in the Print to Serial command (serial monitor in Tinkercad will now display the distance





Tinkercad Project Link: https://www.tinkercad.com/things/lPVfrrqLWxh



Ultrasonic Sound Sensor

Controlling Servo

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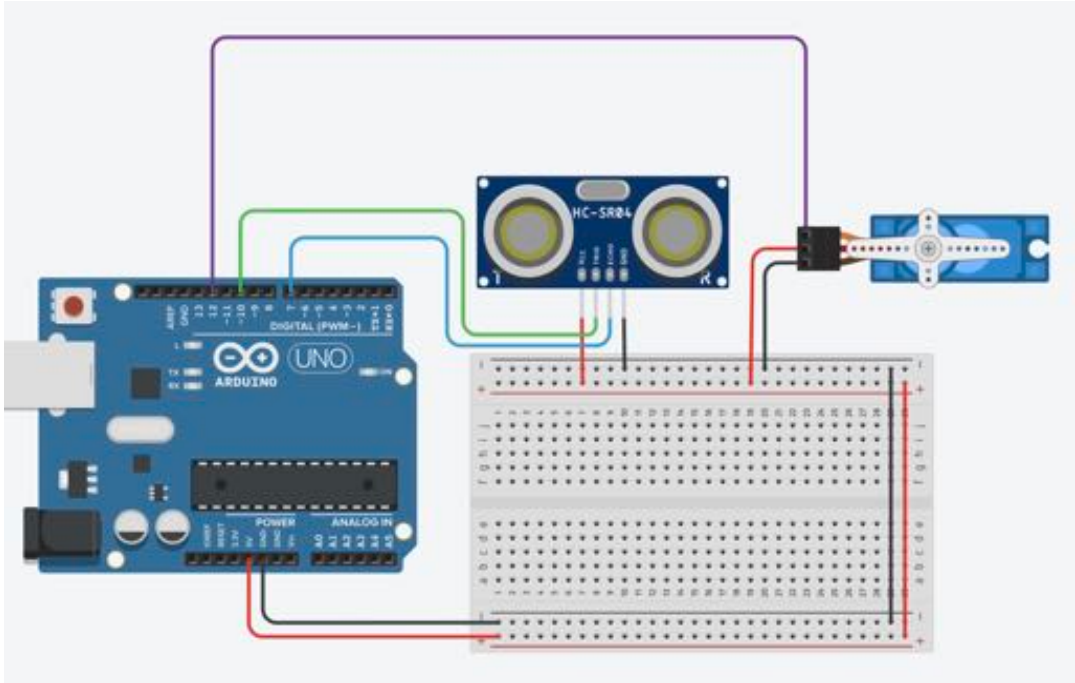

STEPS:

1. We are using the 4-pin Ultrasonic sensor in this example
2. Connect sensor ground pin to Arduino ground pin
3. Connect sensor voltage pin to Arduino 5V pin
4. Connect sensor Trigger pin to Arduino pin 10
5. Connect sensor Echo pin to Arduino pin 7
6. Connect Servo voltage pin to Arduino 5V and servo ground pin to Arduino GND pin
7. Connect Servo signal pin to Arduino pin 12

CODE

1. Create a new Variable. Name it ‘Distance’
2. Bring out Read Ultrasonic sensor command from Input
3. Inside a Forever loop, use the Set Distance command and insert the Read Ultrasonic command. Set trigger pin to 10 and echo pin to 7. Set units to c.m.
4. From Output blocks, bring out a Print to Serial Monitor command and insert Distance variable in this command.
5. Inside an If-Then conditional statement, bring a ‘less than’ block from Math and write the command, “If (variable) Distance < 100”
6. In the If condition, add command “Rotate Servo on pin 12 to 0°” followed by “Wait 2 seconds”
7. In the Else condition, add command “Rotate Servo on pin 12 to 90°” followed by “Wait 2 seconds”

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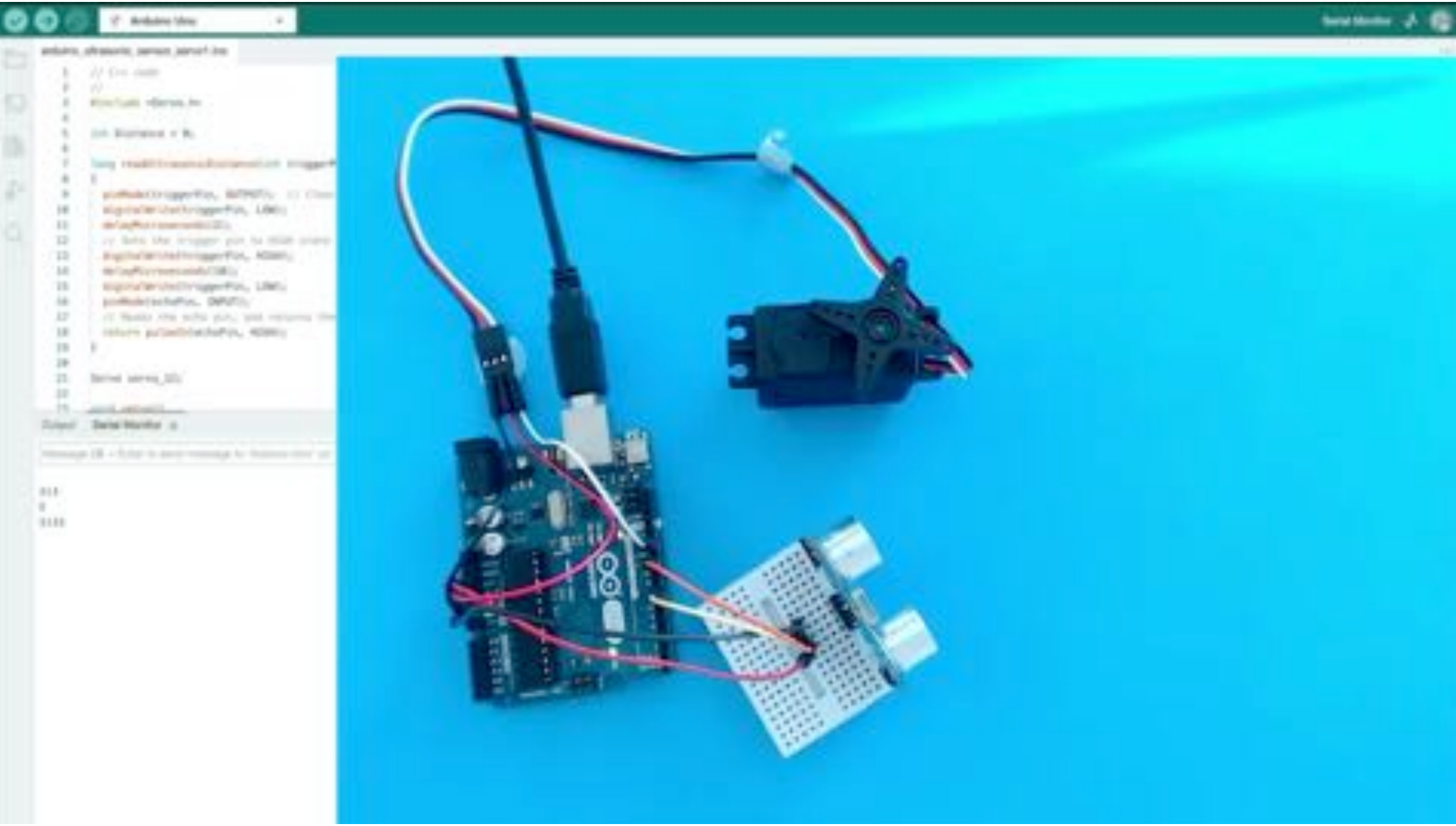
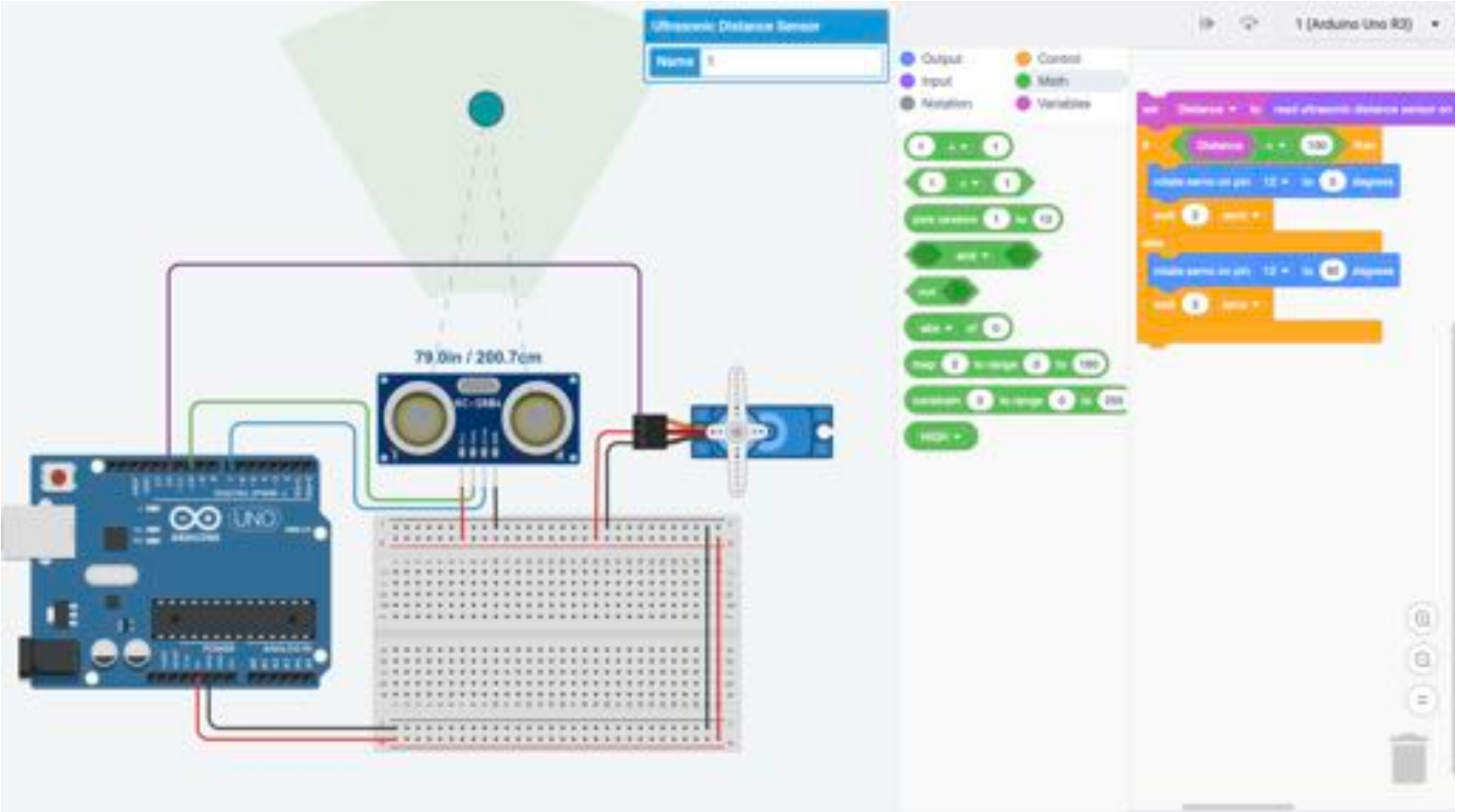
```
set Distance to read ultrasonic distance sensor on trigger pin 10 echo pin 7 in units cm
print to serial monitor Distance with newline
if Distance < 50 then
    rotate servo on pin 12 to 0 degrees
    wait 2 secs
else
    rotate servo on pin 12 to 90 degrees
    wait 2 secs
```





Tinkercad Project Link: https://www.tinkercad.com/things/hgjIDvGDeTL