



Lesson 9 &10:

Project Assignment

Engineering & Robotics

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Announcement!

- ❖ Servomotors **MUST** be handled with care. Do not turn it at will.
- ❖ Connect the **POLARITY** of Capacitors correctly.
- ❖ **TWO WEEKS** class

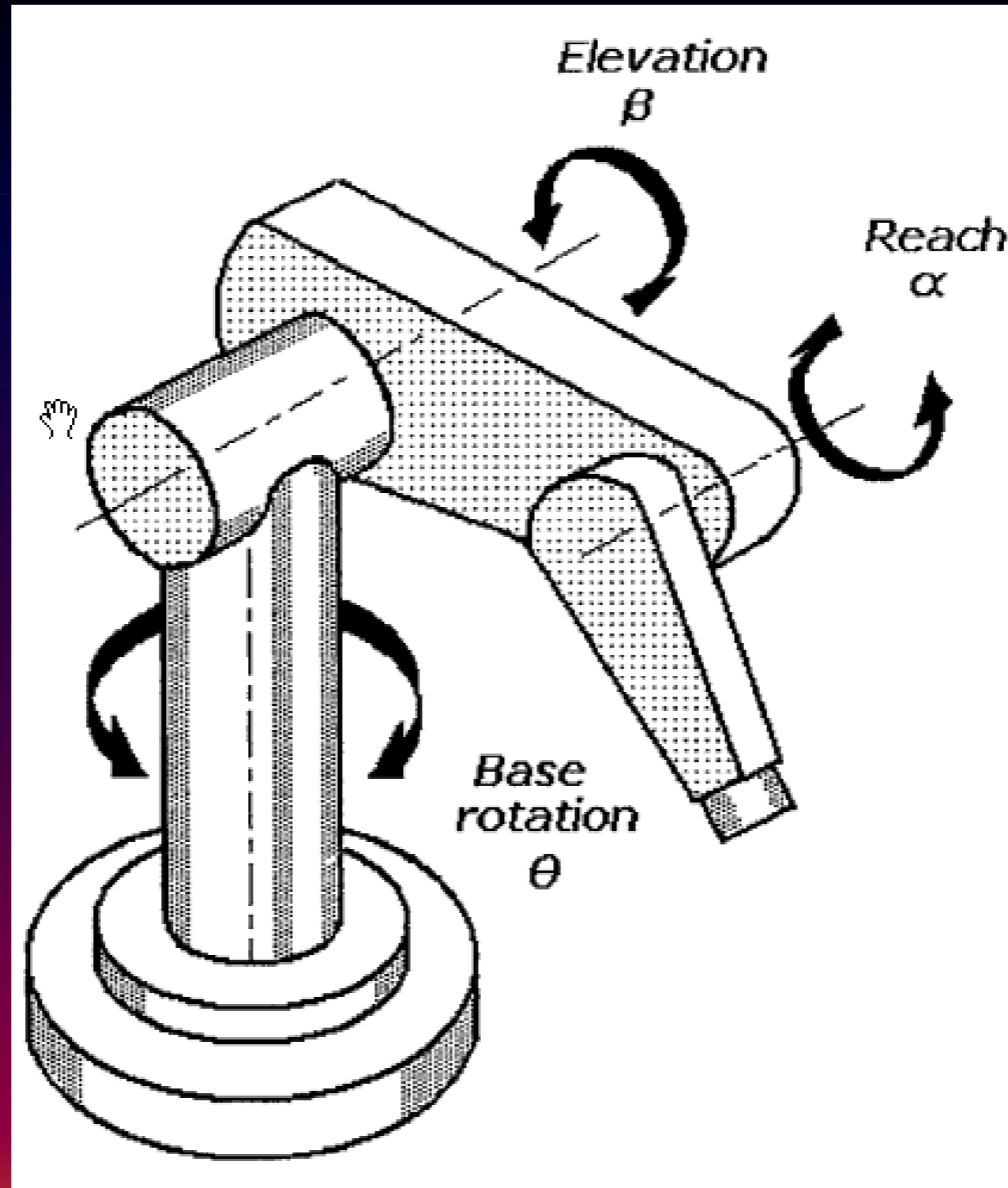
Design Build Code Troubleshoot

- ❖ **Design:** Idealisation
- ❖ **Build:** Assemble
- ❖ **Code:** Sketch
- ❖ **Troubleshoot:** Make it work!

Video 2

Lesson	Component	Command	Remark
1	Light Emitting Diode (LED)	digitalWrite (pin, value)	output
2	Resistor (R)	int, const int	variable
3	Push button (PB)	pinMode (pin, mode) digitalRead (pin)	- input
4	Light Dependent Resistor (LDR)	analogRead (pin)	input
5	Servomotor (servo)	for (i=0; i<x; i++)	loop
6	DC Motor	analogWrite (pin, value)	output
7	Display Panel	Library <library.h>	

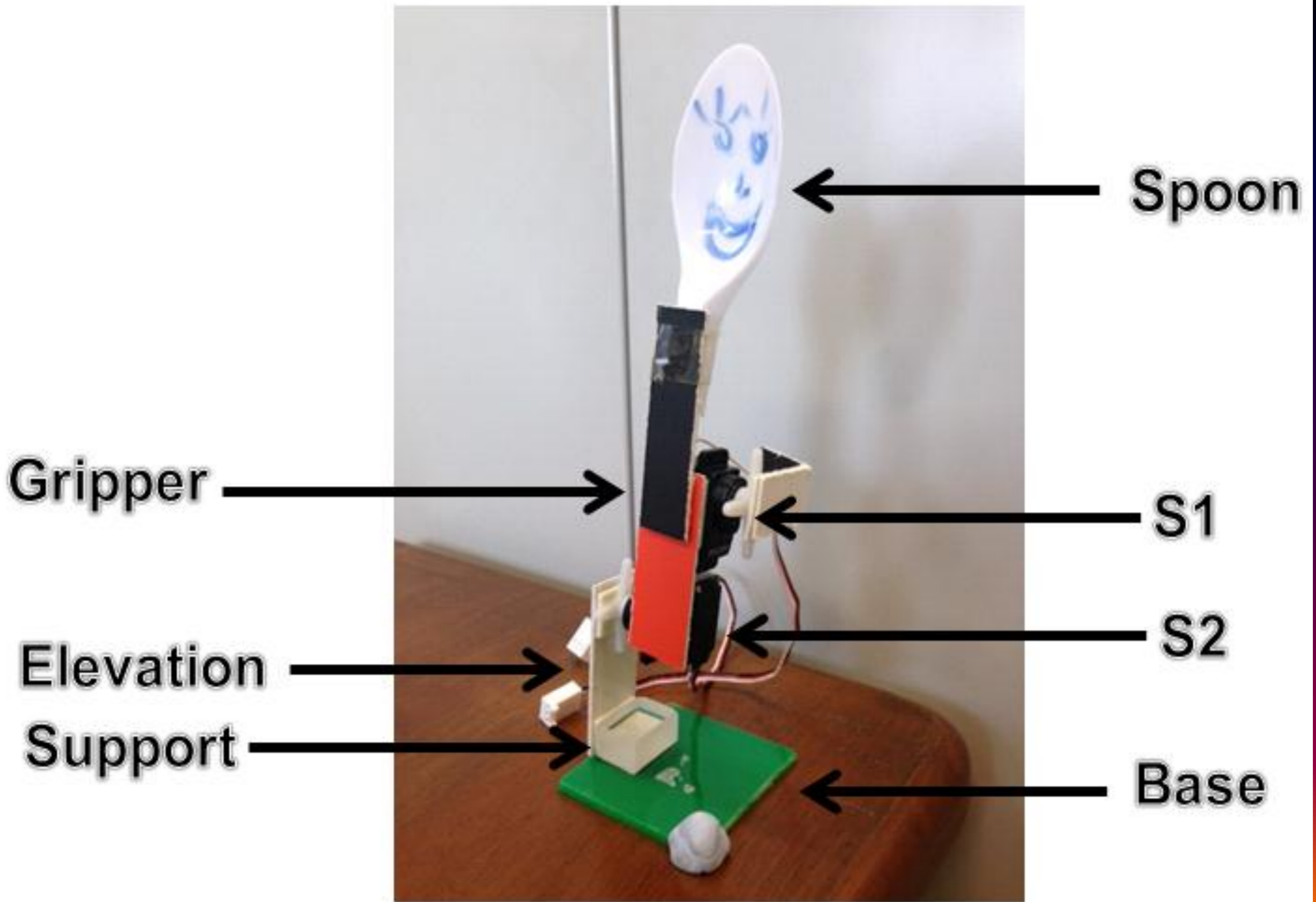
At a glance

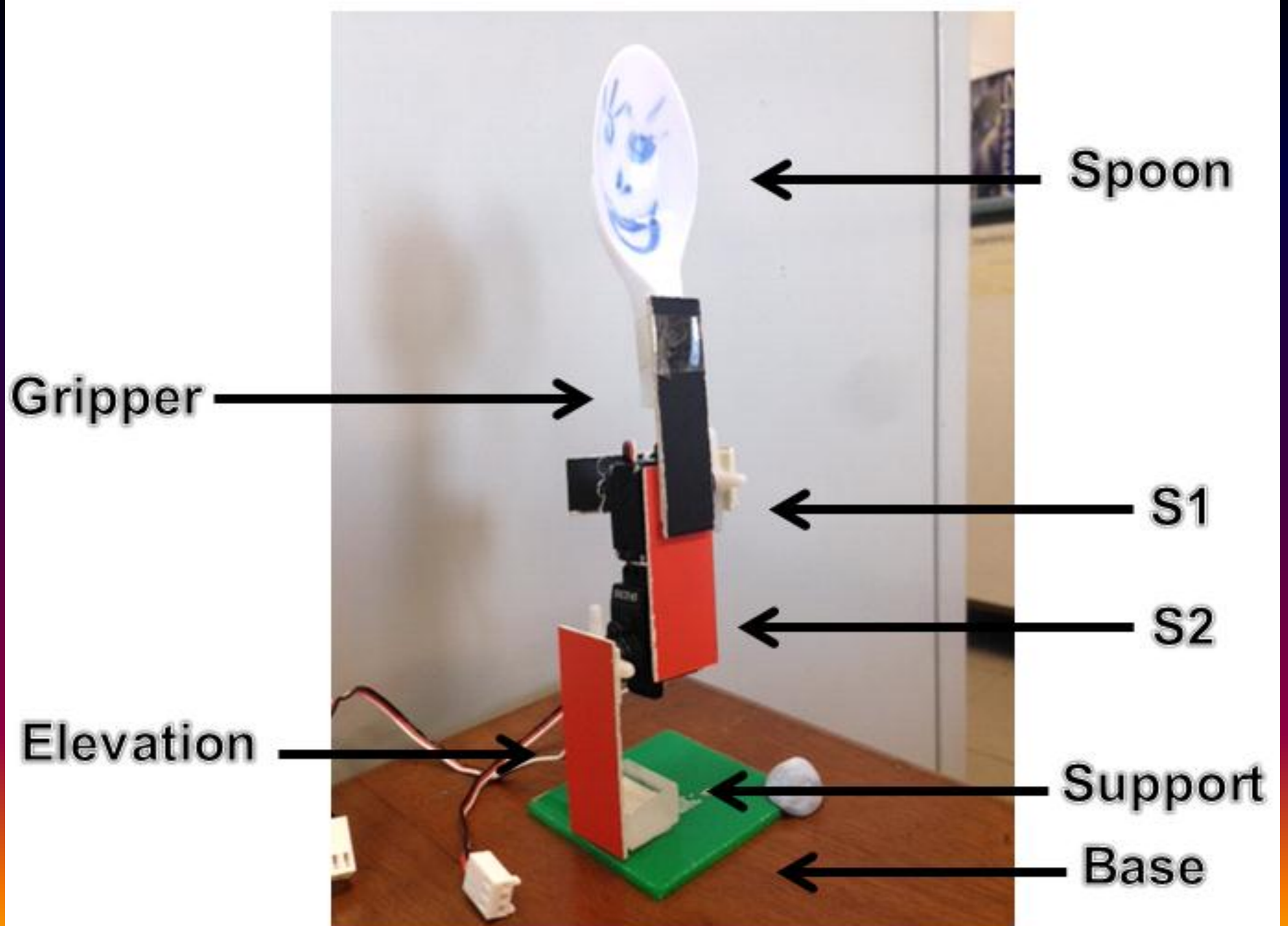


Design (Idea)

Design (Materials)

Part	Material	Quantity
Gripper	Cardboard	1 pc
Spoon	Plastic	1 pc
Reach	PVC	1 pc
Elevation	PVC	1 pc
Support	Acrylic	1 pc
Base	Acrylic	1 pc





Let's Construct!

You will need:

1. 1 Screwdriver
2. 1 Double-sided tape
3. 1 Scissors
4. Materials (Base, Support, Elevation, Gripper & Spoon)
5. 4 Servo motors

Build (Electronic)



Breadboard



Servomotor



Push Button



Capacitor



Jumper wires

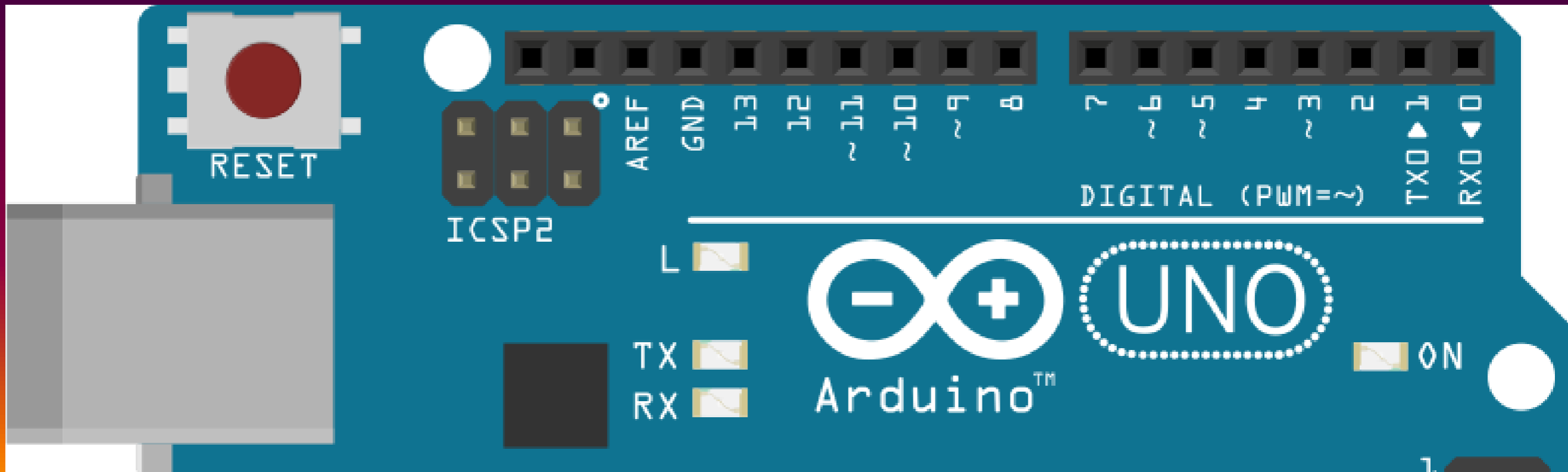


Resistor (10kohms)

PWM Pins

Hint: There are 6!

Digital Input & Output
Pin #1 - 13



Build (Electronic)

		1	2	3	4	5	6	7	8	9	10	11	12	13
A	Shade PWM			■		■	■			■	■	■		
B	Tick pins			✓		✓								
C	Servo Indicator			S1		S2								
D	Push Button													PB

- ❖ A : Identify PWM pins
- ❖ B : Select 4 PWM pins
- ❖ C : Label servomotors to pins
- ❖ D: Pin for push button

*** Important ***

Servomotor wiring

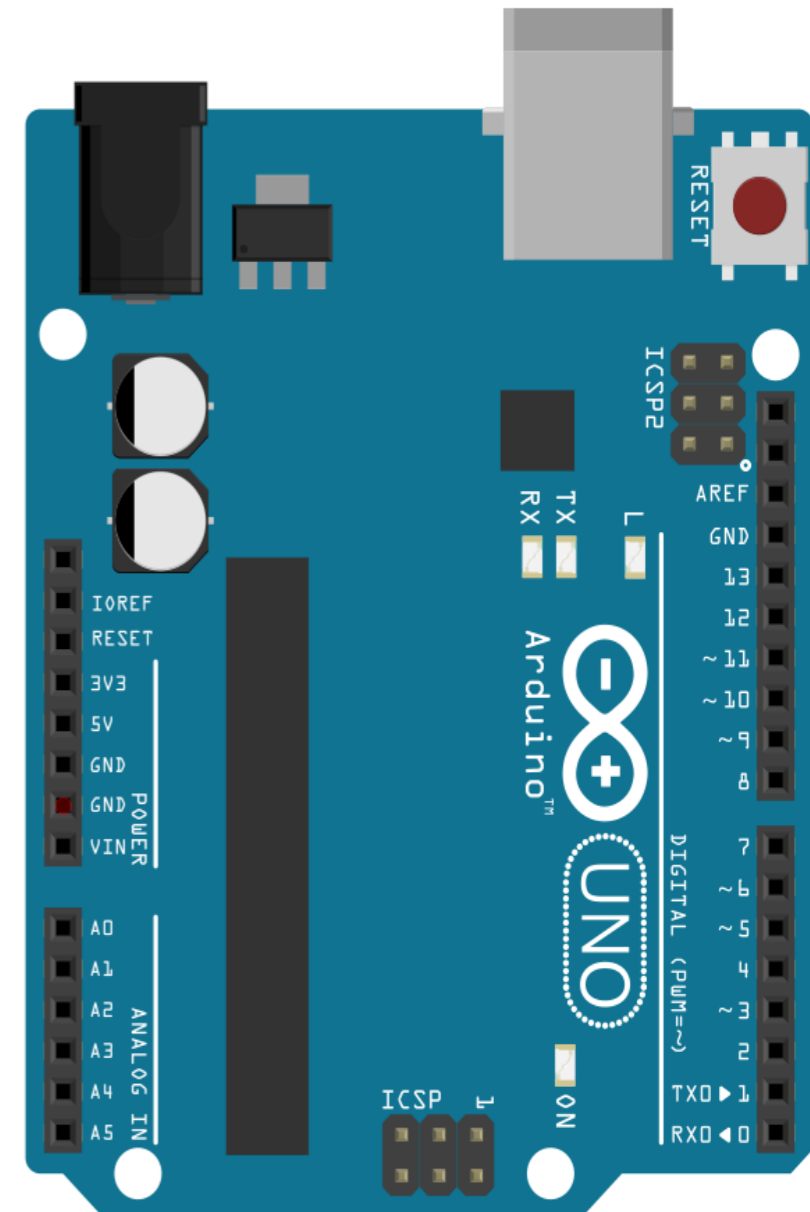
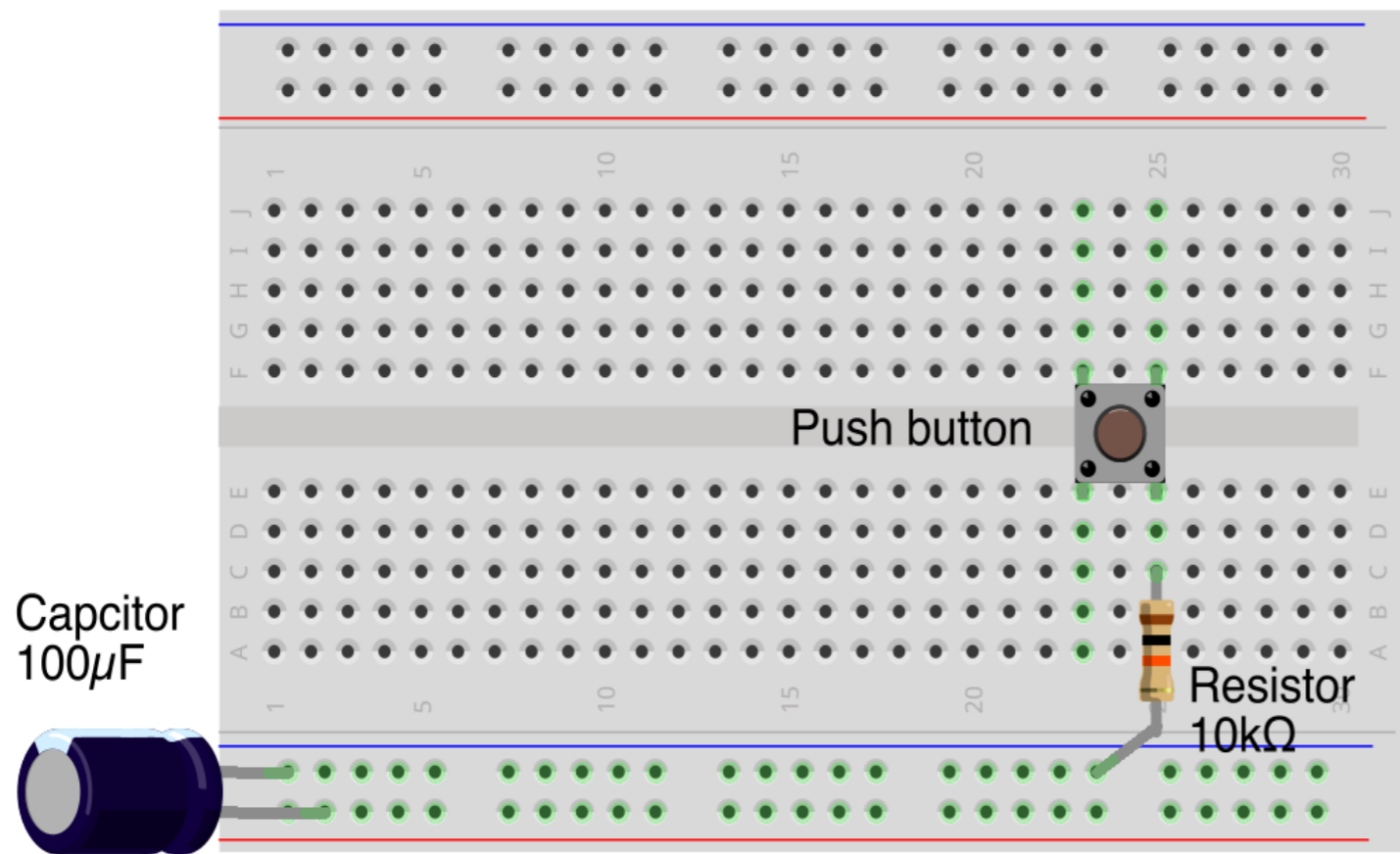
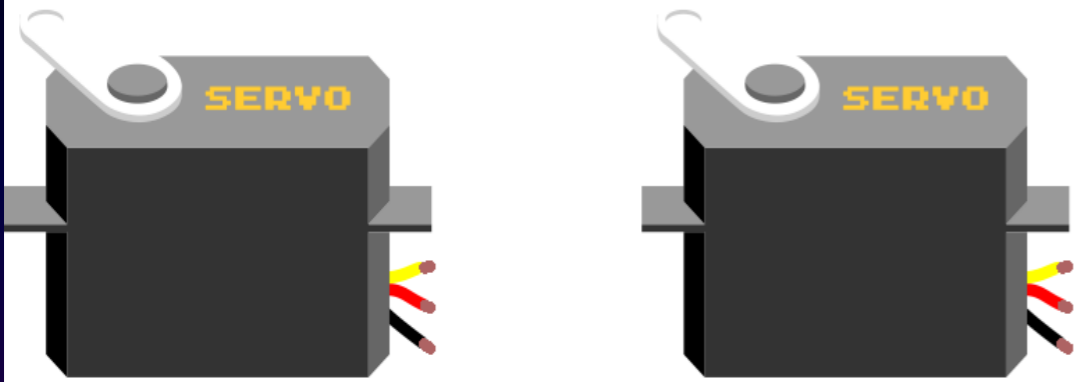


Page 5, Note 1 (Highlight)

Servo1 (S1)

Servo2 (S2)

Page 6



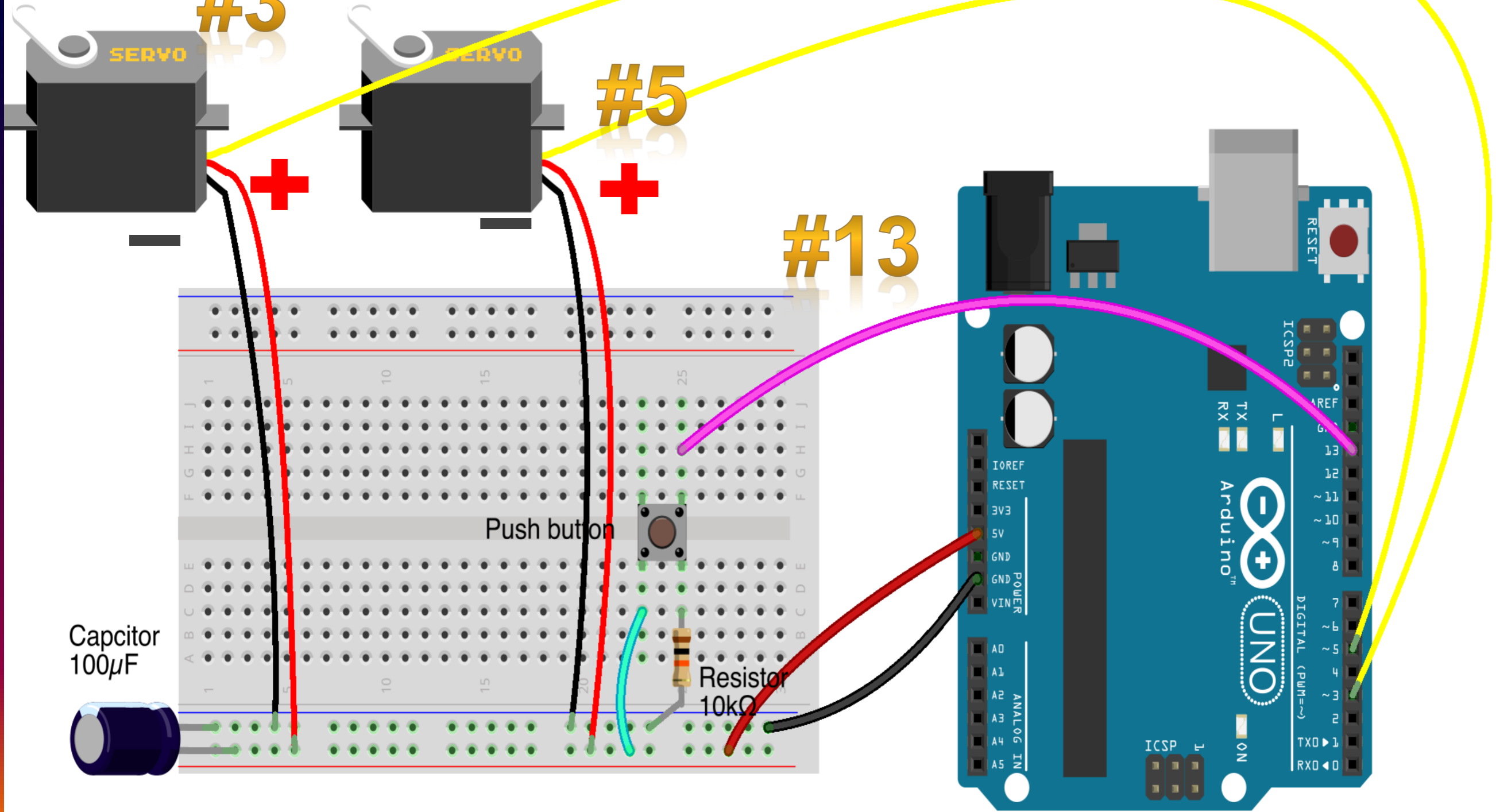
Servo1 (S1)

Servo2 (S2)

#3

#5

#13



Page 6; C3.Code

Part	Servo	Minimum Angle	Initial Angle	Maximum Angle
Gripper	S1	0	90	90
Reach	S2	0	90	180

Instruction and Demo

- ❖ Half of the class nearer to the corridor move to the front of the Lab for Demo of Robotic Arm

Split

- ❖ The other half move to the back of the Lab for instructions on the materials

Lets get Coding! (Declare)

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

```
Servo S1;           // create servo object to control a servo  
Servo S2;
```

```
const int button = 13;           // button to pin 13  
int currentState = LOW;         // button is depressed
```


Lets get Coding! (Prepare)

```
void setup()  
  
{  
  
  S1.attach(3);           // assign S1 to Pin 3  
  S2.attach(5);           // assign S2 to Pin 5  
  
  
  S1.write(90);           // set servo at 90 deg position  
  S2.write(90);           // set servo at 90 deg position  
  
  
  pinMode(button, INPUT); // set the push button as INPUT  
  delay(3000);            // pause for 3 secs  
  
}
```

Lets get Coding! (Execute)

```
void loop()
{
  currentState = digitalRead(button); // read the state of button
  if (currentState == HIGH) // if the button is pressed
  {
    S1.write(10); // 0 < angle < 90
    delay (1000); // pause for 1 sec
    S1.write(180); // 0 < angle < 180
    delay (3000); // pause for 3 sec
    S1.write(180); // 0 < angle < 180
    delay (3000); // pause for 3 sec
  }
}
```

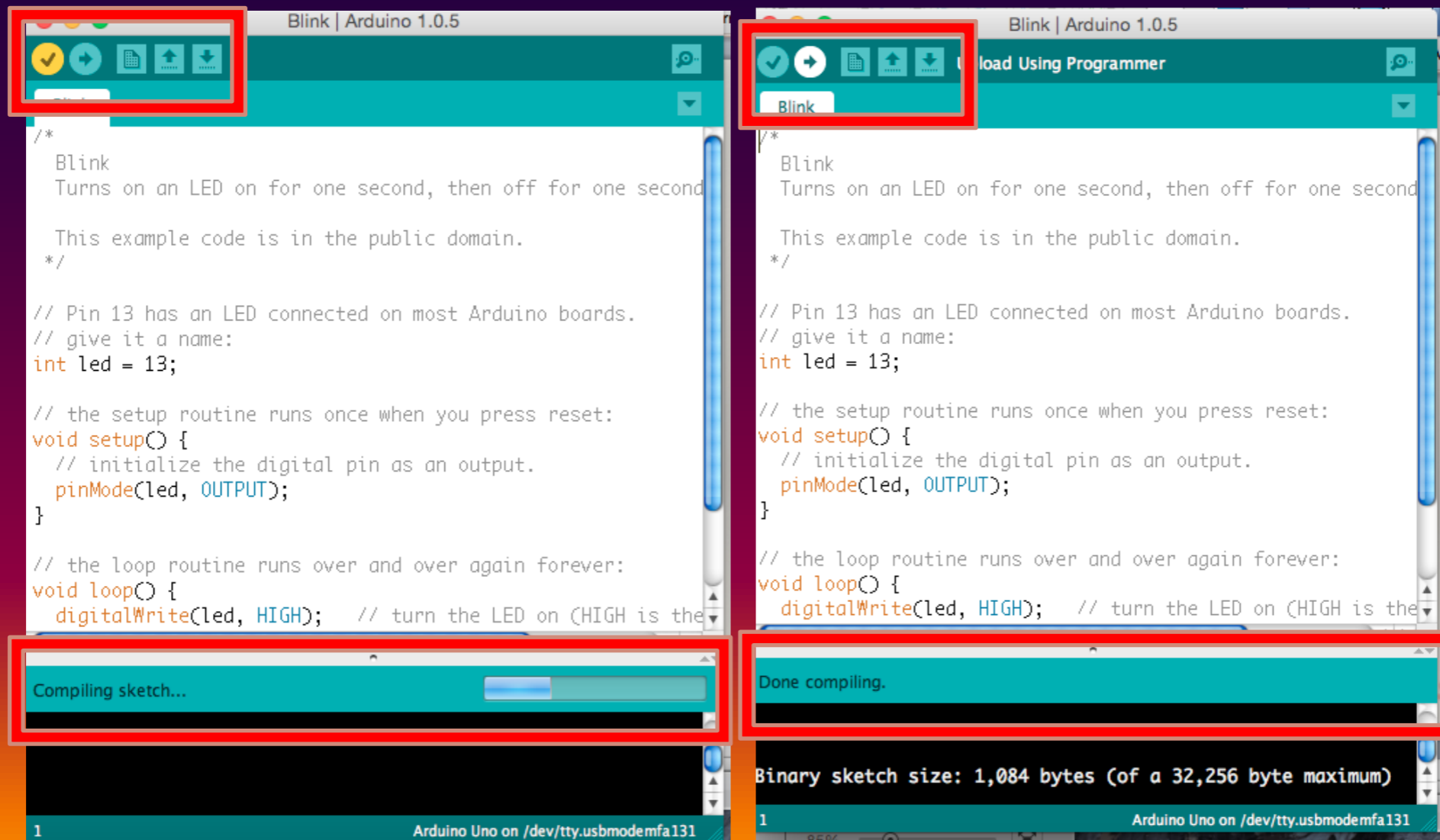
Lets get Coding! (Execute)

```
else // if the button is depressed (reset)
{

// 0 < angle < 90
// pause for 0.5 sec
// 0 < angle < 180
// pause for 0.5 sec
}
}
```

Troubleshoot

Step 1: Click the Verify button (to check for errors)

Step 2: Click the Upload button



Troubleshoot (Lets Think!)

Were there errors upon verifying your program?

How do you correct it?

Troubleshoot (Lets Think!)

Is your arm able to move upon uploading your sketch?

What was your greatest challenge?

Troubleshoot (Lets Think!)

Could you identify what part(s) went wrong?

Discuss with your Educator

Challenge Yourself!

Add another switch to your circuit.

Program another set of instructions to perform another arm movement as shown in Video 2

Use the sketch given in the Project Website.

Show your educators how yours work!!

Before you go...

Step 1: Disconnect all your components

Step 2: Click: File > Examples > 01.Basics > Blink

Step 3: Click the Upload button

