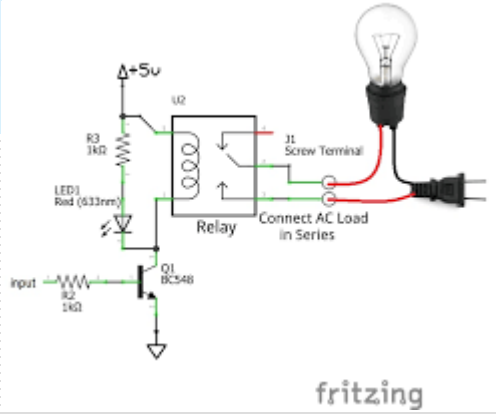
CSE423: Embedded System Summer-2020

Control Servo Motor and AC Appliances



Todays Lecture

- *What is Servo Motor*
- *Application of Servo Motor*
- *How to control Servo Motor*

- *What is Relay*
- *Application of Relay*
- *How to use Relay to Real Life Appliances*

Servo Motor

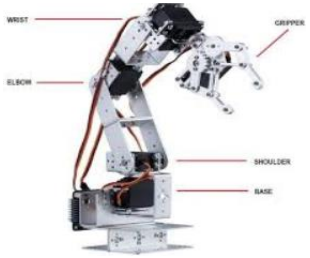
- **S**ervo **M**otors are high torque motors which are commonly used in robotics and several other applications as it's easy to **control their rotation**.

- Servo motors have a geared output shaft which can be electrically controlled to turn **one degree** at a time.

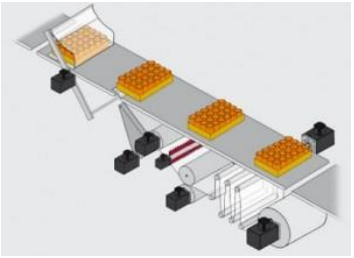
- Usually servo motors have an additional pin asides the two power pins (Vcc and GND) which is the **signal pin**. The signal pin is used to control the servo motor, turning its shaft to any desired angle.

Application of Servo Motors

- The servo motor is used in robotics to activate movements, giving the arm to its precise angle.



- The Servo motor is used to start, move and stop conveyor belts carrying the product along with many stages. For instance, product labeling, bottling and packaging

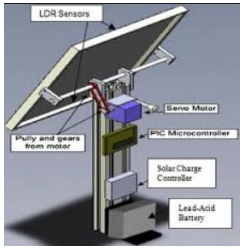


- The servo motor is built into the camera to correct a lens of the camera to improve out of focus images.

Application of Servo Motors

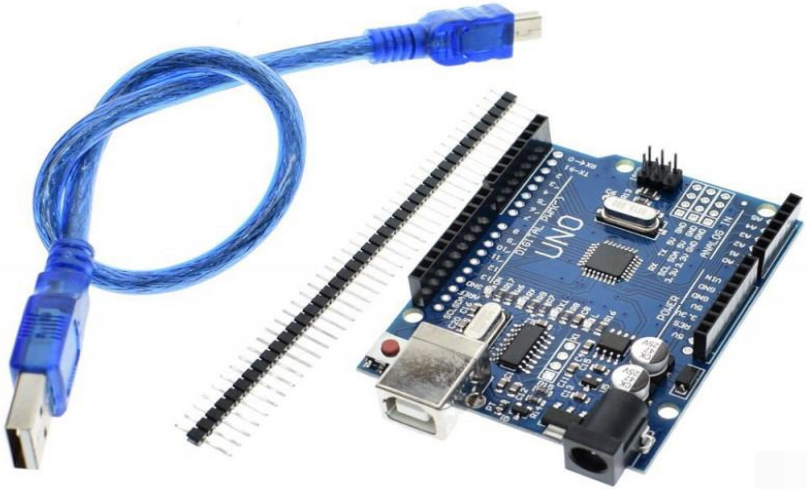
- The servo motor is used in robotic vehicle to control the robot wheels, producing plenty torque to move, start and stop the vehicle and control its speed.

- The servo motor is used in solar tracking system to correct the angle of the panel so that each solar panel stays to face the sun.

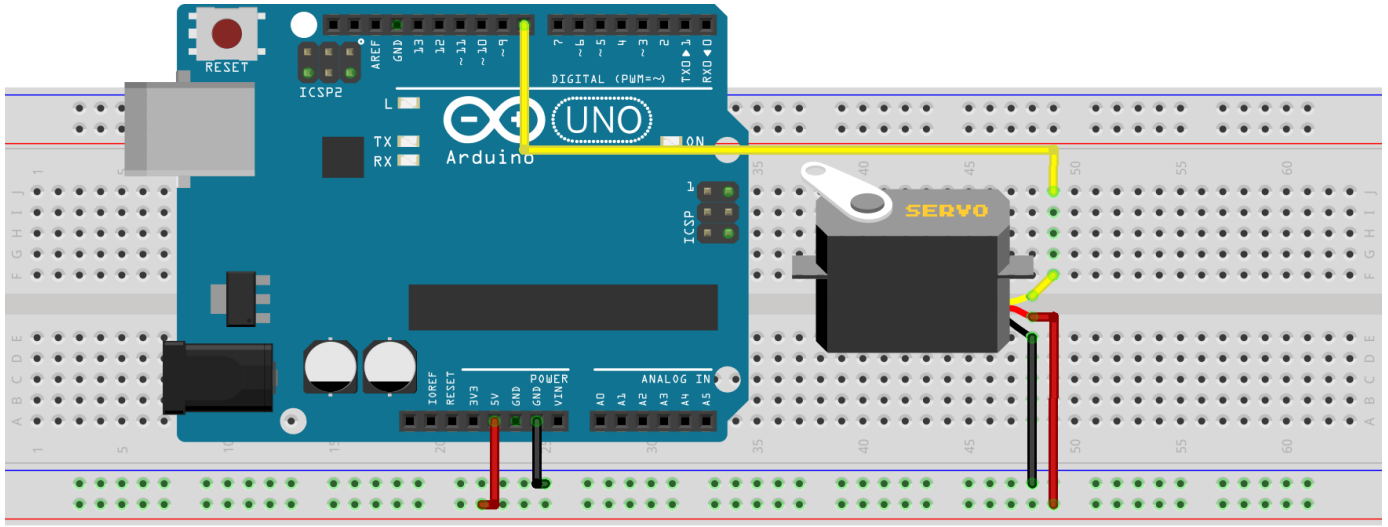


- The Servo motor is used in metal forming and cutting machines to provide specific motion control for milling machines.

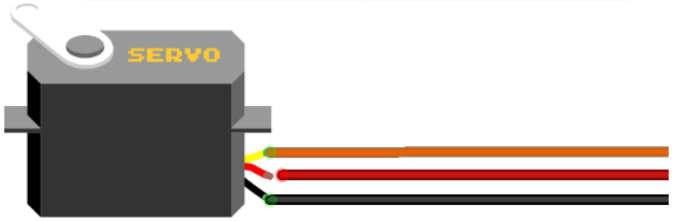
Required Components



Connection Diagram



SG90 Servo Motor	Arduino Board
Brown	GND
Red	5V
Yellow	D8



Code to run the **Servo Motor**


```
#include <Servo.h>

Servo servo;
int angle = 10;

void setup()

{
  servo.attach(8);
  servo.write(angle);
}
```

```
void loop()
{
 // scan from 0 to 180 degrees

for(angle = 10; angle < 180; angle++)
  {
    servo.write(angle);
    delay(15);
  }

  // now scan back from 180 to 0 degrees

for(angle = 180; angle > 10; angle--)
  {
    servo.write(angle);
    delay(15);
  }
}
```

Can you remember the last slide of last lesson?

What About Controlling the Speed of your Home Ceiling Fan??

Relay

A **Relay** is a programmable electrical switch, which can be controlled by Arduino or any micro-controller. It is used to control (on/off) devices, which use the high voltage and/or high current (AC).

It is a bridge between Arduino and high voltage devices (our home appliances like TV, Fridge, Fan, Light).

⚠ WARNING

When you are making projects that are connected to mains voltage, you need to know what you are doing, otherwise, you may shock yourself. This is a serious topic, and we want you to be safe. If you're NOT 100% sure what you are doing, do yourself a favor and don't touch anything. Ask someone who knows!

Although some kinds of relays support both DC and AC devices, We highly recommend you to use a DC device (≤24V) for testing.

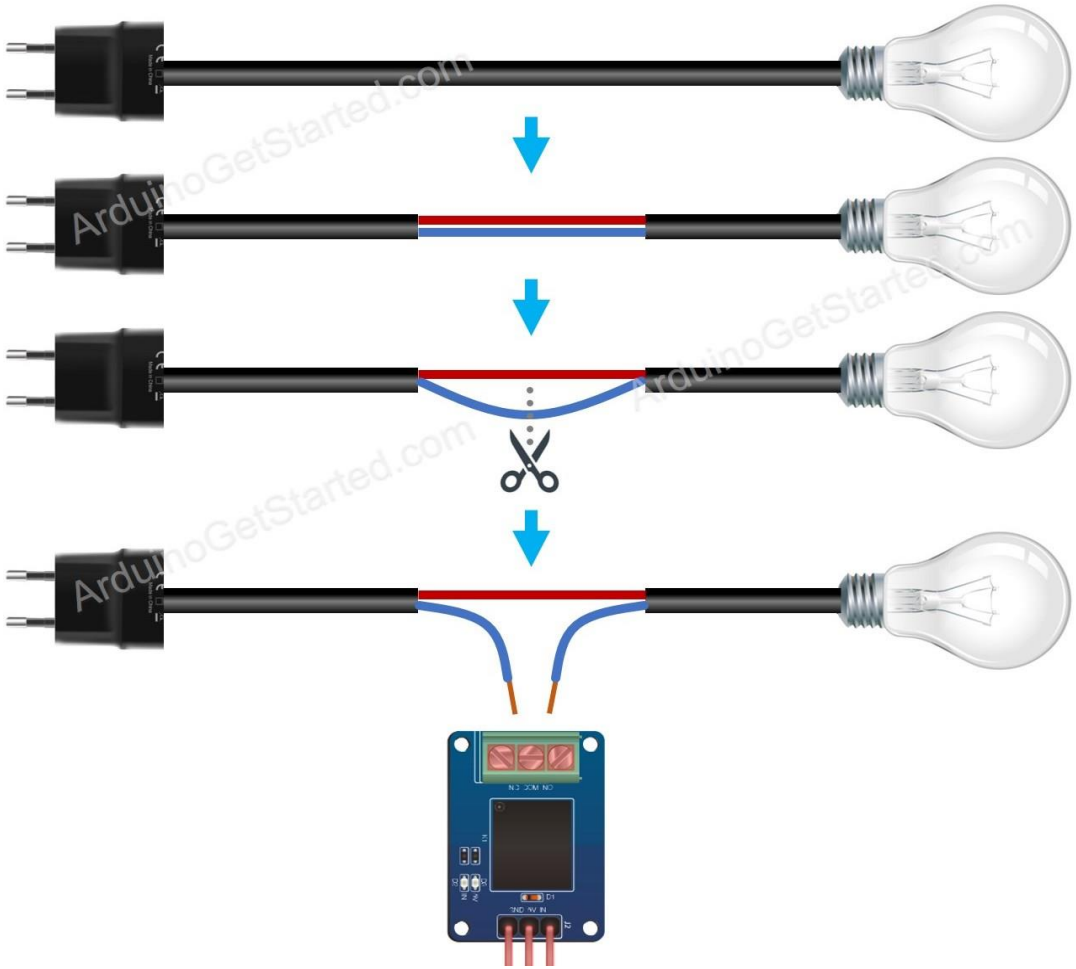
Relay (Pin Diagram)

Relay

Relay has two groups of pins: low voltage group and high voltage group.

- Pins in the low voltage group are connected to Arduino, including three pins:
  - GND pin needs to be connected to **GND** (0V)
  - VCC pin needs to be connected to **VCC** (5V)
  - IN pin receives the control signal from Arduino
- Pins in the high voltage group are connected to high voltage a device, including three pins (usually in screw terminal):
  - COM pin is the common pin. It is used in both normally open mode and normally closed mode
  - NO pin is normally open pin. It is used in the normally open mode
  - NC pin is normally closed pin. It is used in the normally closed mode

How to Connect the High Voltage Device to Relay

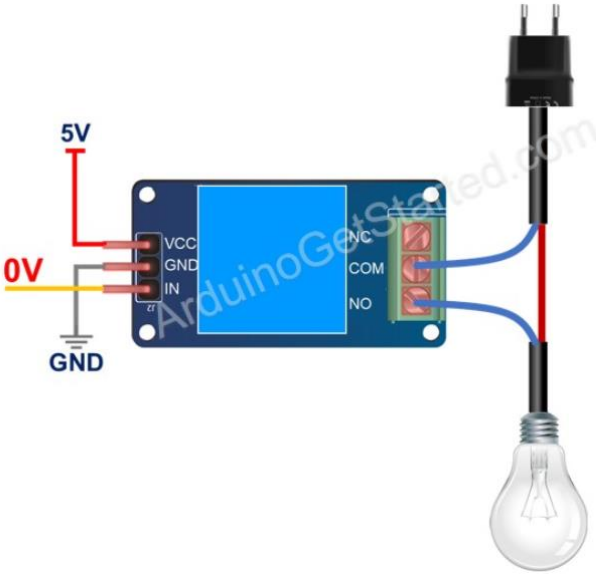


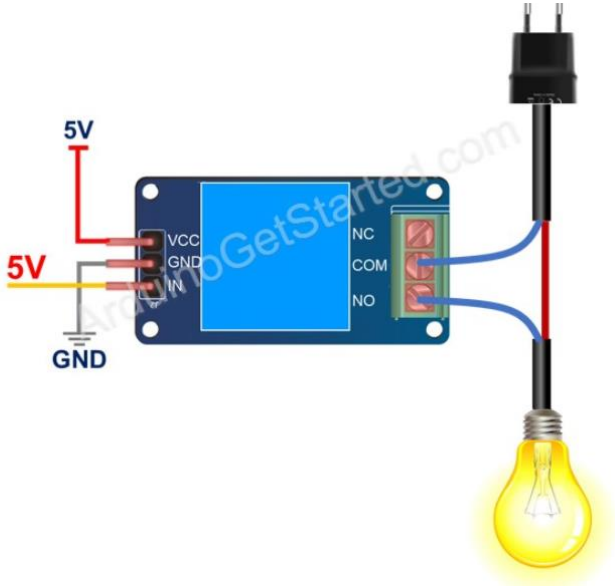
How to Connect the High Voltage Device to Relay

Usually we use Normally Open **(NO)** mode to control the any high voltage device:

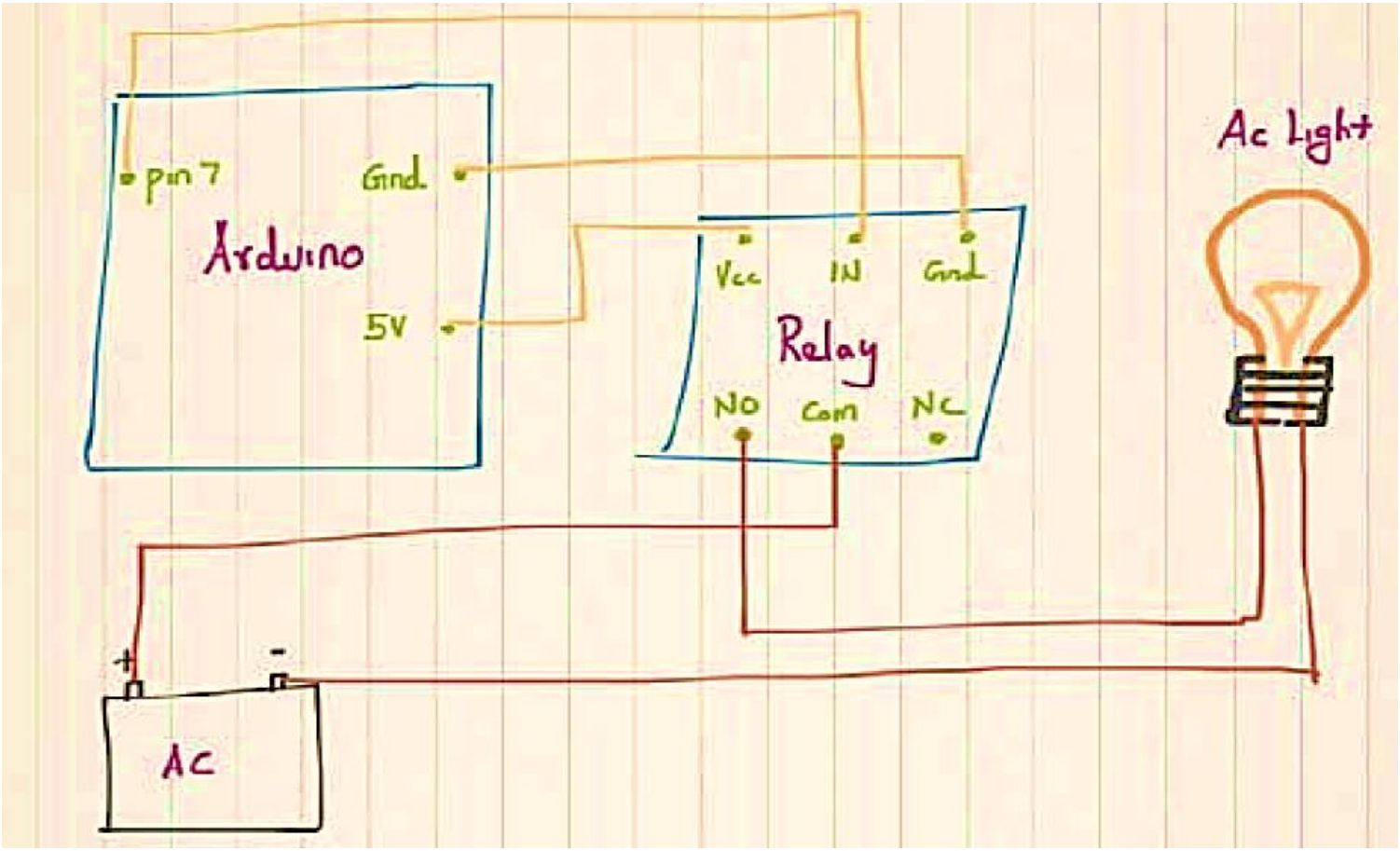
To use this mode, we need to connect the high voltage device to the COM pin and NO pin.

- If the IN pin is connected to **LOW** (0V), the switch is open. The device is **OFF** (or inactive).
- If the IN pin is connected to **HIGH** (5V), the switch is closed. The device is **ON** (or active).





Complete Connection Diagram



Code to Control the AC Device

```
const int RELAY_PIN = 7;  // the Arduino pin, which connects to the IN pin of relay

void setup()
{
pinMode(RELAY_PIN, OUTPUT);  // initialize digital pin 7 as an output
}

void loop()                                  // The code will turn on/off the light for 5 seconds

{
  digitalWrite(RELAY_PIN, HIGH);
  delay(500);
  digitalWrite(RELAY_PIN, LOW);
  delay(500);
}
```

Control any device in your home and share us your experience