

## PRACTICAL - 4

### ***AIM: Integration of a motor based actuator with Arduino board***

#### **Introduction to Servo Motor**

A servo motor is an electrical device which can push or rotate an object with great precision. If you want to rotate an object at some specific angles or distance, then you use servo motor. It is just made up of simple motor which runs through servo mechanism. If motor is used is DC powered then it is called DC servo motor, and if it is AC powered motor then it is called AC servo motor. We can get a very high torque servo motor in a small and lightweight packages. Due to these features they are being used in many applications like toy cars, RC helicopters and planes, Robotics, Machine etc.

Servo motors are rated in kg/cm (kilogram per centimeter) most hobby servo motors are rated at 3kg/cm or 6kg/cm or 12kg/cm. This kg/cm tells you how much weight your servo motor can lift at a particular distance. For example: A 6kg/cm Servo motor should be able to lift 6kg if the load is suspended 1cm away from the motors shaft, the greater the distance the lesser the weight carrying capacity. The position of a servo motor is decided by electrical pulse and its circuitry is placed beside the motor.

It consists of three parts:

- Controlled device
- Output sensor
- Feedback system

It is a closed loop system where it uses positive feedback system to control motion and final position of the shaft. Here the device is controlled by a feedback signal generated by comparing output signal and reference input signal. Here reference input signal is compared to reference output signal and the third signal is produced by feedback system. And this third signal acts as input signal to control device. This signal is present as long as feedback signal is generated or there is difference between reference input signal and reference output signal. So the main task of servo mechanism is to maintain output of a system at desired value at presence of noises.

#### **Working principle of Servo Motors**

A servo consists of a Motor (DC or AC), a potentiometer, gear assembly and a controlling circuit. First of all we use gear assembly to reduce RPM and to increase torque of motor. Say at initial position of servo motor shaft, the position of the potentiometer knob is such that there is no electrical signal generated at the output port of the potentiometer. Now an electrical signal is given to another input terminal of the error detector amplifier. Now difference between these two signals, one comes from potentiometer and another comes from other source, will be processed in feedback mechanism and output will be provided in term of error signal. This error signal acts as the input for motor and motor starts rotating. Now motor shaft is connected with potentiometer and as motor rotates so the potentiometer and it will generate a signal. So as the potentiometer's angular position changes, its output feedback signal changes. After sometime the position of potentiometer reaches at a position that the output of potentiometer is same as external signal provided. At this condition, there will be no output signal from the amplifier to the motor input as there is no difference between external applied signal and the signal generated at potentiometer, and in this situation motor stops rotating.



*Fig 4.1 - Servo Motor*

### **Code**

```
#include<servo.h>

int servopin=12;
Servo ServoDemo;

void setup(){
    ServoDemo.attach(servopin);
}

void loop(){
    ServoDemo.write(0);
    delay(1000);
    ServoDemo.write(90);
    delay(1000);
    ServoDemo.write(180);
    delay(1000);
}
```

### Circuit Diagram

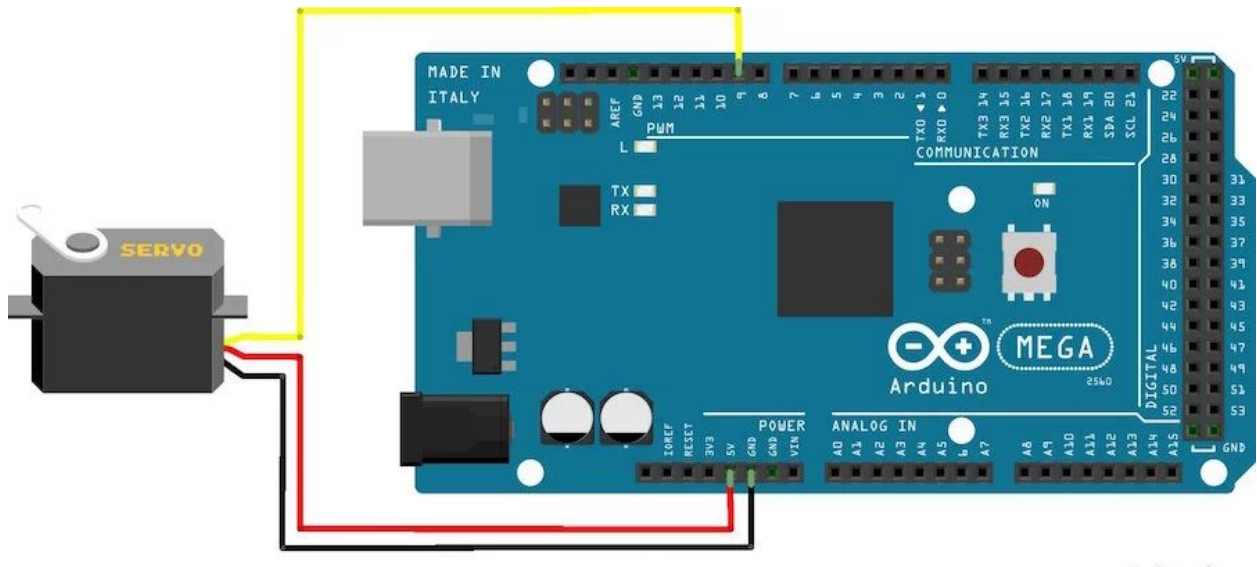


Fig 4.2 - Circuit Diagram for connecting Servo Motor with Arduino

### Output on Arduino with Servo Motor

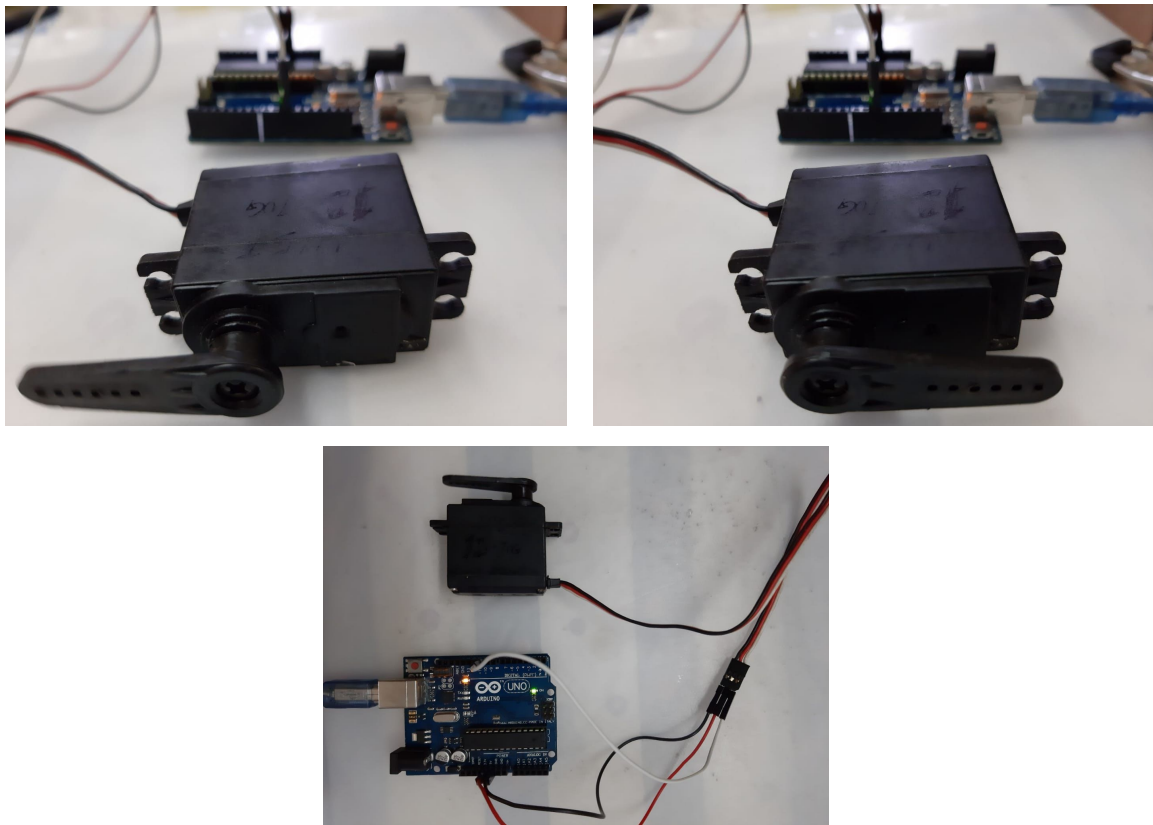


Fig 4.3 - Arduino UNO connected to Servo Motor