MIT World Peace University

Internet of Things
Second Year B. Tech, Semester 2

Interface of Servo Motor like Actuators with Development Boards

---

Assignment 3

Prepared By

Krishnaraj Thadesar
Cyber Security and Forensics
Batch A2, PA 20

May 2, 2023

Contents

1 Aim

To interface simple actuators such as DC Motor with Raspberry Pi/ ESP8266 boards / Beagle bone board/ Tinker CAD Arduino Uno.

2 Objectives

- To understand actuators interfacing with development boards
- Servo Motor control using LN298 motor driver and Arduino Uno

3 Component List

Name	Quantity	Component
U1	1	Arduino Uno R3
DIST1	1	Ultrasonic Distance Sensor
SERVO1	1	Positional Micro Servo

4 Theory

4.1 Stepper Motor

A stepper motor is a type of electric motor that rotates in small, precise steps. Stepper motors are commonly used in applications that require precise positioning, such as robotics, CNC machines, and 3D printers. Stepper motors have multiple coils that are energized in a specific sequence to produce precise steps of rotation.

The rotation of the stepper motor is controlled by a series of pulses sent to the motor driver, which energizes the coils in the correct sequence.

4.2 DC Motor

A DC (direct current) motor is a type of electric motor that uses a magnetic field to produce rotational motion. DC motors typically have two terminals that are connected to a DC power source.

When a current is applied to the motor, it generates a magnetic field that interacts with the magnetic field of the stator, causing the rotor to rotate. DC motors are commonly used in applications that require high torque and low speed, such as robotics, conveyor systems, and electric vehicles.

4.3 Servo Motor

A servo motor is a type of electric motor that uses feedback to control the position of the output shaft. Servo motors are commonly used in applications that require precise control of position and speed, such as robotics, RC cars, and model airplanes.

Servo motors have a built-in feedback mechanism that detects the position of the output shaft and adjusts the motor's operation accordingly. Servo motors typically have a limited range of motion (usually less than 180 degrees) and are used for applications that require precise control of motion.

4.4 LN298 Motor Driver

1. Dual H-bridge configuration: The L298 consists of two H-bridge circuits, which allows it to drive two DC motors or one bipolar stepper motor.
2. High current capacity: The L298 can handle a maximum current of up to 2 amps per channel, which makes it suitable for driving high-power motors.
3. Low voltage drop: The L298 has a low voltage drop, which means that it can operate with low voltage power supplies.
4. Built-in protection features: The L298 includes built-in protection features such as thermal shutdown, overvoltage protection, and under-voltage lockout, which help to protect the device from damage.
5. TTL and CMOS compatible inputs: The L298 has TTL and CMOS compatible inputs, which allows it to be easily interfaced with microcontrollers and other digital circuits.
6. Wide operating voltage range: The L298 can operate over a wide voltage range, typically from 5 volts to 46 volts, which makes it suitable for a variety of applications.
7. Compact package: The L298 is available in a compact 15-pin package, which makes it easy to integrate into small electronic devices.

5 Platform

Operating System: Arch Linux x86-64
IDEs or Text Editors Used: Arduino UNO
Compilers : C++ GNU Compiler

6 Circuit

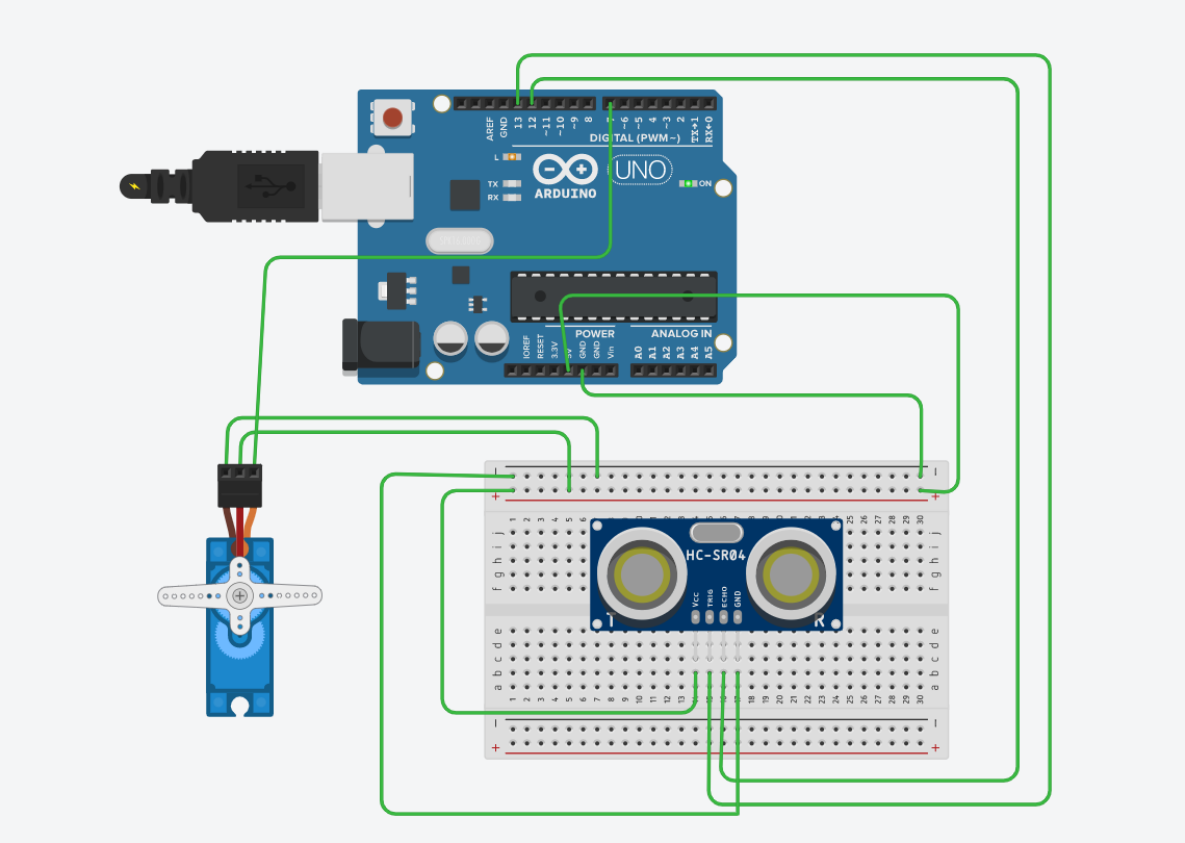

Figure 1: Circuit Diagram

7 Circuit Diagram

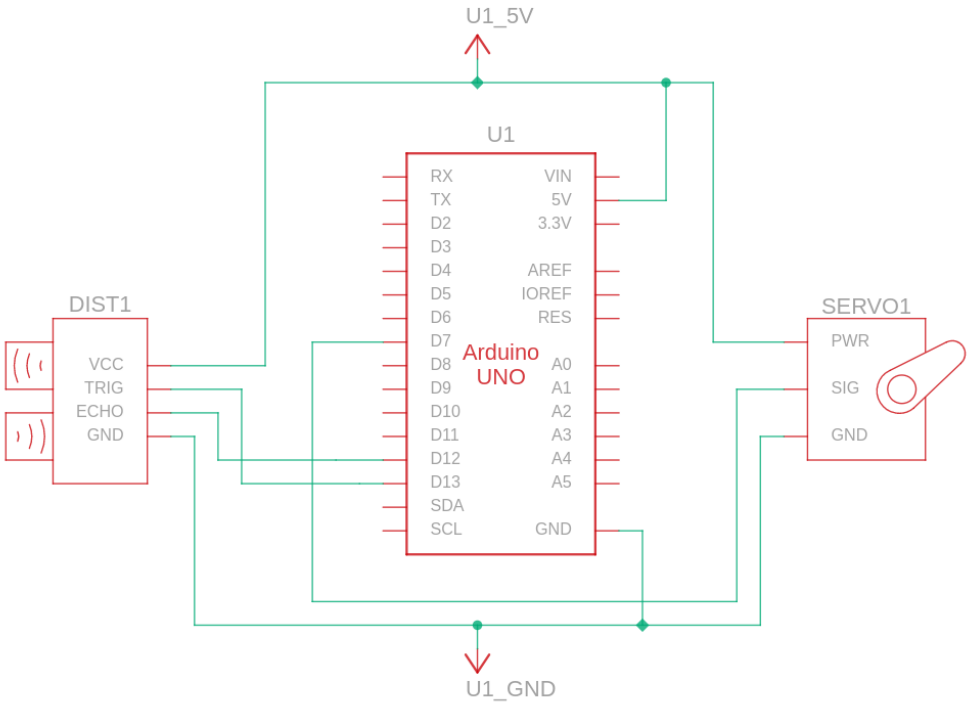

Figure 2: Circuit Diagram

8 Code

```
#include<Servo.h>
Servo srv;
#define maxdistance 100
void setup()
{
  Serial.begin(9600);
  pinMode(13, OUTPUT);
  pinMode(12, INPUT);
  srv.attach(7);

}

void loop()
{

  digitalWrite(13, LOW);
  delay(1000); // Wait for 1000 millisecond(s)
  digitalWrite(13, HIGH);
  delay(1000); // Wait for 1000 millisecond(s)
  digitalWrite(13, LOW);
  int d=pulseIn(12,HIGH);
  d=d/29/2;
  Serial.println(d);
```

```
24      if(d<=maxdistance)
25      {
26      srv.write(90);
27      delay(1000);
28      }
29      else
30      {
31      delay(1000);
32      srv.write(0);
33      }
34
35    }
```

9 Conclusion

Thus, we have successfully controlled the servo motor using the ultrasonic sensor and Arduino Uno.

10 FAQ

1. Arduino Uno R3 (Code: U1)
    - Type: Microcontroller board
    - Digital pins: 14
    - Analog input pins: 6
    - Operating voltage: 5V
    - Input voltage (recommended): 7-12V
    - Input voltage (limits): 6-20V
    - Flash memory: 32 KB (ATmega328P microcontroller)
    - SRAM: 2 KB (ATmega328P microcontroller)
    - EEPROM: 1 KB (ATmega328P microcontroller)
    - Clock speed: 16 MHz (ATmega328P microcontroller)
2. Servo Motor (Code: M1)
    - Type: DC motor with a built-in gear and feedback mechanism
    - Operating voltage: 4.8V to 6V
    - Stall torque: 1.8 to 12 kg-cm
    - Rotation angle: 0° to 180°
    - Control signal: Pulse width modulation (PWM)
    - Signal frequency: 50 Hz