MAE 598 MEDM: Lab # 6

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MAE 598: Mechatronics Engineering for Design & Manufacturing (MEDM)
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Question - Bonus Lab HW5

- Get familiar with distance sensors;
- Get exposure to close loop control;
- Constructing a linear motion system with all components.

Step1 Moves the linear stage platform from one side to the central position.

Step2 then move the linear stage two inches left and runs back to the central position.

Step3 moves the platform two inch right from the central position.

Physical Set Up

Circuit Diagram with connections.
Figure 1 & 2

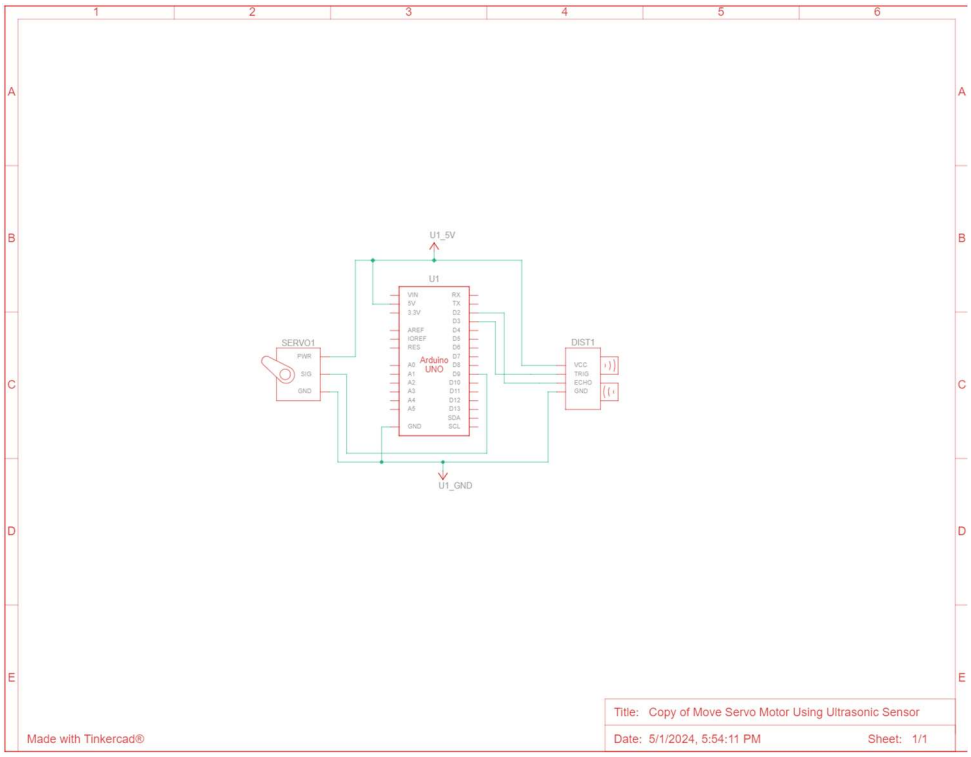


Figure 1

Name	Quantity	Component
U1	1	Arduino Uno R3
SERVO1	1	Positional Micro Servo
DIST1	1	Ultrasonic Distance Sensor (4-pin)

Figure 2

Circuit Schematic Diagram

Circuit Schematic Diagram
Figure 3

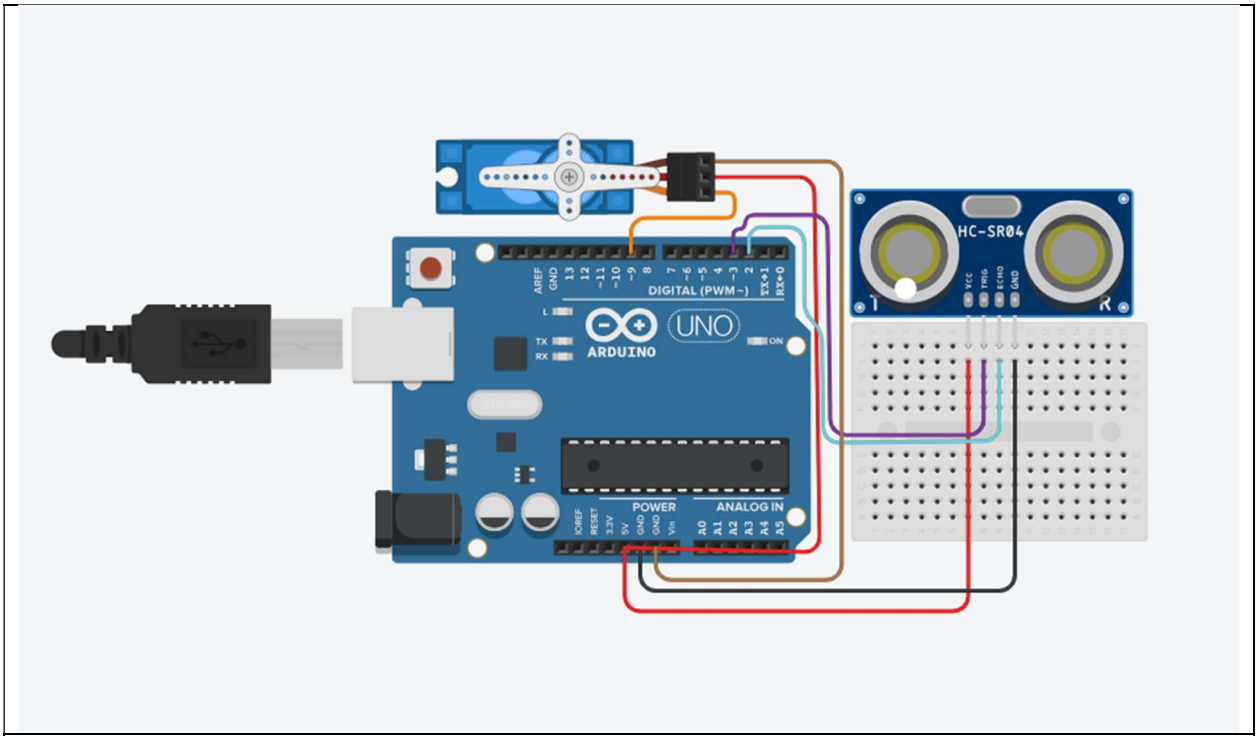
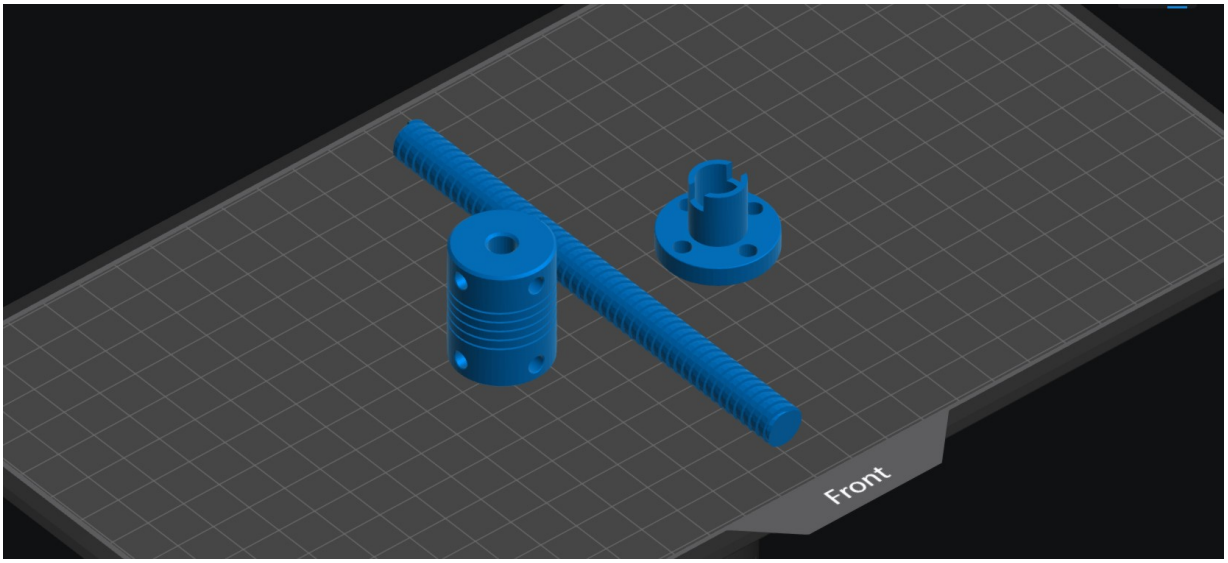
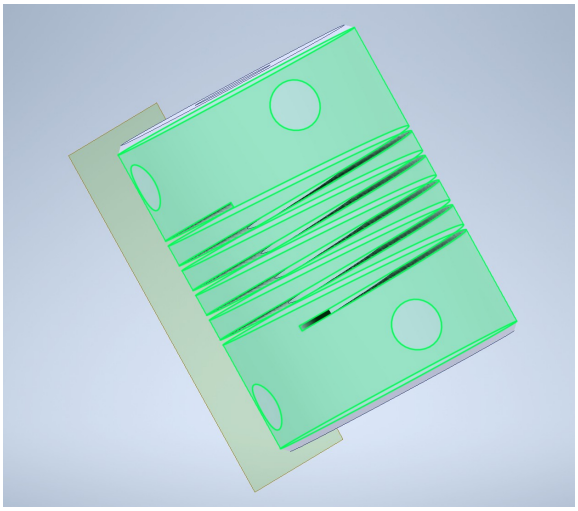


Figure 3

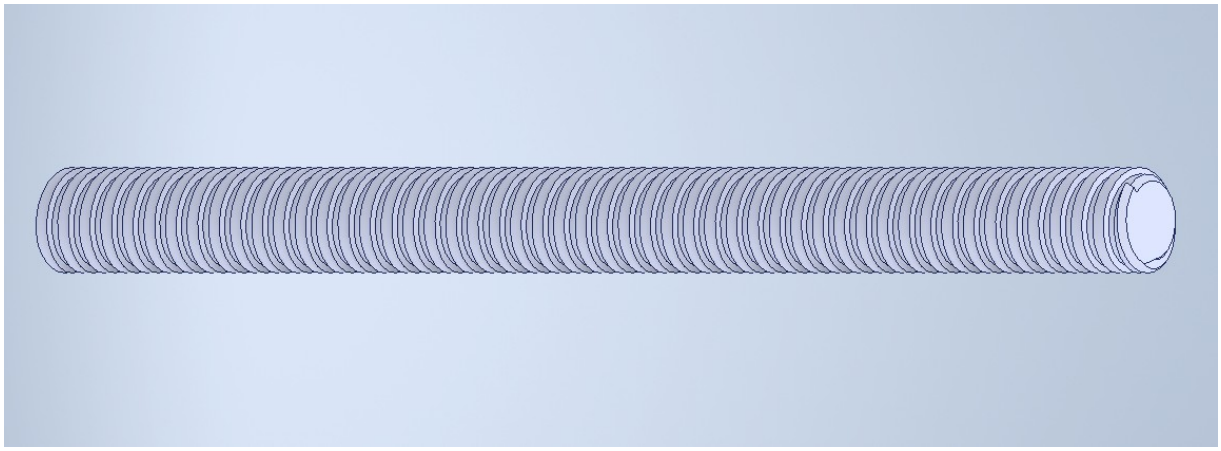
Lead Screw Mechanism
Figure 4



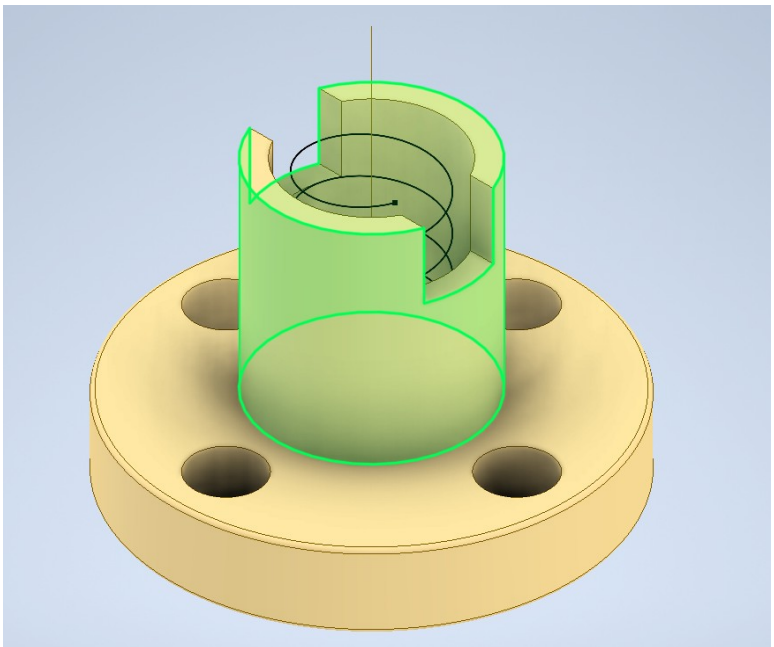
Coupler
Figure 5

- 

Lead Screw
Figure 6



Circle Screw
Figure 7



3D printing simulation (Chitubox)

This system employs an ultrasonic sensor and a servo motor to manage a linear stage platform. The sensor gauges the distance between the platform and an object, while the Arduino interprets this data. Based on the measured distance, the servo motor, linked to the platform, adjusts its position. The code follows a series of steps: initially, the platform moves to a central position, then shifts two inches left before returning to the central position, and finally, moves two inches right from the central position. These steps are looped, ensuring the platform moves as per the specified conditions.

Since we cannot model the setup manually, I have set up a video showing the operation of the code below. We will not be able to manually switch the loops as conditions cannot be set up in tinker CAD over continuous situations.

Video Of Operation

I have kept the range of motion of the servo as 180 degrees for understanding (visual) purpouses.

Code(s)

```
#include <Servo.h>

// Define servo control pin
#define SERVO_PIN 9

// Define ultrasonic sensor pins
#define TRIGGER_PIN 3
#define ECHO_PIN 2

// Create servo object
Servo servoMotor;

void setup() {
  // Attach the servo to the control pin
  servoMotor.attach(SERVO_PIN);

  // Initialize ultrasonic sensor pins
  pinMode(TRIGGER_PIN, OUTPUT);
  pinMode(ECHO_PIN, INPUT);

  // Move the platform to the central position
  moveLinearStageToCenter();
}

void loop() {
  // Move the linear stage left and then back to center
  moveLinearStageLeft();

  // Move the linear stage right
  moveLinearStageRight();
```

```
  }

  // Function to move the linear stage to the central position
  void moveLinearStageToCenter() {
    // Set the servo angle to point straight ahead
    servoMotor.write(90);
  }

  // Function to move the linear stage to the left and then back to center
  void moveLinearStageLeft() {
    // Set the servo angle to point left
    servoMotor.write(0);
    // Wait for the movement to complete
    delay(1000);
    // Set the servo angle back to the central position
    servoMotor.write(90);
  }

  // Function to move the linear stage to the right
  void moveLinearStageRight() {
    // Set the servo angle to point right
    servoMotor.write(180);
    // Wait for the movement to complete
    delay(1000);
}
```

Note - In case of spacing issues the txt file has been attached here - txt