NAU

Flying Squirrel

Jonathan Avila, Ryan Donnellan, Justin Joy, Owen Kehl, Joey Mathews

NORTHERN ARIZONA UNIVERSITY

Sub System Prototype 1

Figure 1: Partial Lifting Assembly

- Motor and lead screw supplied by Dr. Razavian
- 3D printed fixture combines the components; prevents nut from rotating freely

Question(s) this prototype answered:
- Is the screw lifting system feasible for our design?

Owen K

NORTHERN
ARIZONA
UNIVERSITY

Sub-System Prototype 2

Figure 2: Completed Lifting
Motor Circuit

- Components provided by Dr. Razavian
- Features a 24V DC power supply, a stepper motor and stepper driver
- Controlled by Arduino

Question(s) this simulation answered:
- How do we incorporate a motor driver into the code?
- How do we create a circuit using the necessary components to successfully power and control the motors?

NORTHERN
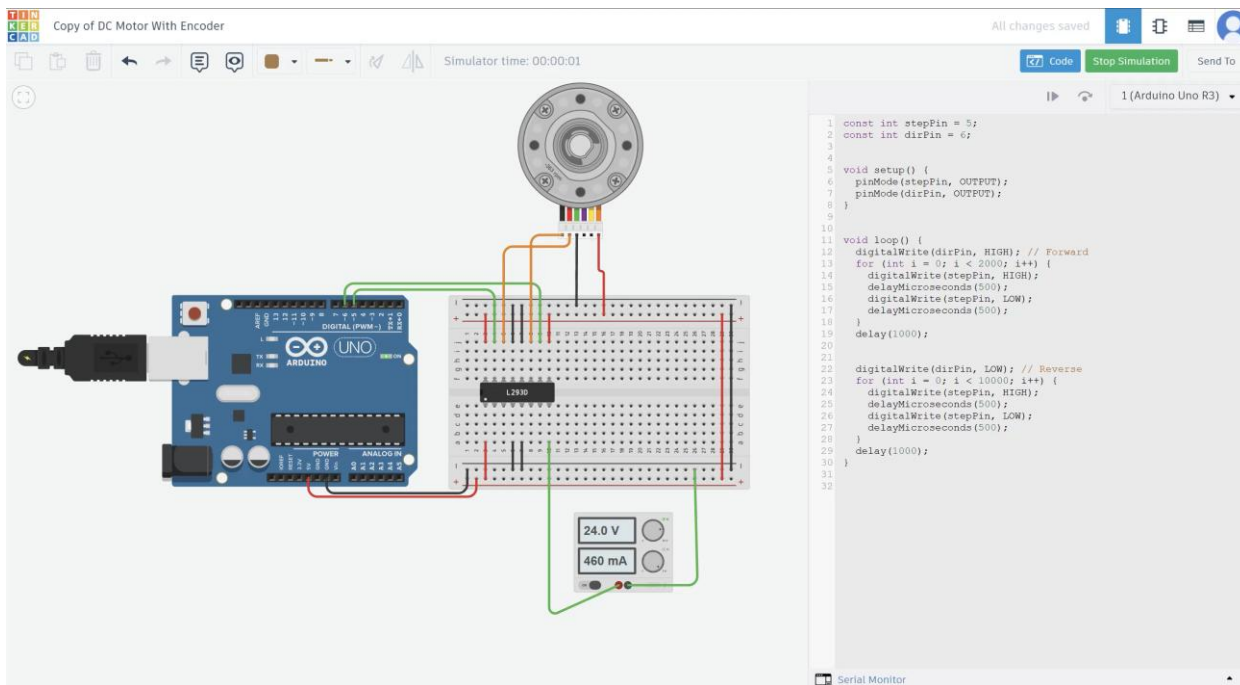ARIZONA
UNIVERSITY

Virtual Prototype

Figure 3: Motor Circuit Simulation

- Simulation uses an H-bridge connecter in place of motor controller
- Circuit created by breeno3
- Motor controller used for real prototype has malfunctioning B-coil output resulting in no movement

Question(s) this simulation answered:
- Does the code used for direction of motor work as intended?

NORTHERN ARIZONA UNIVERSITY

Code

```
const int stepPin = 5;
const int dirPin = 6;

void setup() {
  pinMode(stepPin, OUTPUT);
  pinMode(dirPin, OUTPUT);
}


void loop() {
  digitalWrite(dirPin, HIGH); // Clockwise
  for (int i = 0; i < 2000; i++) {
    digitalWrite(stepPin, HIGH);
    delayMicroseconds(500);
    digitalWrite(stepPin, LOW);
    delayMicroseconds(500);
  }
  delay(1000);
  digitalWrite(dirPin, LOW); // Counter Clockwise
  for (int i = 0; i < 2000; i++) {
    digitalWrite(stepPin, HIGH);
    delayMicroseconds(500);
    digitalWrite(stepPin, LOW);
    delayMicroseconds(500);
  }
  delay(1000);
}
```

Figure 4: Motor Control Code

NORTHERN
ARIZONA
UNIVERSITY

Potential Errors

The Issue

The motor driver given to us by Dr. Razavian had a faulty output port for the motor's second coil. The circuit was set up correctly, and it would have operated as intended under normal circumstances.
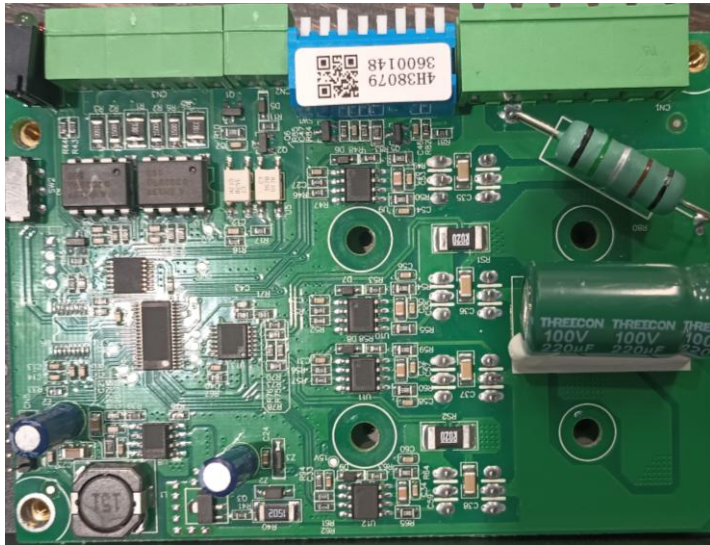

Figure 5: Faulty Motor
Driver Internals

Possible Causes

These issues could have possibly been damaged during its last use, whether by pushing too much current through it, extended duration of use, or a faulty motor was used.
Another possible issue is that it may have been disassembled previously and handled incorrectly, which could have damaged the board.

Resulting output voltage from motor driver
- Channel A +20V
- Channel B -15mV

NORTHERN
ARIZONA
UNIVERSITY

Conclusion

Results

- The screw design should work for our purposes
- We now have the most basic circuit design to control our motors
- Our code to control the motors works (Both directions) and can control speed

Design Adaptation

- Research common issues in motor drivers and test all physical components
- Use fundamental circuit design in our robot (With different components)

NORTHERN
ARIZONA
UNIVERSITY

Thank You!

NORTHERN ARIZONA UNIVERSITY

Resources

[1] Tinkercad, https://www.tinkercad.com/ (accessed Apr. 28, 2025).
[2] "Circuit design DC motor with encoder," Tinkercad, https://www.tinkercad.com/things/5XmfSjHGIoF-dc-motor-with-encoder (accessed Apr. 28, 2025).

NORTHERN
ARIZONA
UNIVERSITY

Question?

NORTHERN ARIZONA UNIVERSITY