DEPARTMENT OF MECHANICAL ENGINEERING

TEAM 5
Guitar Heroes
Andrew Claffee, Madison Collins, John Farren, William Garner, Bryan Rose, Lisa Walsh
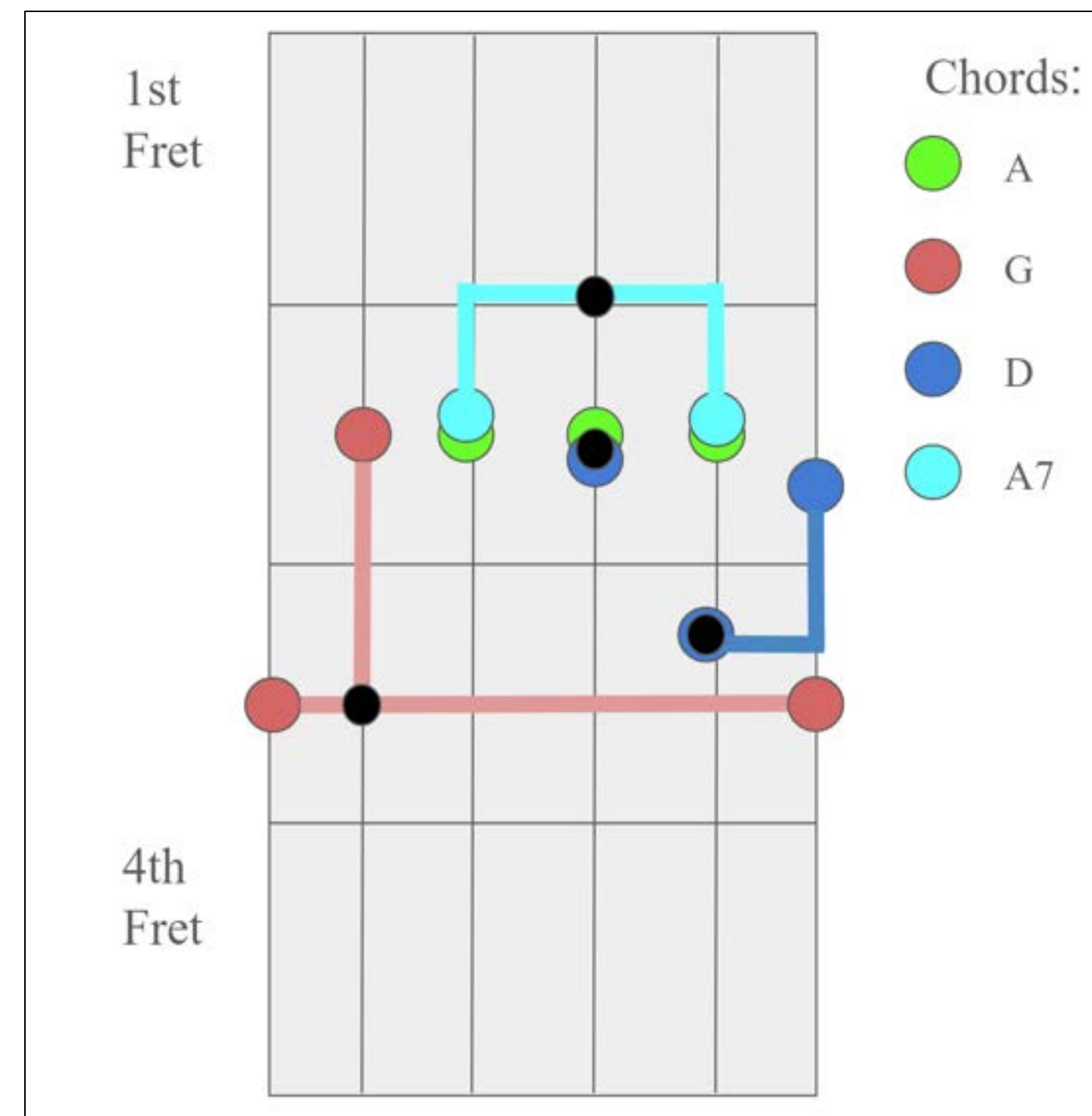
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Problem Definition

The purpose of the project is to allow our client, Ross, to independently play the guitar again. He recently suffered a stroke, which caused him to lose movement in his left extremities and use of his fret hand.

Design Calculations & Analysis

Equivalent strain FEA

Displacement FEA

- Simulating the maximum possible force applied to the guitar and actuators when playing the G chord.

- Showed very small stress and strain on the mount.

- Actuator outputs have been optimized to produce as little force as possible

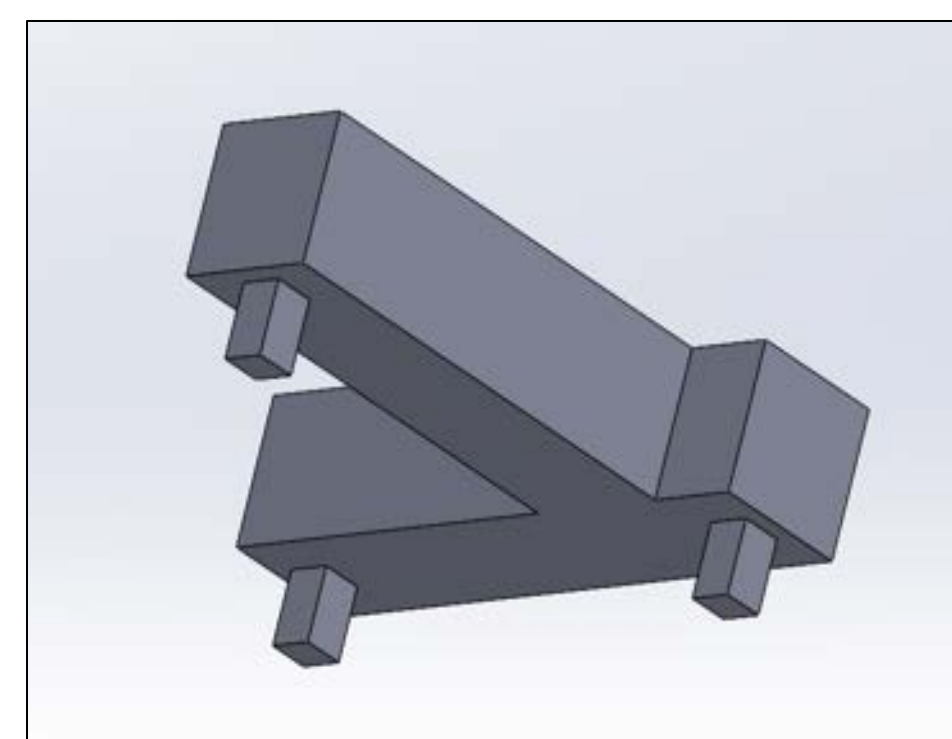- Lead to smaller stress, strain, and displacement when in use.

Chord Map

Map of the four different chords that our chosen for our user. The black dots represent where the actuators press down.
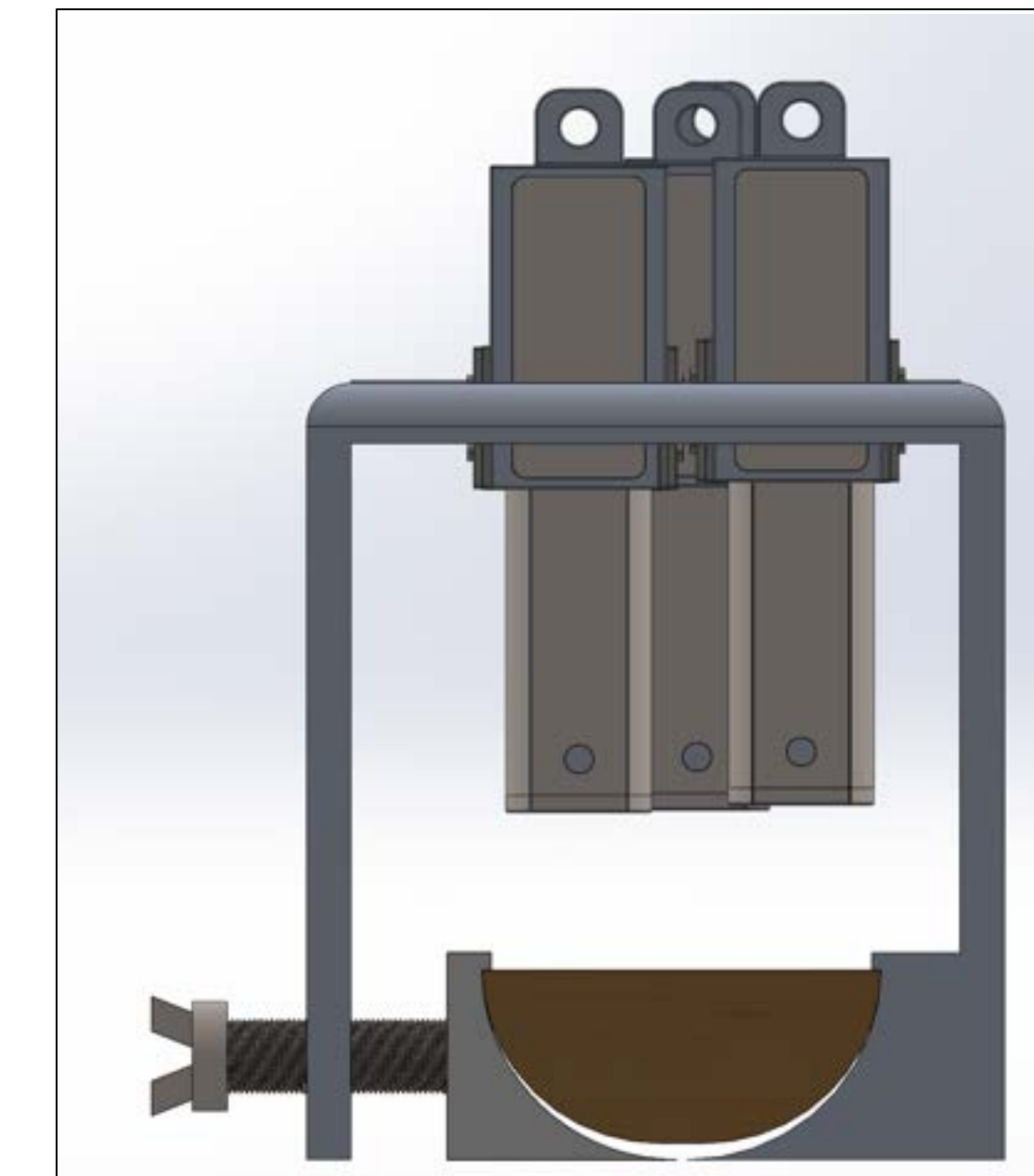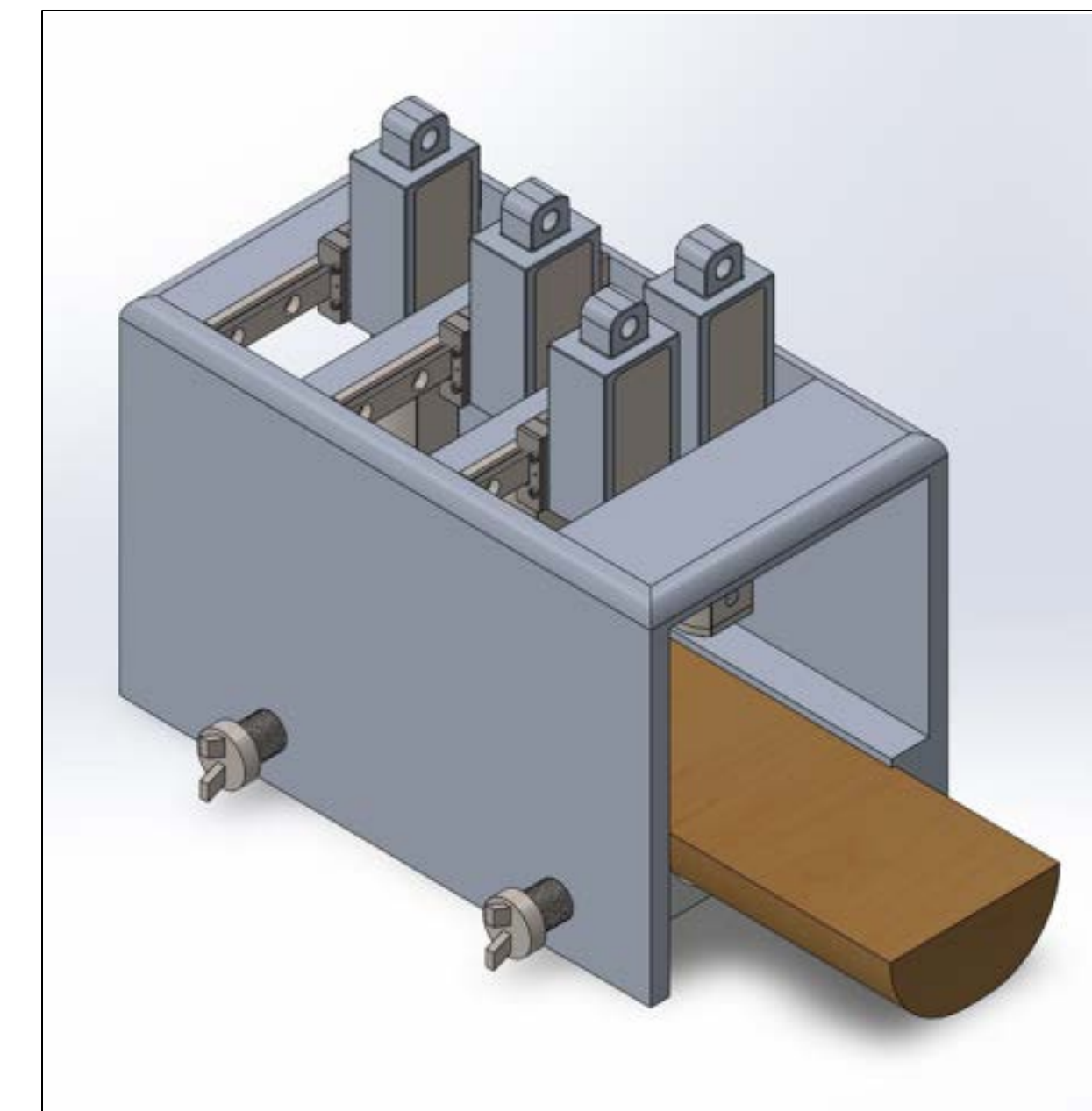
Chord G 3D-printed piece

The piece that attaches to the actuator to press down the strings. They were created based off the chord map to above.
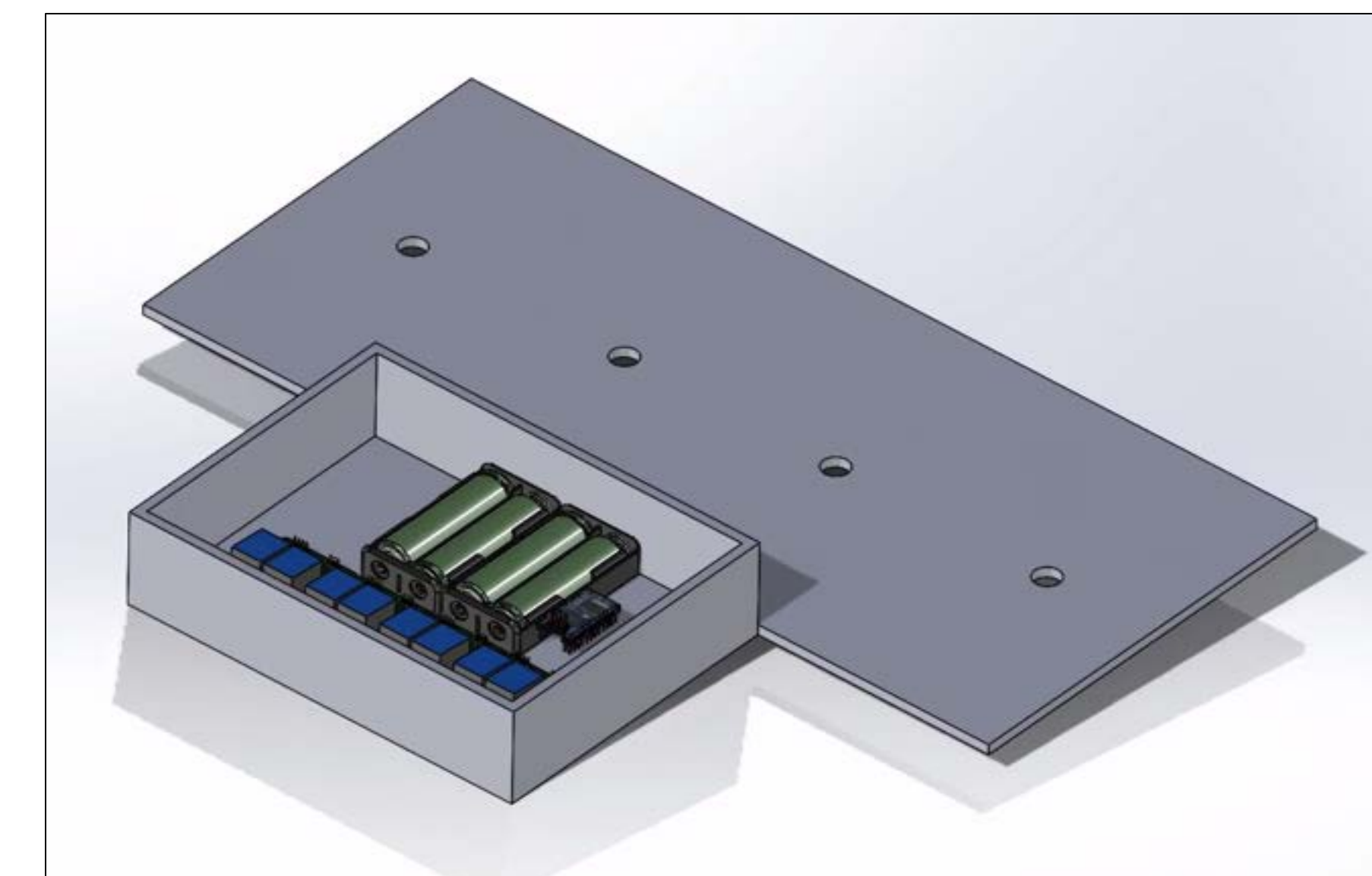

The relationship between the length and weight of the device on different guitar sizes. The shaded area is where the force exerted on the user is less than 2 kg, a value based off stakeholder testing.

Final Design

Mount/Actuators

3D CAD of the mount and actuator assembly, utilizing a clamping function with two bolts that tighten the curved edges of the mount to the guitar.
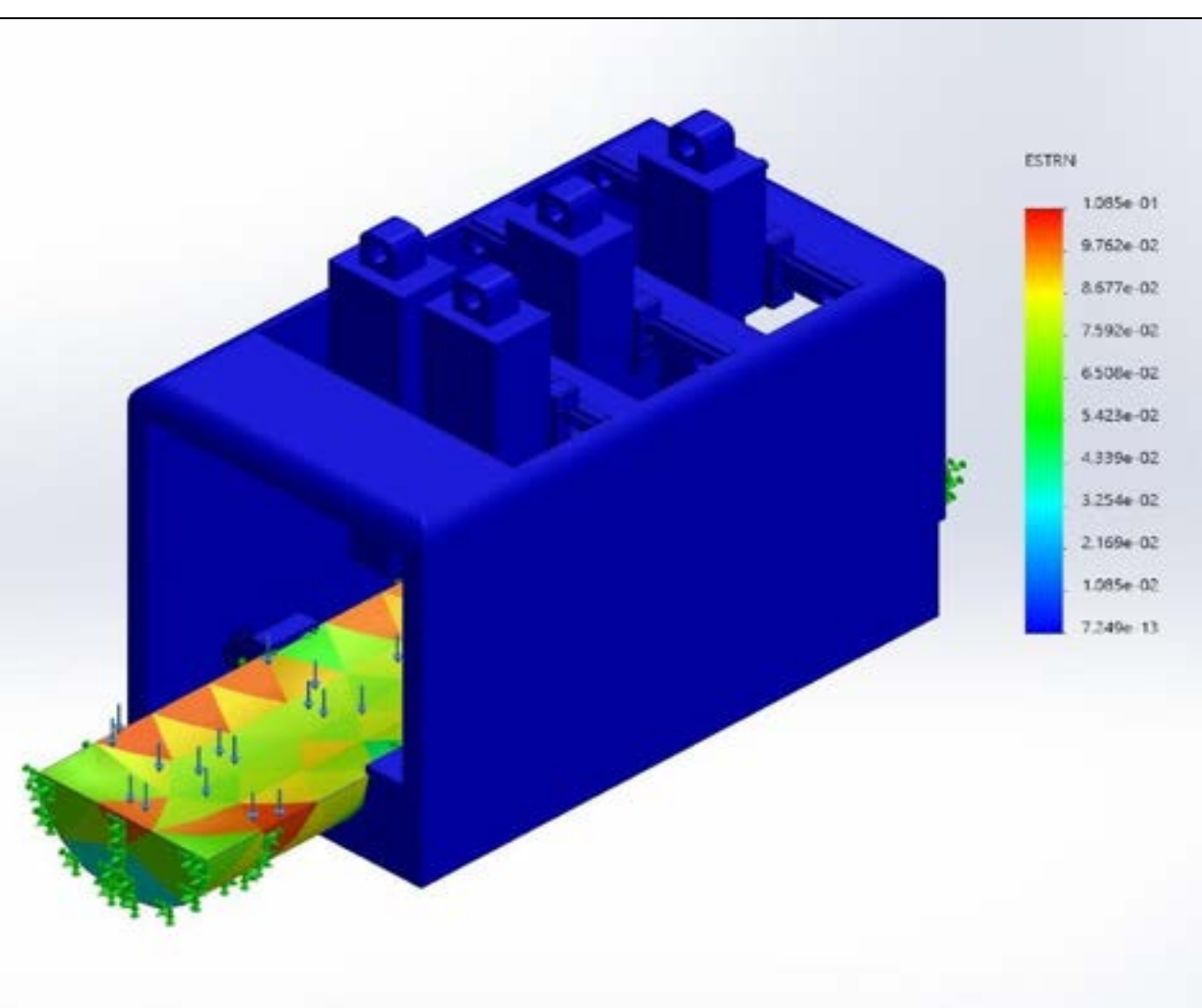
Mat and Electronics Box

Design of the mat and electronics box, which includes four two-channel relays, a 12V battery pack, and an ATmega328P.
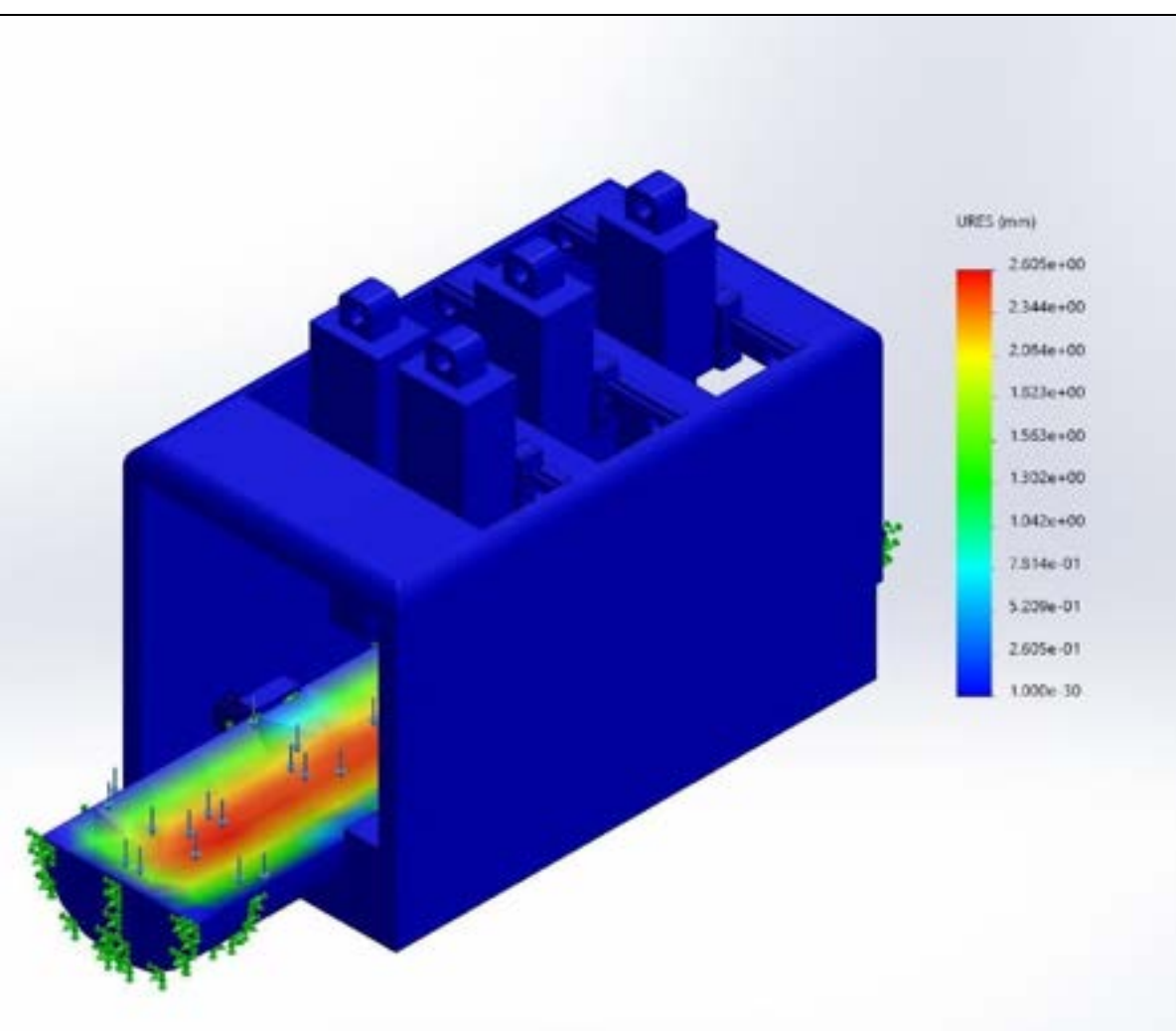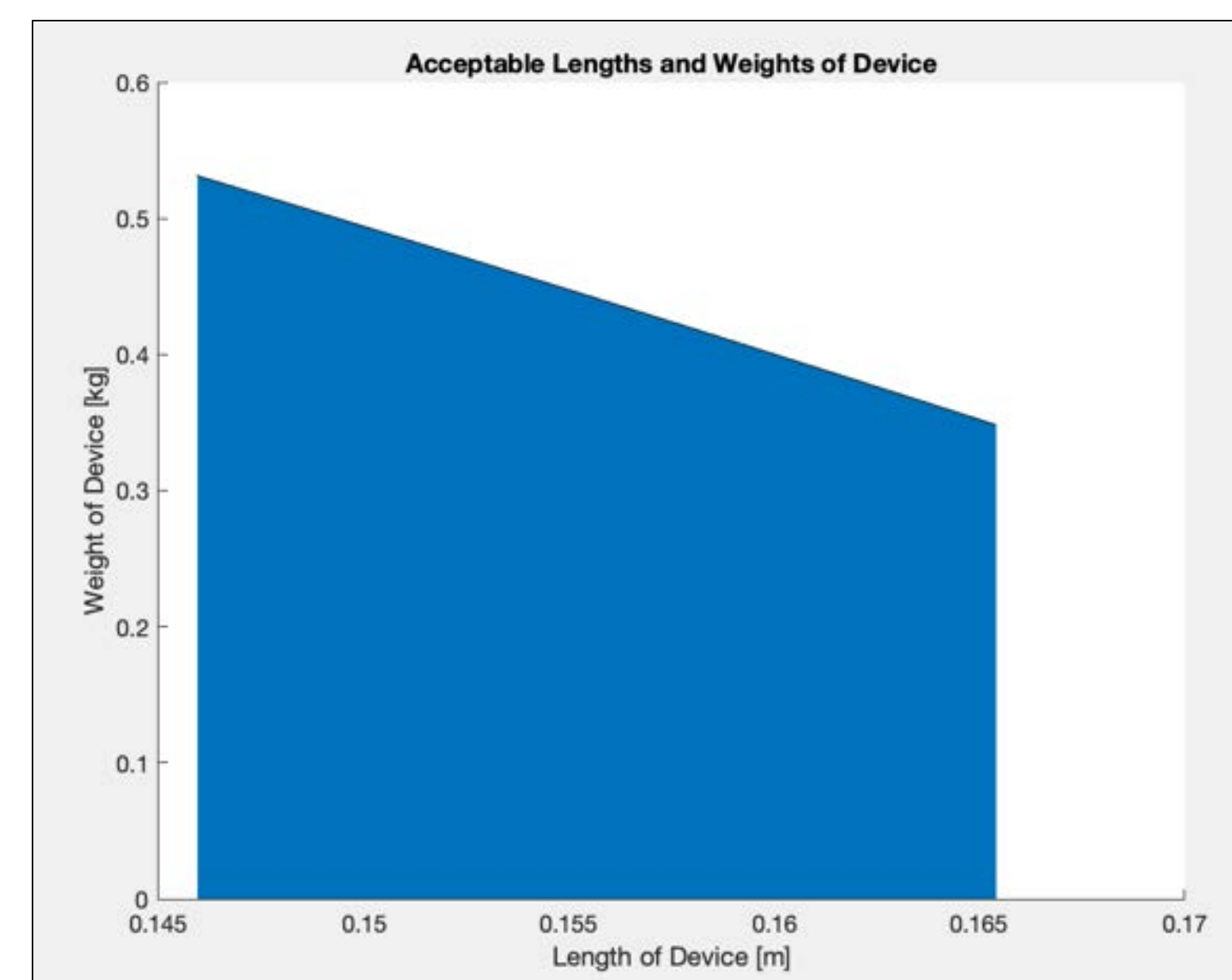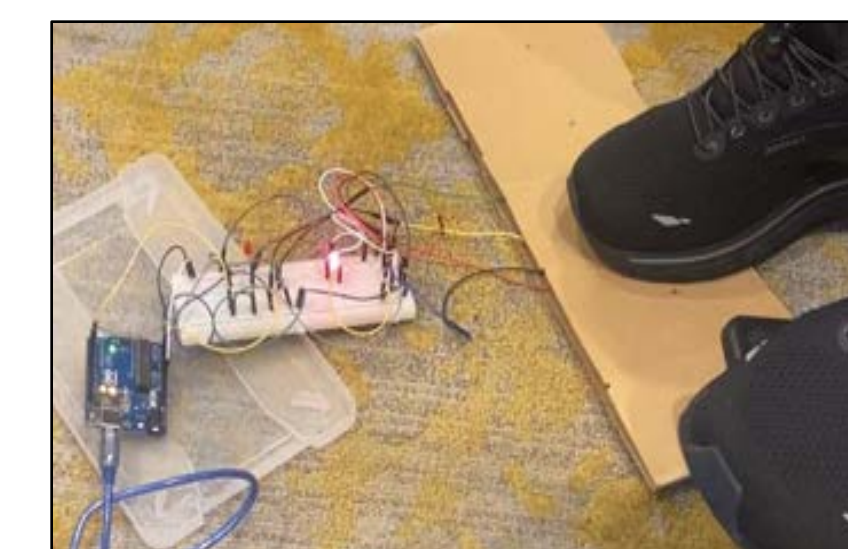
Prototype & Test Results

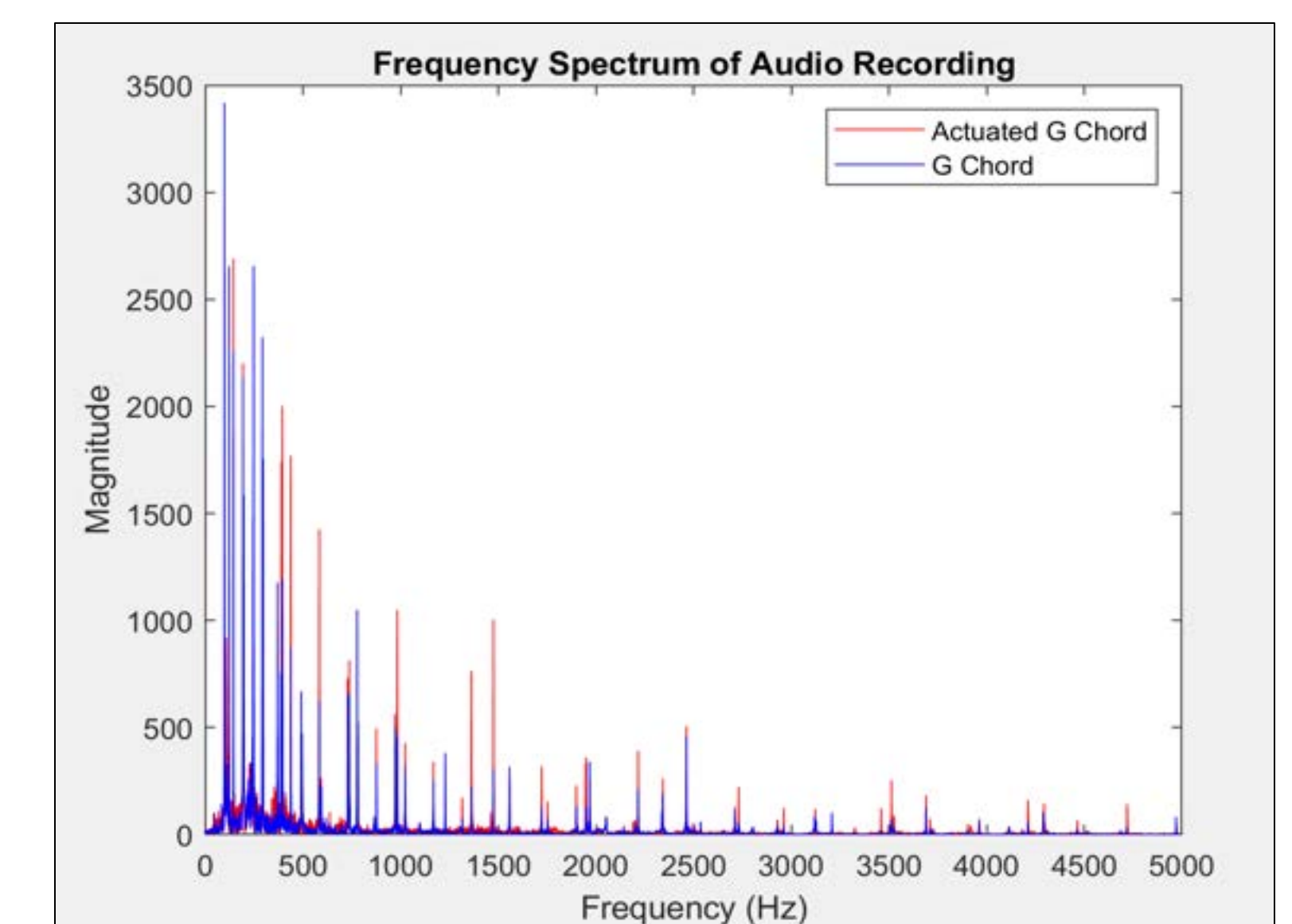### User Input

User places their foot on different photoresistors to send a signal to an actuator through a relay.

Mount/Actuators

The mount clamps onto the first three frets, using shims molded to the neck's shape. The linear actuators press down the 3D-printed pieces to play each chord.

Fourier Transform of the actuated G chord over 25 trials compared to a theoretical G chord. On average, the actuated G chord produces an accurate sound.