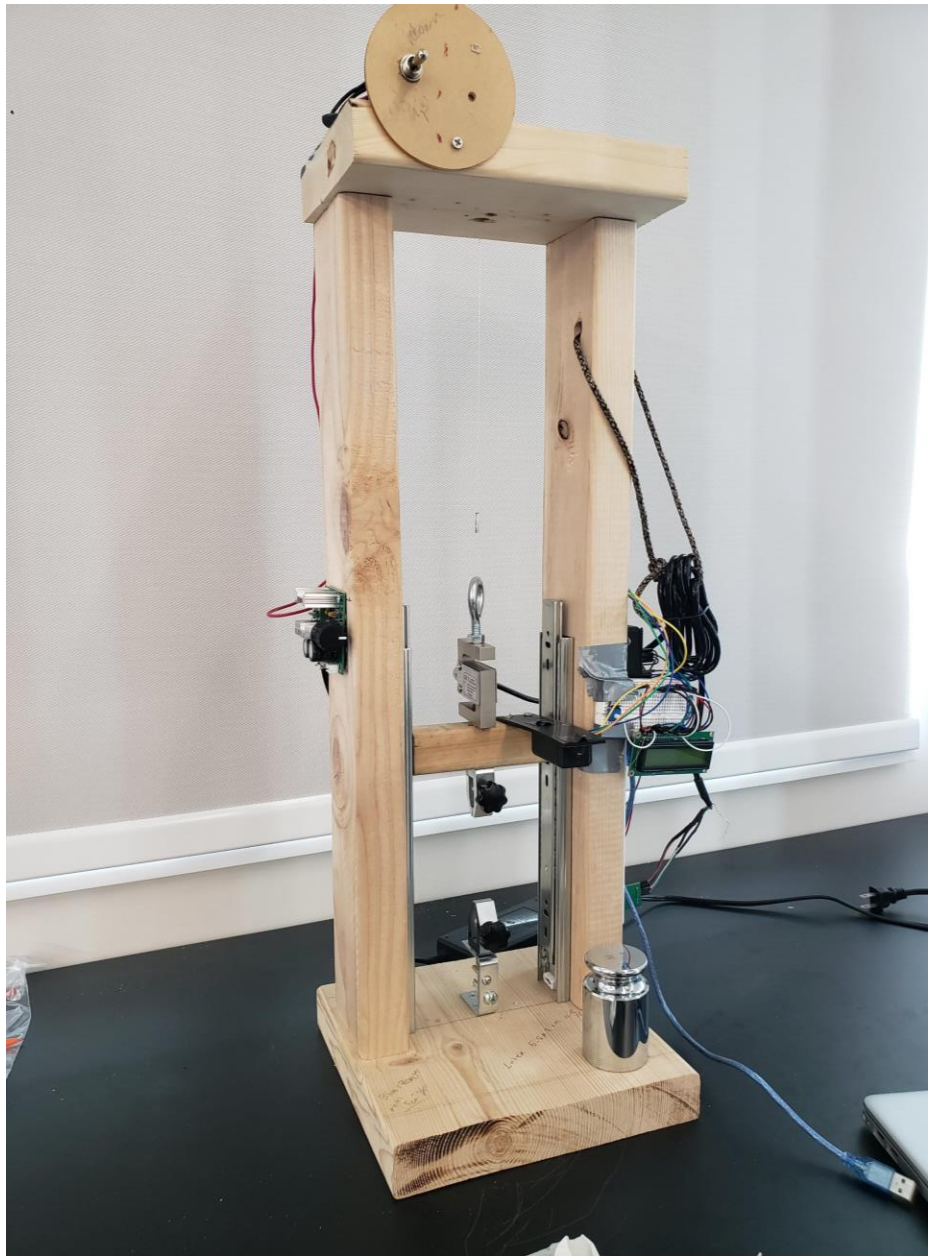


Material Tensiometer

Group 8:

Jebadiah Parillo, Alexander Rotariu, Hiroaki Nakahara, Alistair Talaboc

Key Features: (the whats, whys and hows)

Ease-of-use:

- Streamlined data collection system. The device is simple to use and a sample can be taken with just 5 easy steps:
    1. Connect PC/laptop via blue USB cable
    2. Tighten material in clamps and follow prompts on LCD Screen
    3. Toggle motor switch to begin measurements
    4. Open ArduSpreadsheet and save data as csv
    5. Open Stress Strain matlab app and plot the csv

- Outputs include the Stress-Strain graph, Young's Modulus and the Ultimate Tensile Strength .

Accuracy:

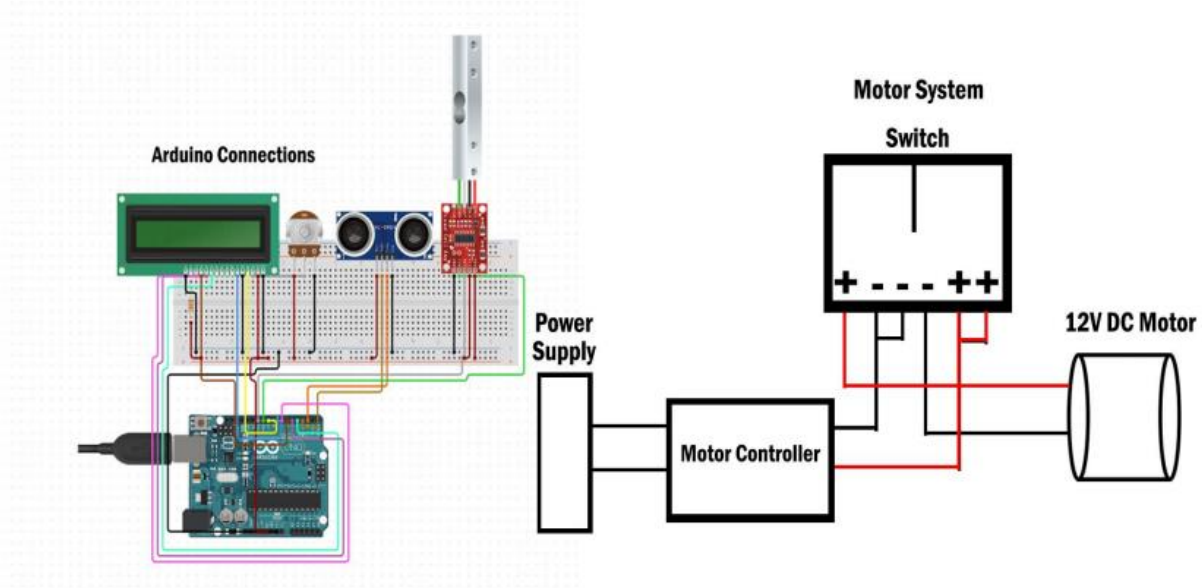
- Load is automatically calibrated Arduino and then normalized again at the beginning of testing
- Average of 20 values before the device outputs load or distance.

Budget and Expenses

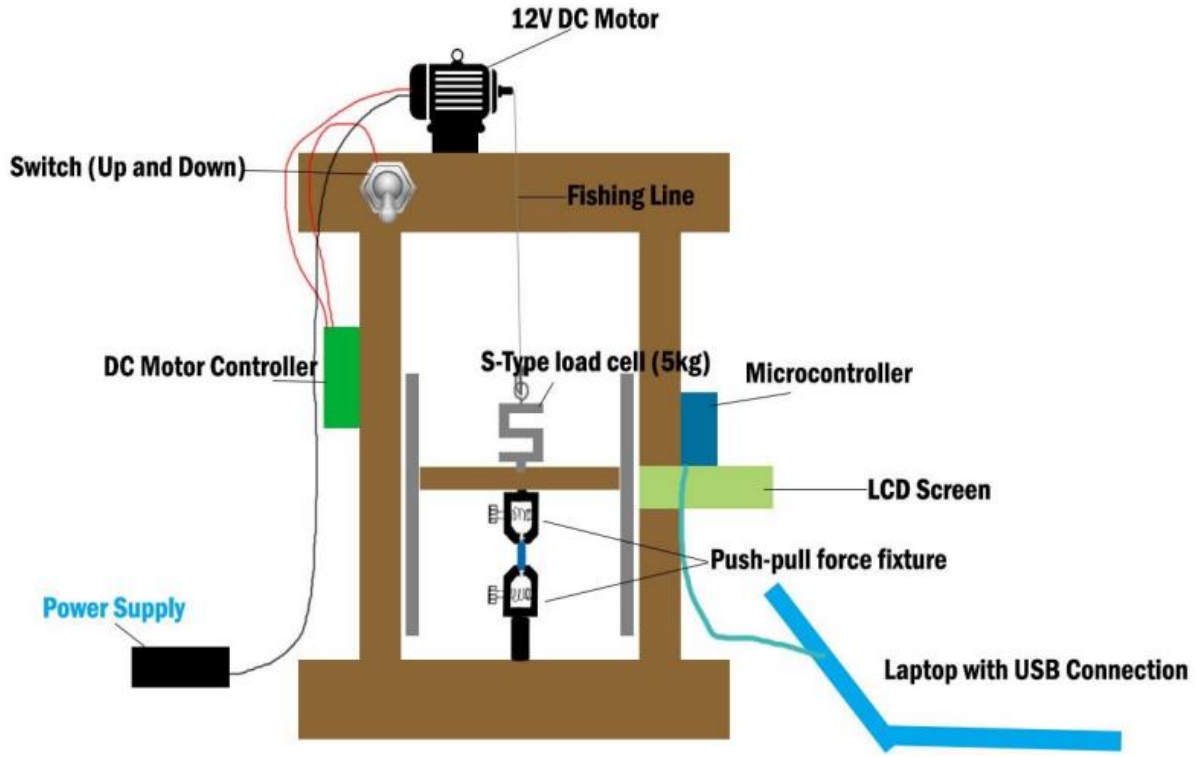
System Components & Budget		
Part	**Purpose**	**Cost**
Ultrasonic Range Sensor	Measures Distance	$4
S-Type Load Cell (5kg)	Measures Force	$36
Amplifier Board	Amplifies and Digitizes Signal	$10
Microcontroller	Controls System	$15
Push Pull Force Fixtures	Secures Test Material	$45
12V DC Geared Motor	Automates Material Stretching	$16
DC Motor Speed Controller	Controls Motor	$12
Flange	Enables Motor To Stretch	$8
	TOTAL	**$146**

Tensiometer Figures:

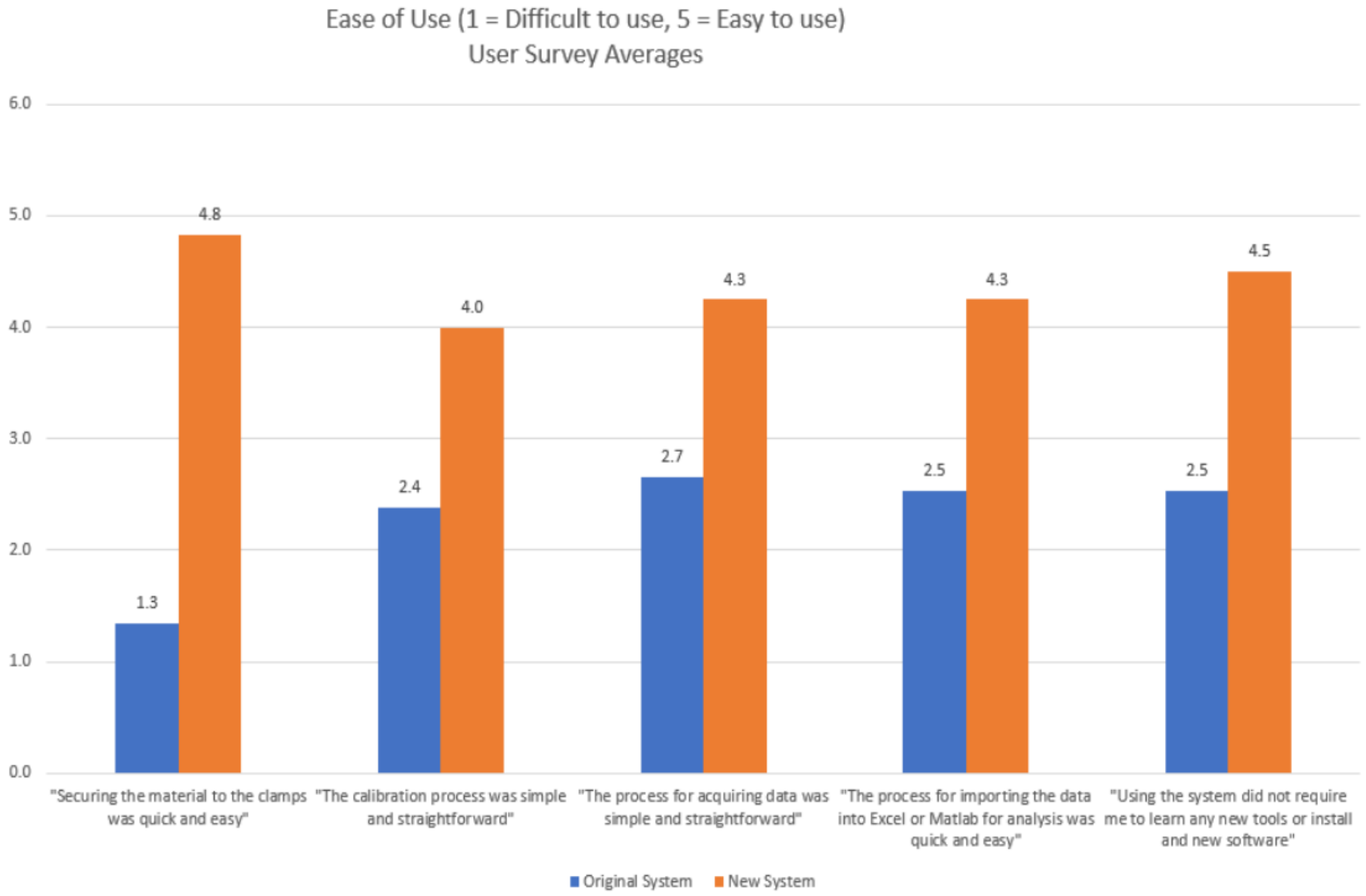
Circuit Schematic



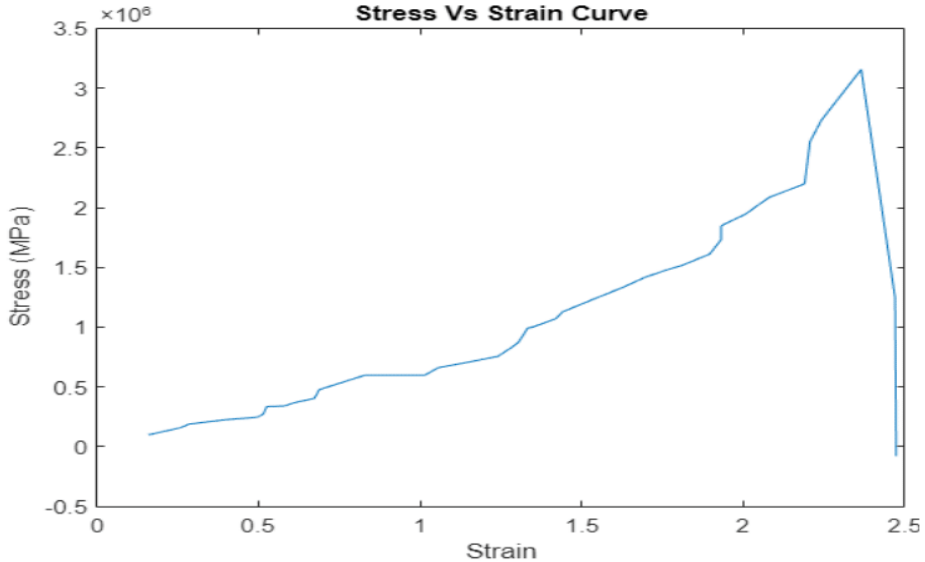
Physical Model



Ease of use survey data:



Ulttens2 = 3.1549e+06



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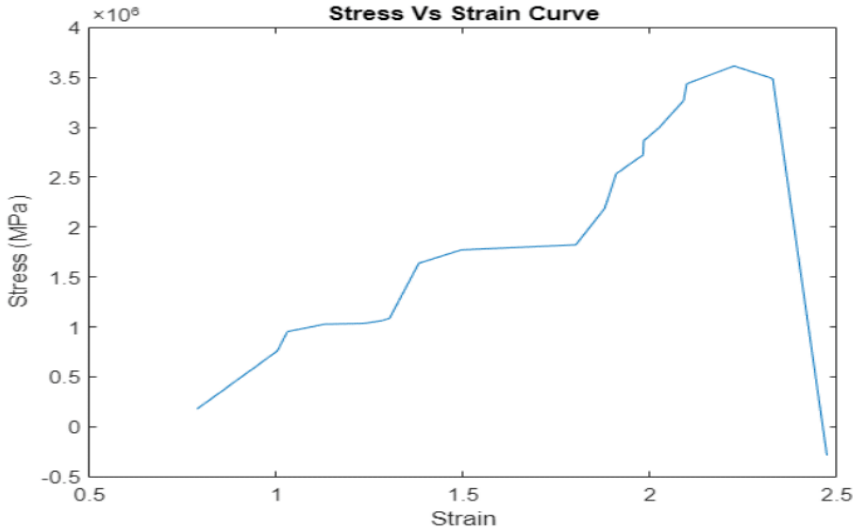
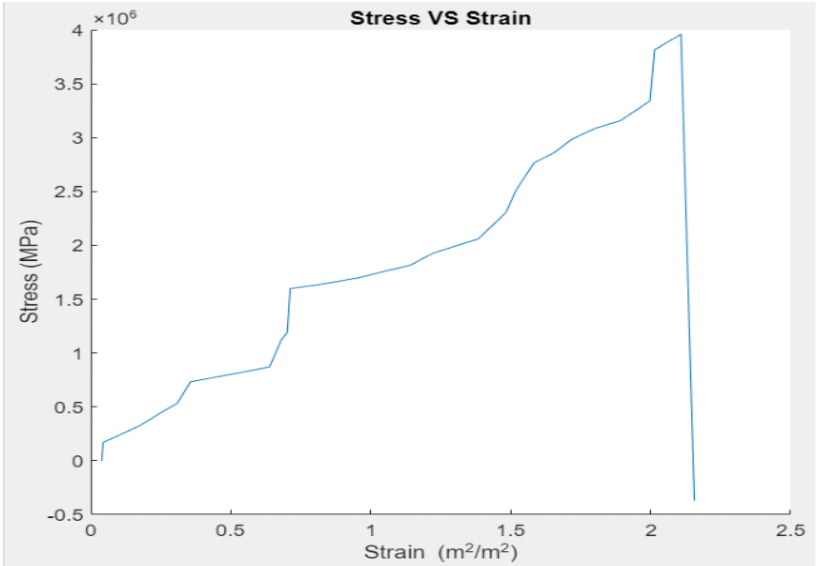
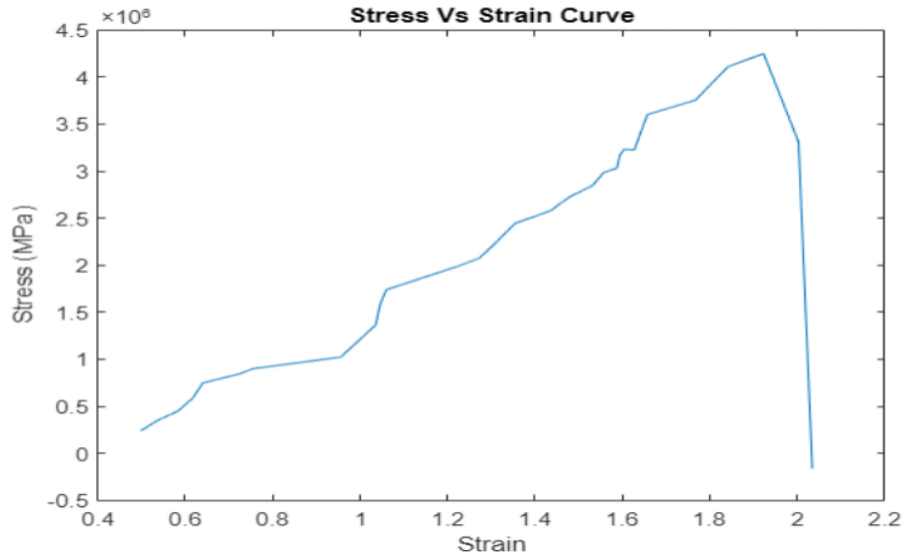


Ulttens4 = 3.96e+06

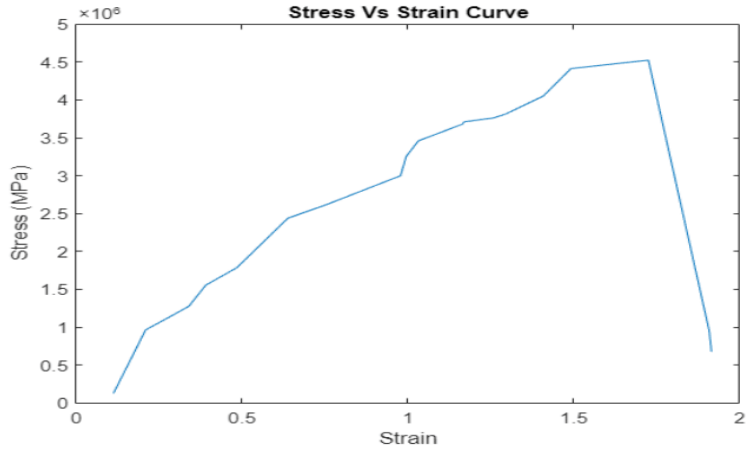


Ulttens5 = 4.2497e+06

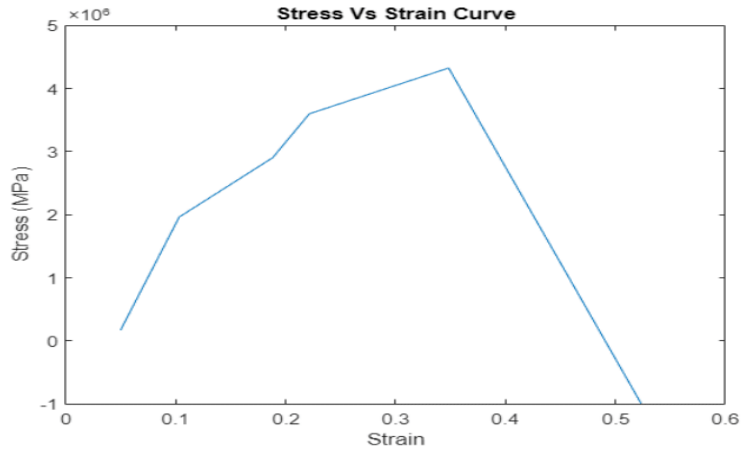


AverageUltTensile = 3.5792e+06

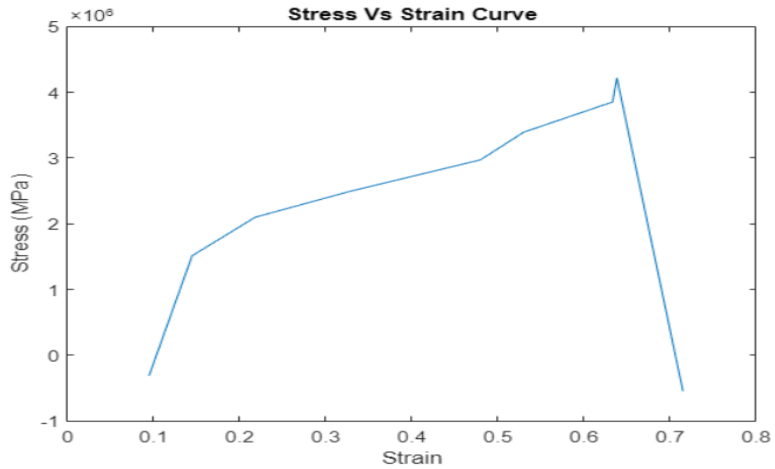
Ulttens1 = 4.5259e+06



Ultens2 = 4.3259e+06



Ulttens3 = 4.2200e+06



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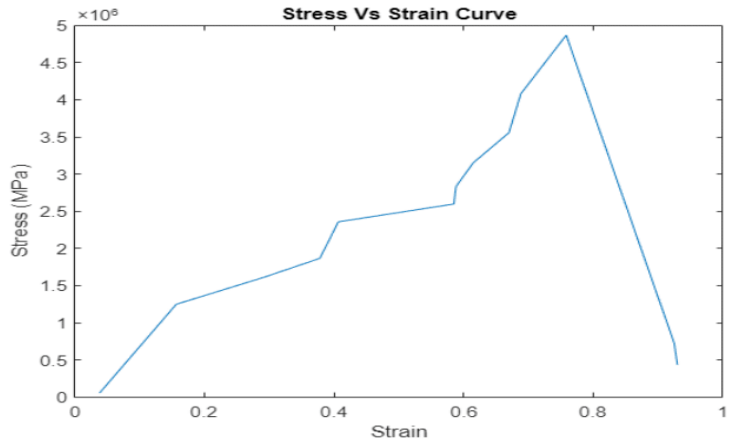
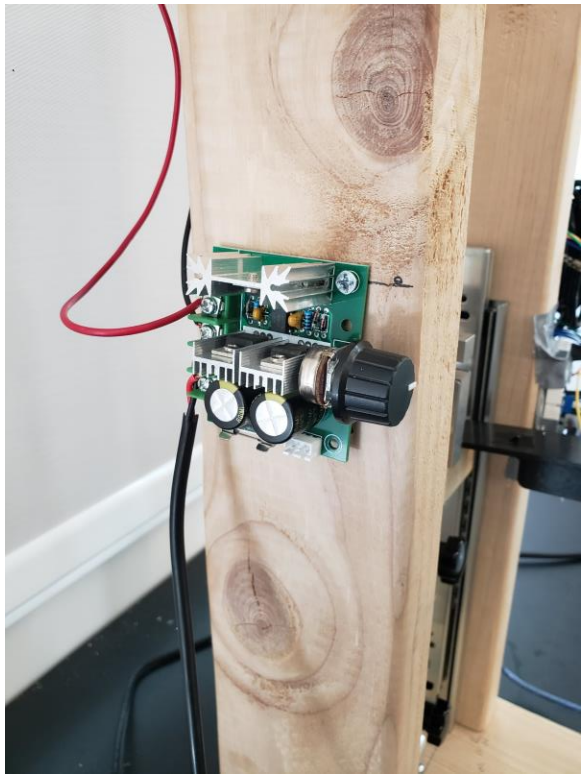
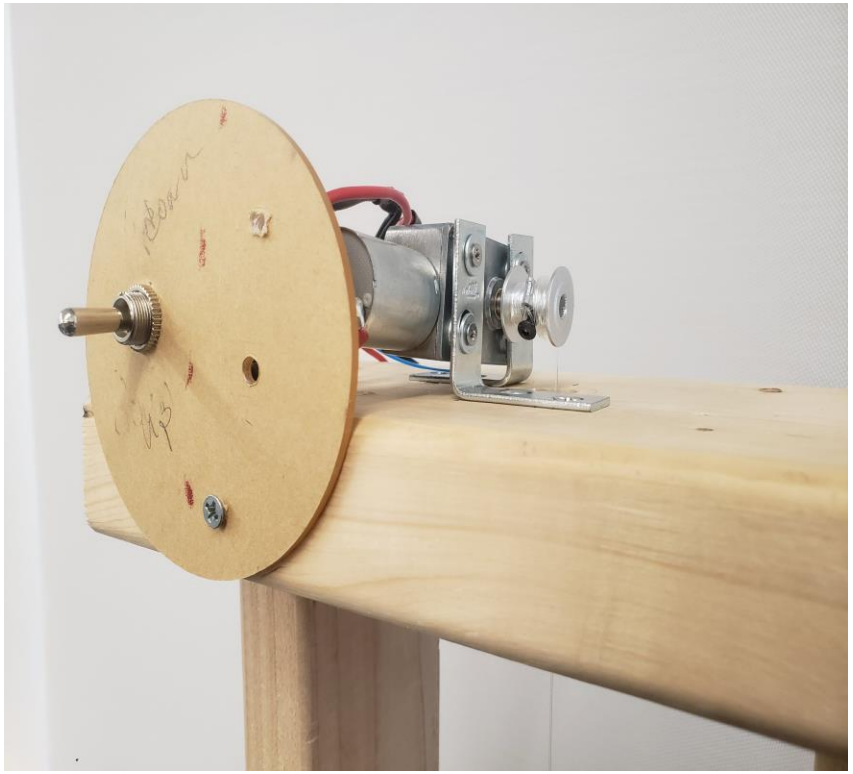


AverageUltTensile = 4.4853e+06

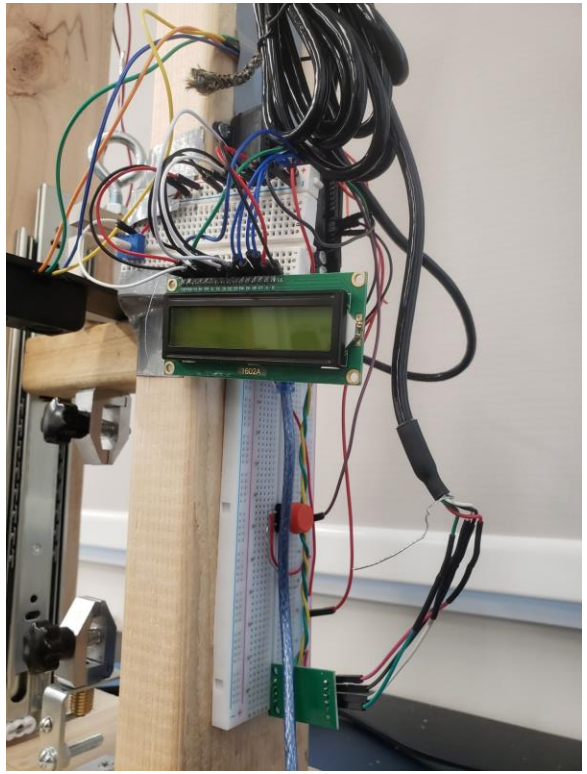
System Design Improvements:



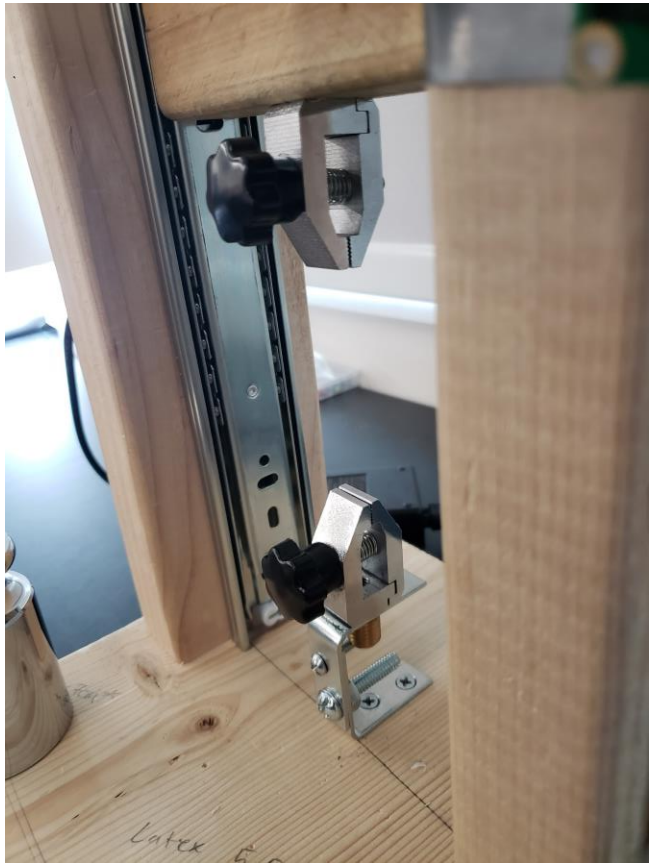


12V DC Motor with worm drive gearbox
Driven with a DC Speed Controller, Up/Down Switch

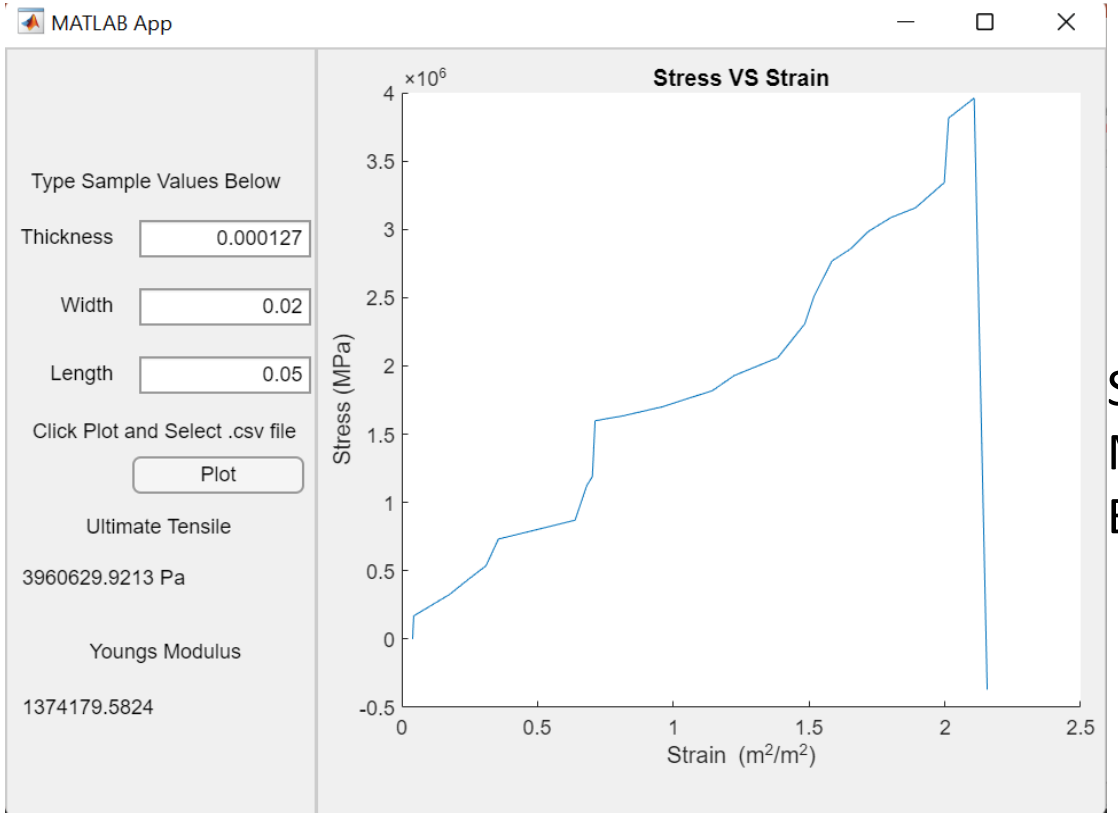
S-type Load Cell



LCD Screen and button interface



Clamps



Standalone MATLAB Executable

Thank You!