

Team#1: (E+M^2)

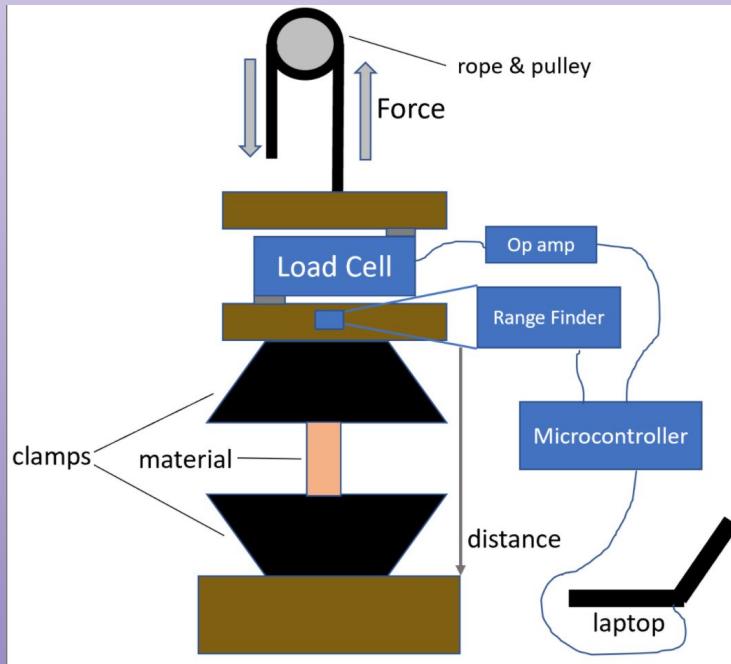
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Main Goals: Ease of Use/Accuracy/Cost Efficient

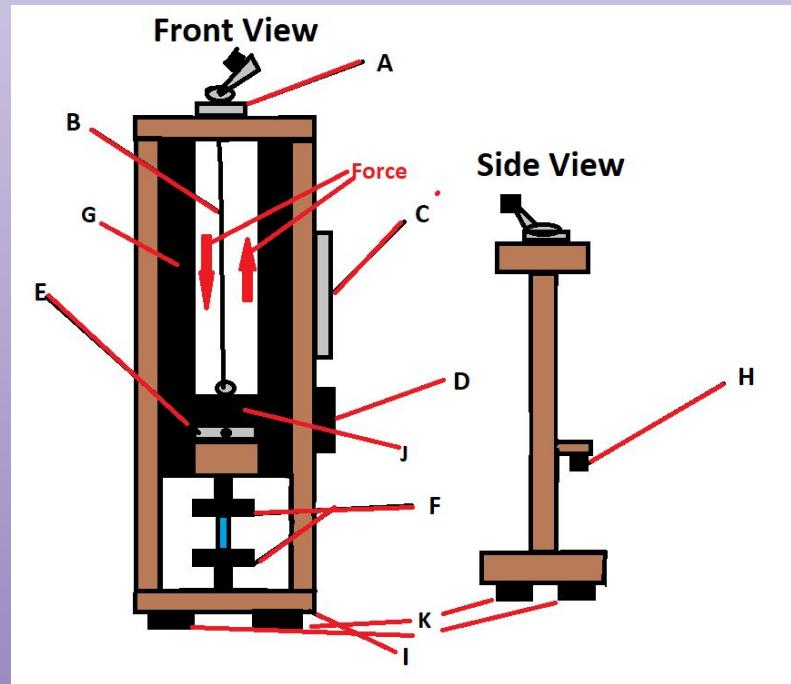
- **Item #1: Laser Ranging Module Sensor**, measures accurate distance.
- **Item #2: Pulling Winch**, creates a uniform pull.
- **Item #3: 3D printed Clamps**, easy to attach material to the system.
- **Item #4: 3D printed Rails**, reduces friction when pulling the material.
- **Item #5: 3D printed Feet**, creates a stable platform for the system.

Base Design Vs Improved Design

Base Design



Improved Design



3-D Printed Rails



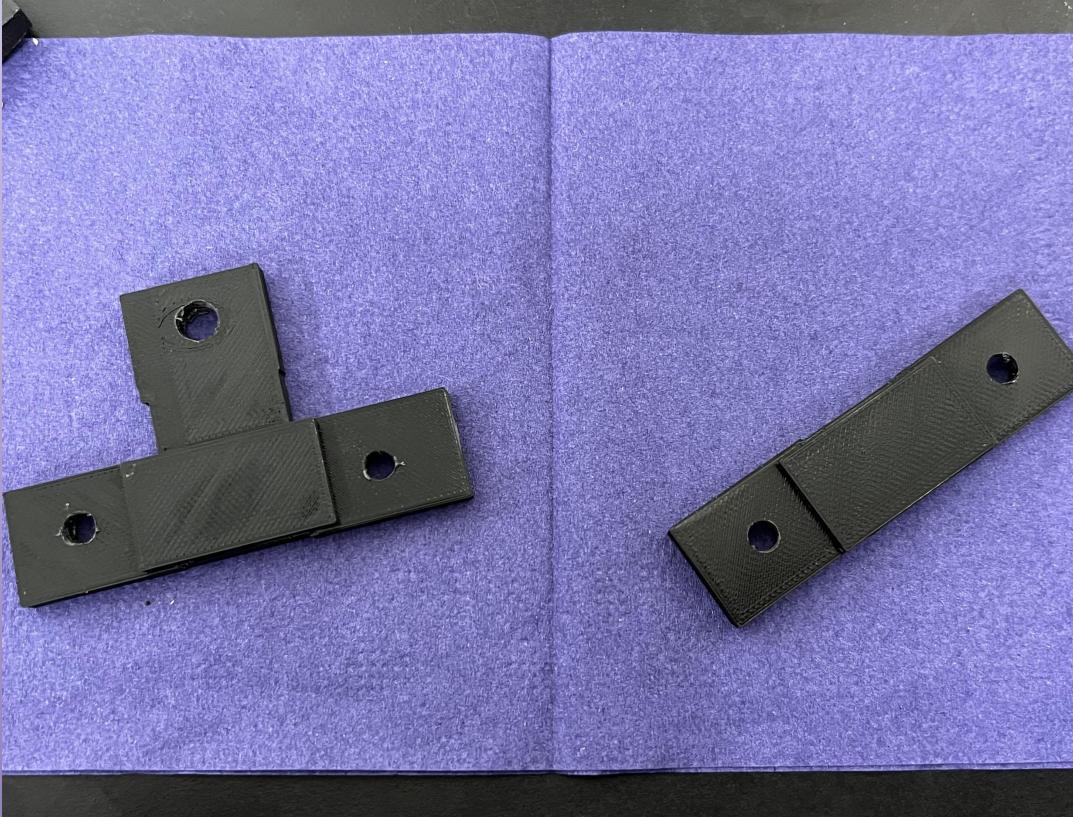
1st Prototype



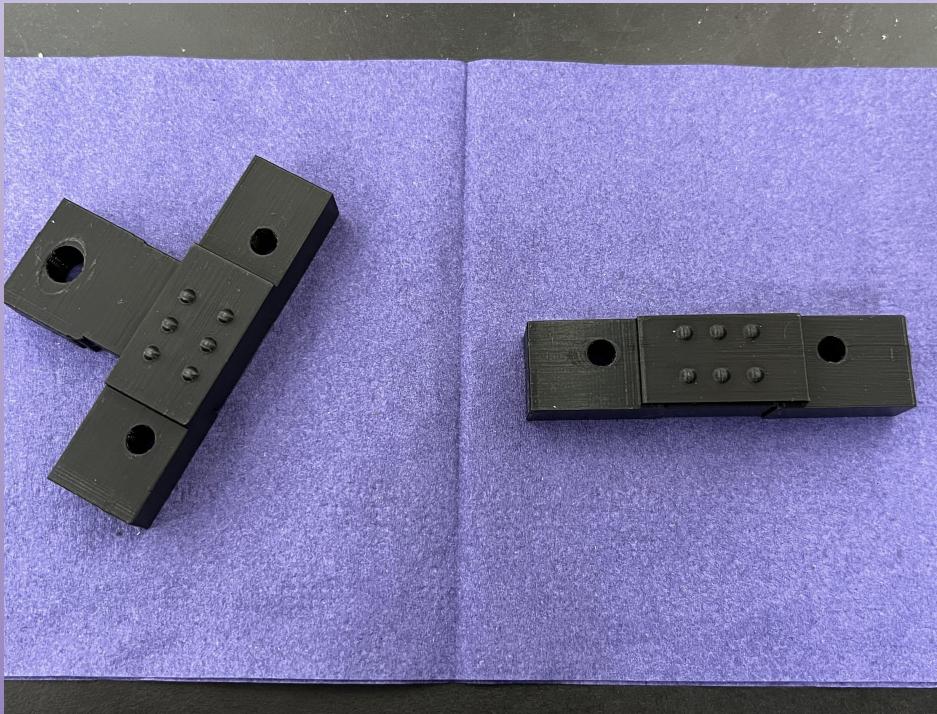
2nd Prototype



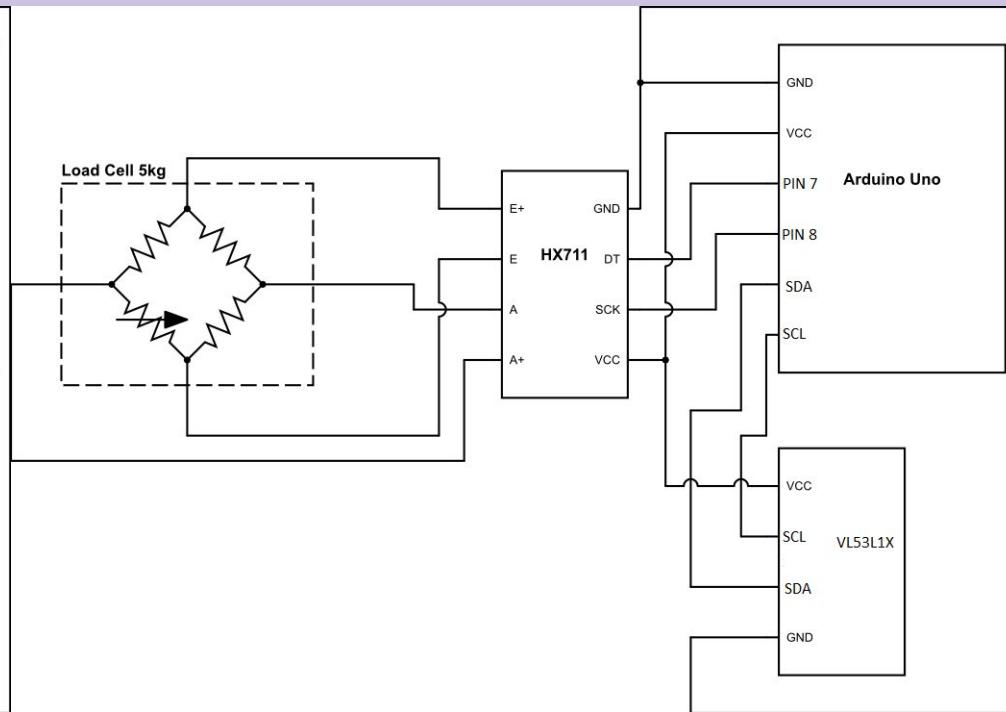
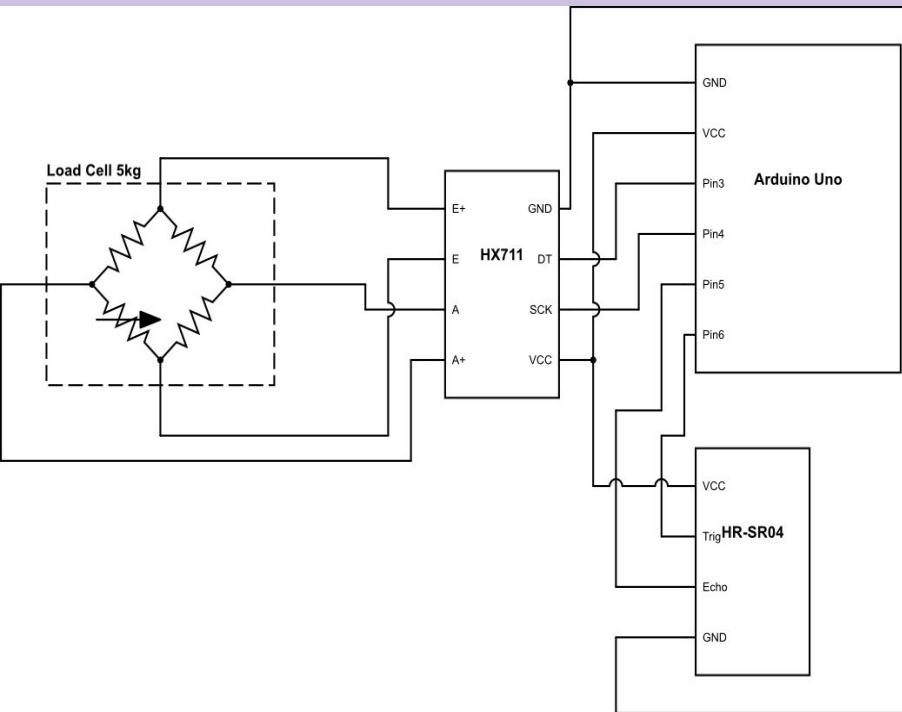
3rd Prototype



4th Prototype

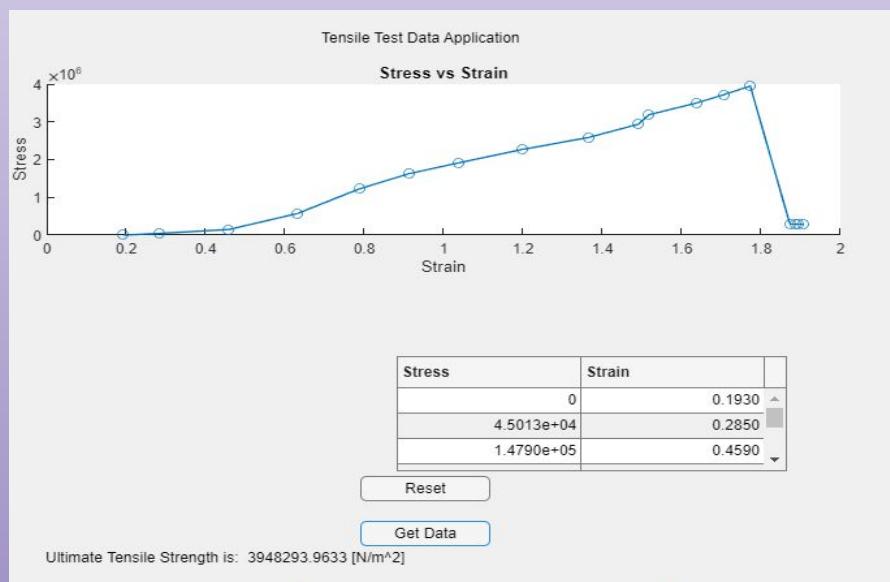


Original Circuit Design Vs Improved Circuit Design



Data

Metric	Sample	Our System	Known Value	Error
Young's Modulus	Latex	$572 \pm 136 \text{ kPa}$	$740 \pm 10 \text{ kPa}$	22%
...	Nitrile	$1.5 \pm 1.1 \text{ MPa}$	$2.4 \pm 0.2 \text{ MPa}$	37.5%
Ult. Tensile Strength	Latex	$2.7 \pm 1.2 \text{ MPa}$	$3.3 \pm 0.1 \text{ MPa}$	18%
...	Nitrile	$4.9 \pm 1.3 \text{ MPa}$	$4.4 \pm 0.1 \text{ MPa}$	11%



Advantages and Disadvantages - Software

Advantages:

- MATLAB application
 - Don't need to download Matlab
 - Plots the Stress vs. Strain Curve
 - Finds the Ultimate Tensile Strength

Disadvantages:

- Have to download Arduino Program
- Downloading all of the libraries used for the Arduino Code
 - Libraries for both the Laser Distance Sensor and Load Cell
 - Also have to download ArduSpreadSheet tool for Arduino