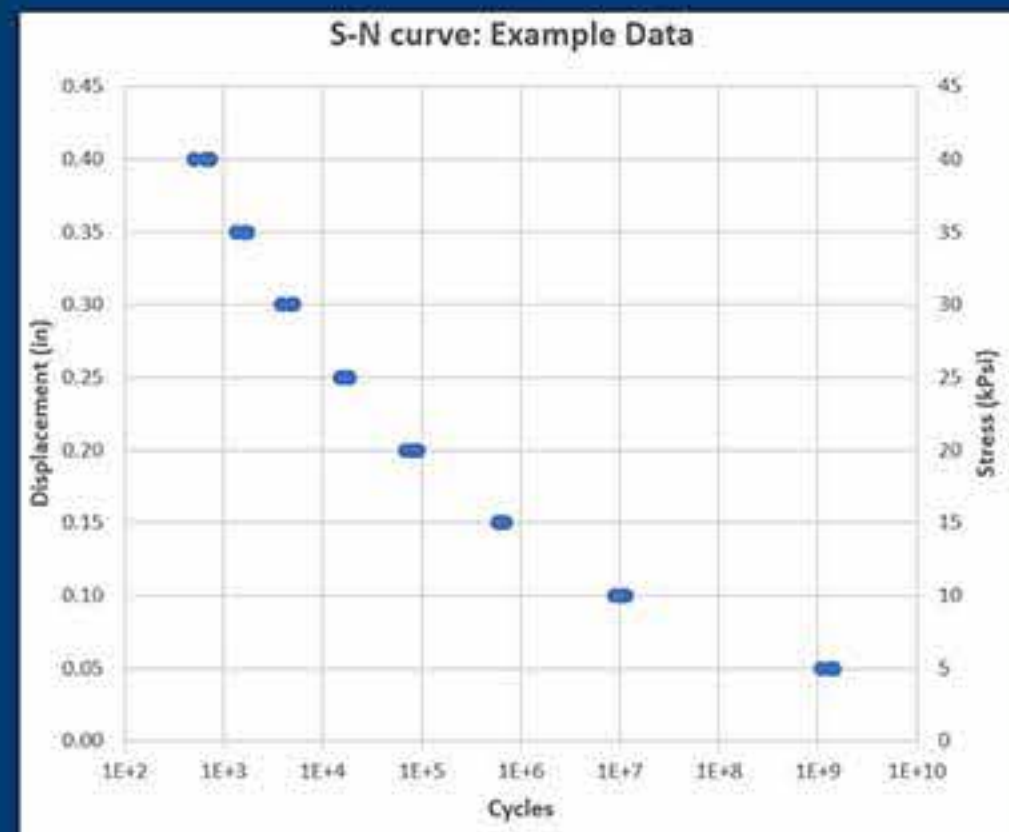


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Problem

An engineer needs to know the durability for a material after it has been bent or pulled many times. In addition, things like heating and bending the metal can change its durability. This durability is modeled with an S-N curve. Commercial machines to produce an S-N curve of a material can cost between \$10,000 and \$300,000.

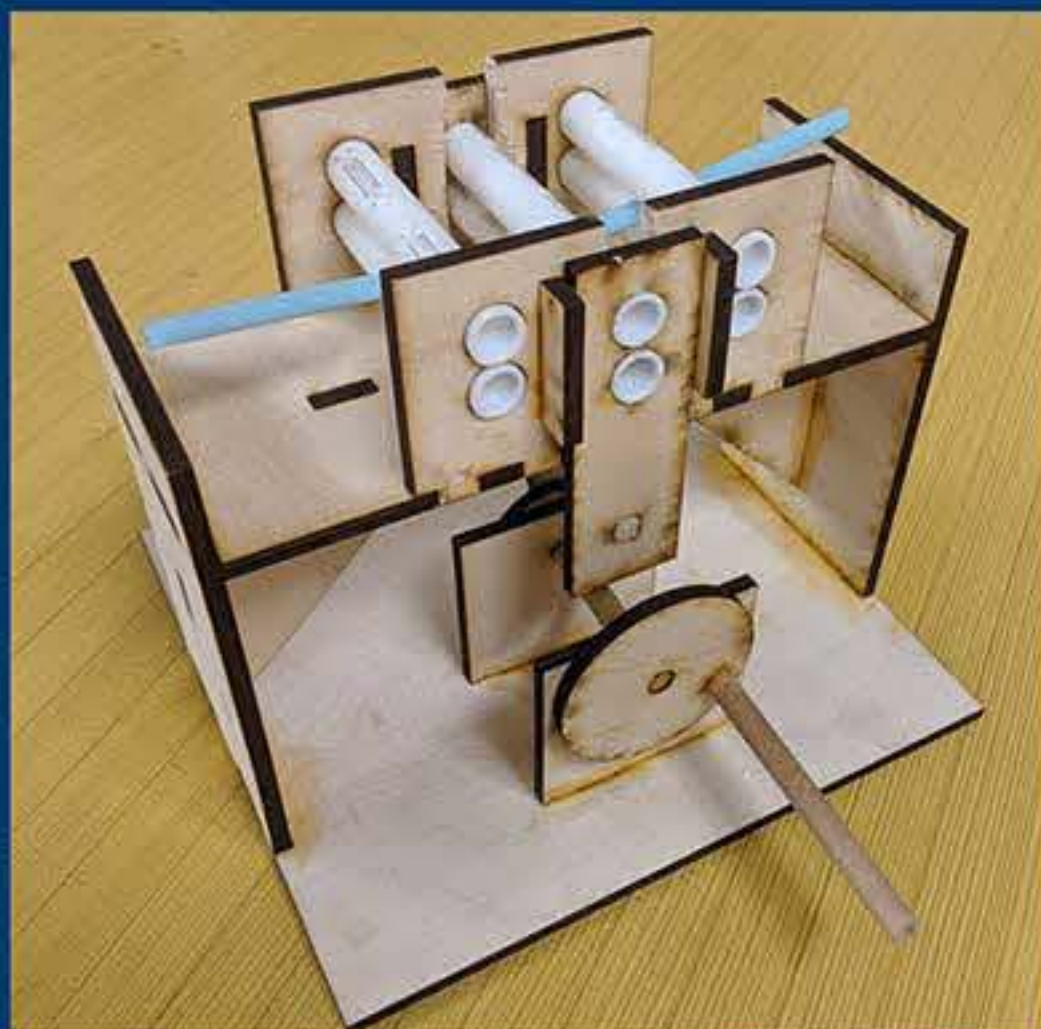


Project Goal

The purpose of this project is to create a fully reversible fatigue fixture that can test the fatigue life of a given sample. This data can be used to create an S-N curve for the sample.

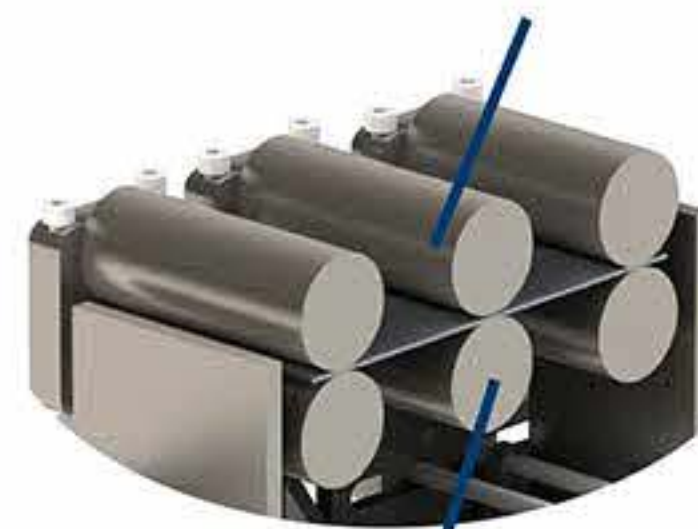
Project Learning

Low-cost, proof of concept prototype laser cut from wood.



Solution

A sandwich of rollers creates a "3-point-bend".



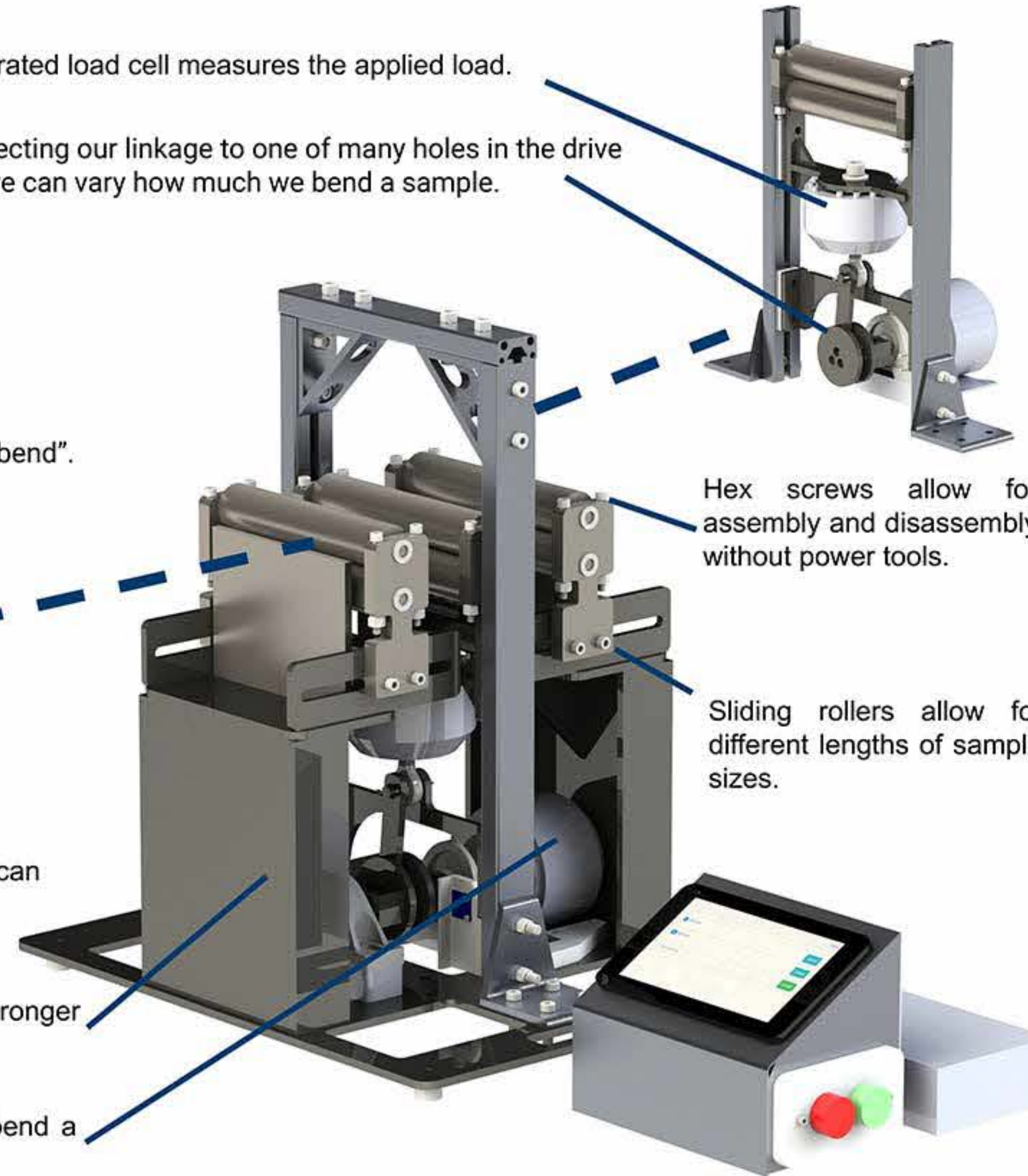
By moving the middle set of rollers, we can bend our sample repeatedly.

1/4" steel guarantees that the fixture is stronger than the aluminum we're bending.

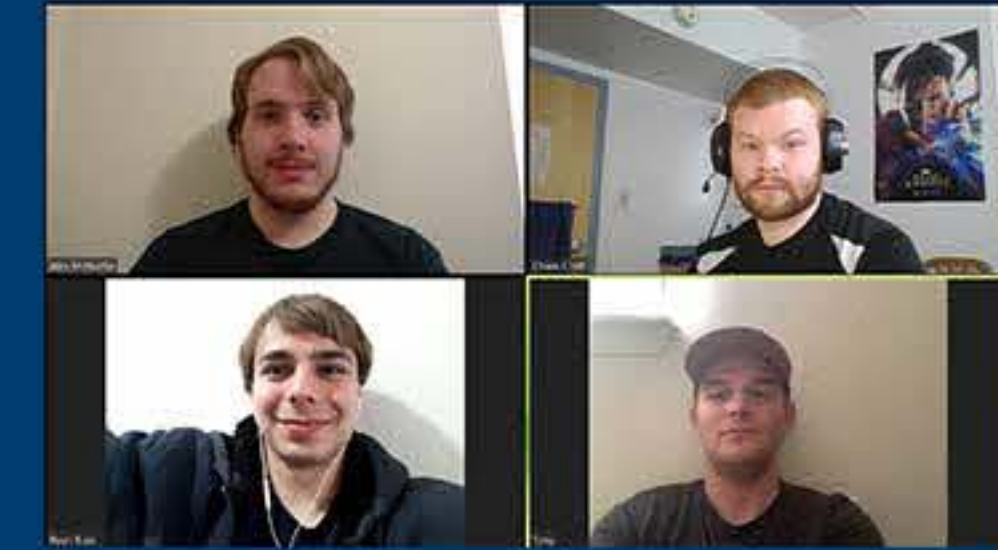
A scooter motor allows the fixture to bend a sample at up to 45 times per second.

Fatigue rated load cell measures the applied load.

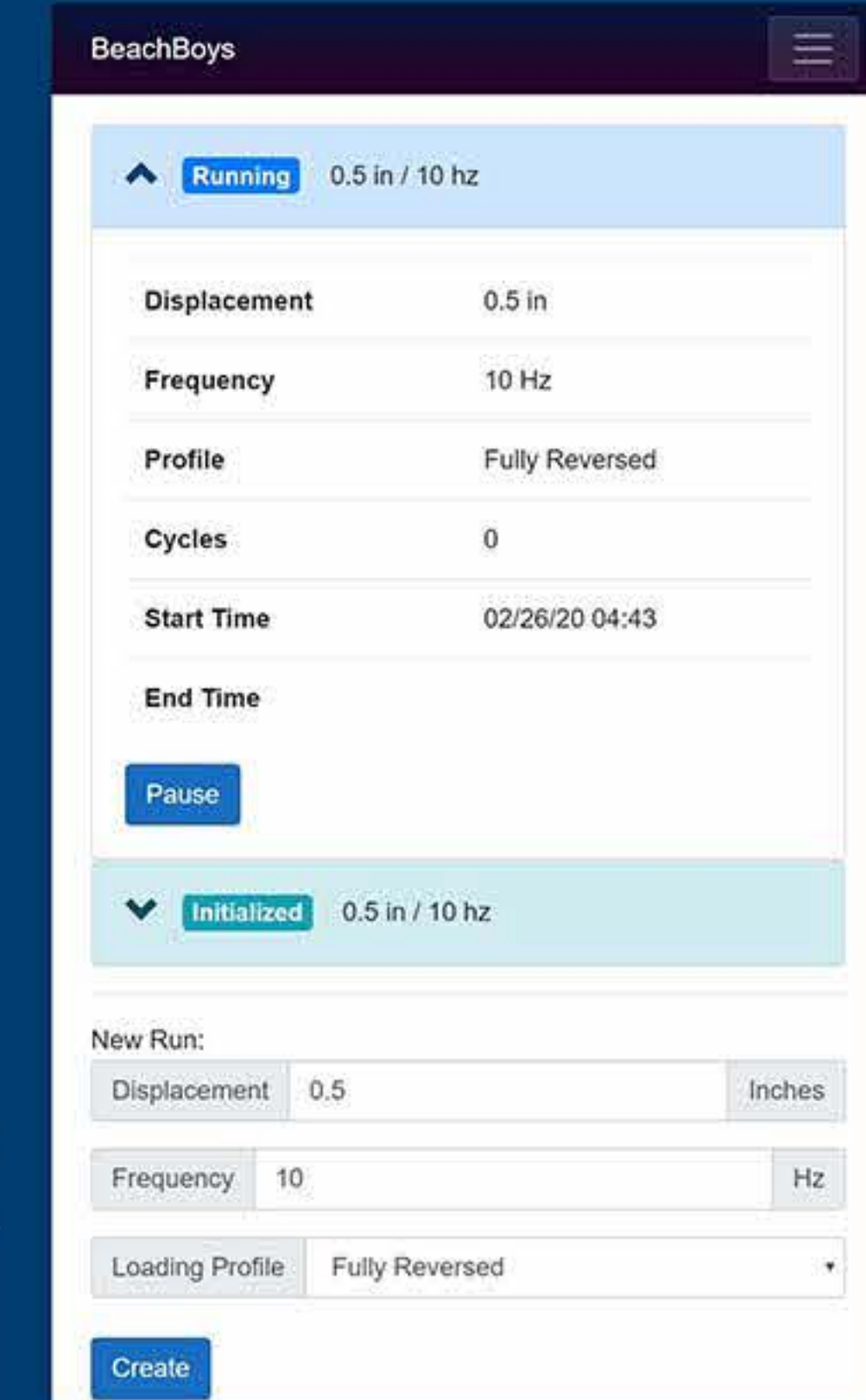
By connecting our linkage to one of many holes in the drive wheel, we can vary how much we bend a sample.



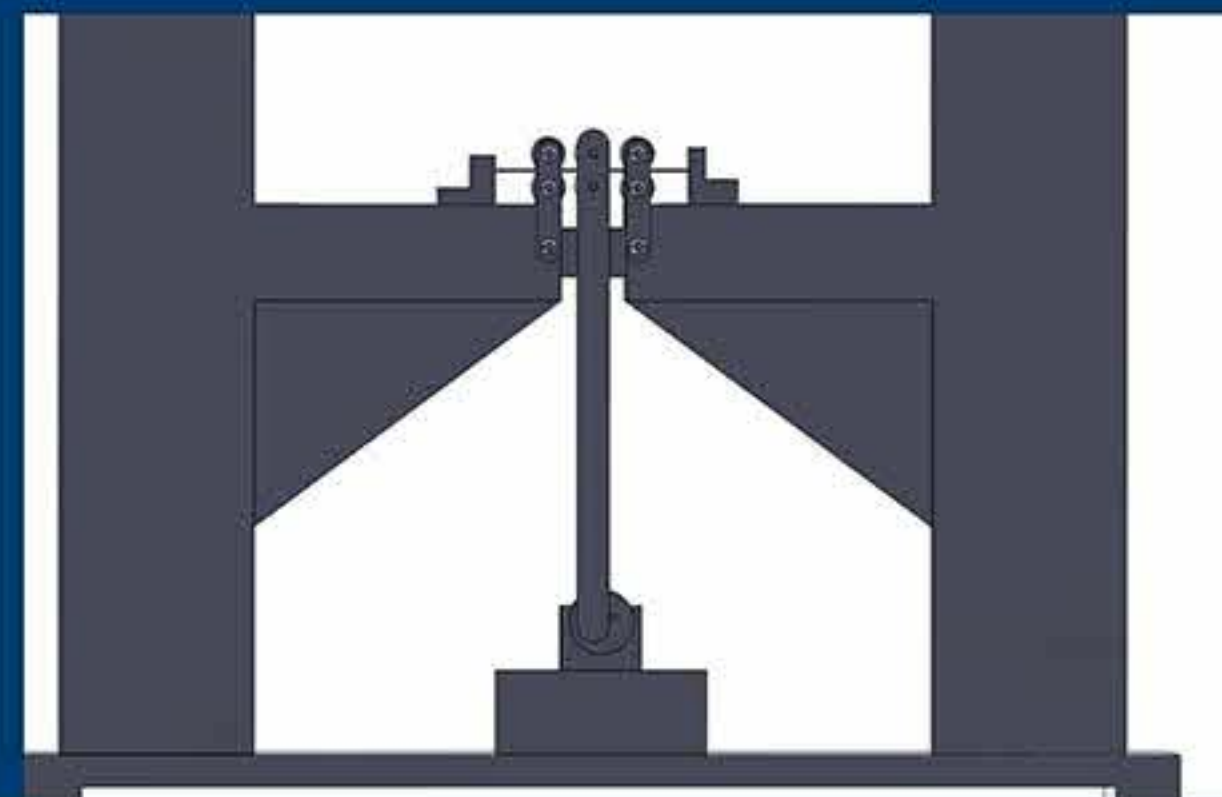
Team Beach Boys



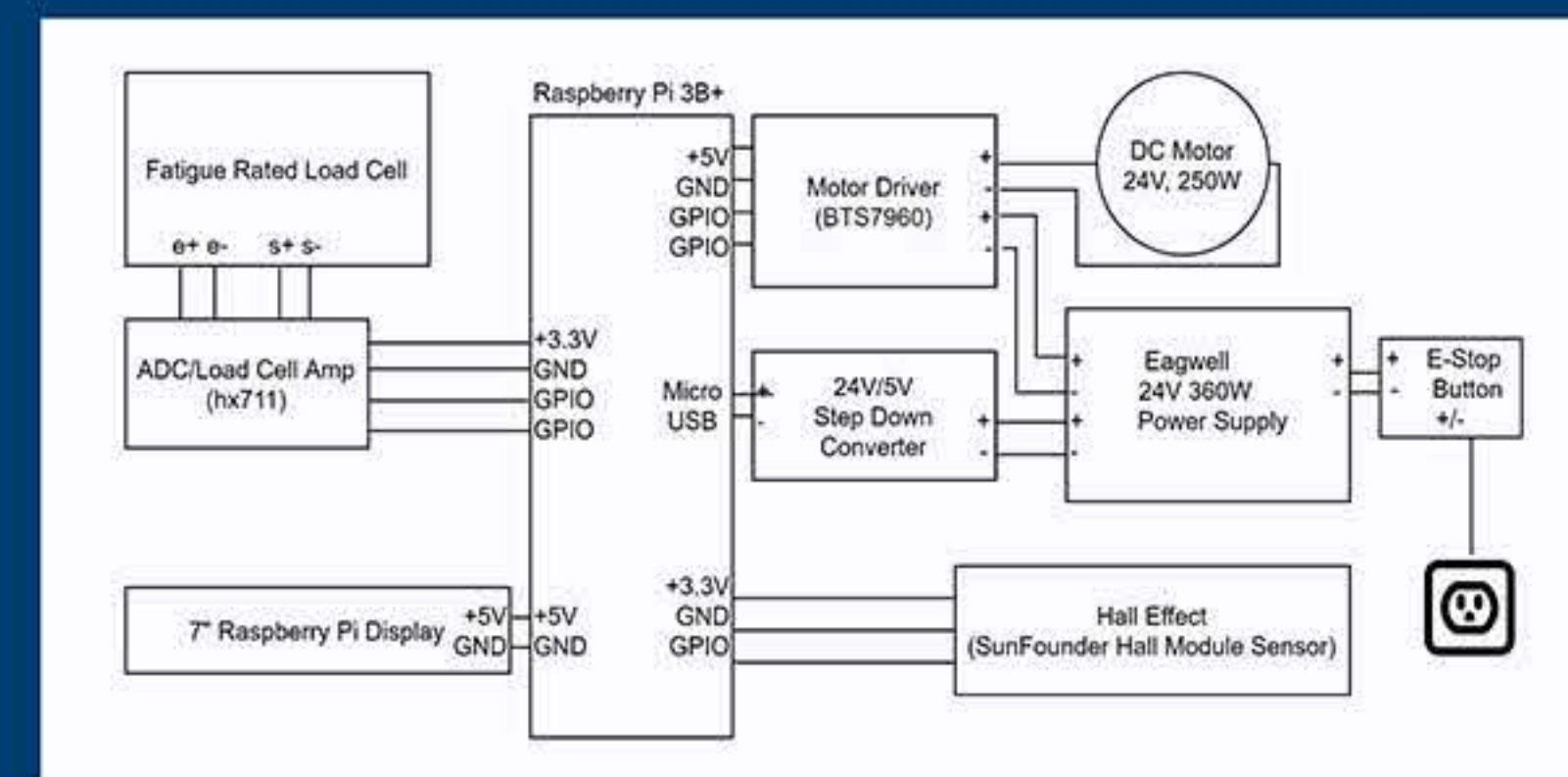
Software/Data Acquisition



A Raspberry Pi counts how many times the sample is bent, and detects when it breaks. It logs this information in an Excel sheet that can be downloaded or sent via email.



Early SolidWorks models allowed us to visualize the important electronic components.



Circuit diagram showing all of the electronic components and how they connect.