

Background:

Tensegrity structures are valued for their high strength-to-weight ratios and unique damping and stiffness properties. Each of these characteristics depends on the tensions of the connecting cables. Structure behavior varies based on how much or how little tension is in each cable. Current research has not established an easy or repeatable way to accurately measure or precisely set the tension in these cables.

Methods:

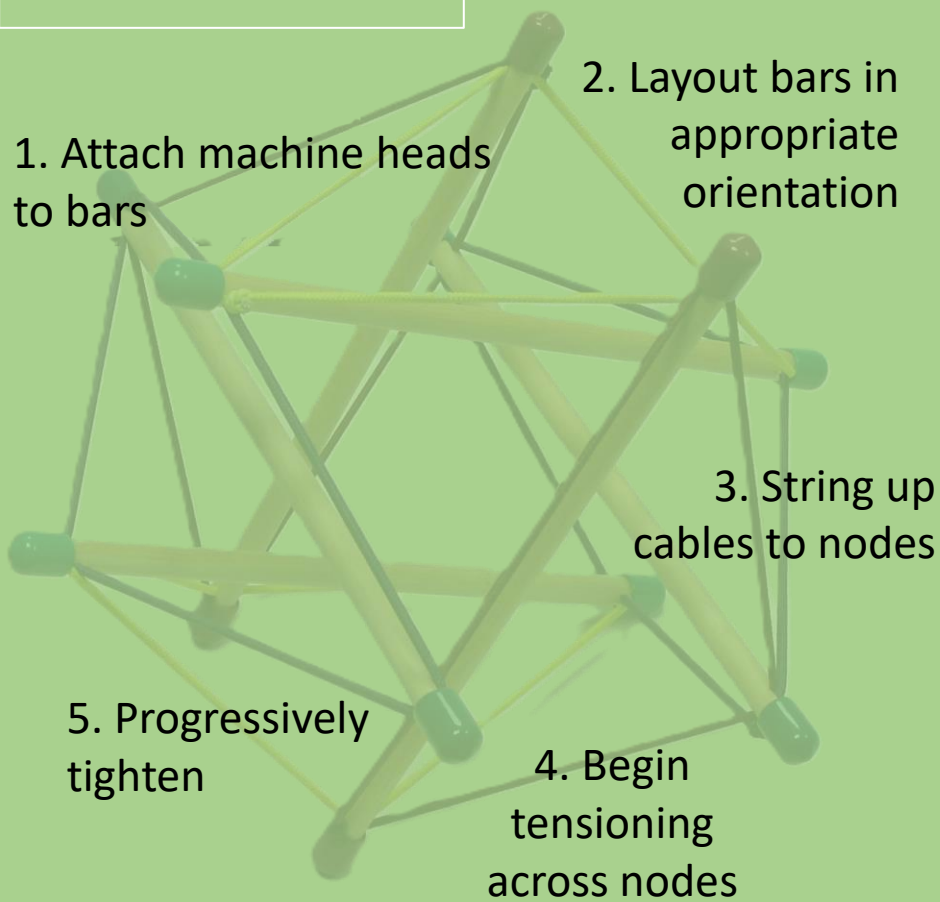
Using off-the-shelf machine heads for instruments we devised a method of constructing tensegrity models using winding of cables. This allows for easy and precise construction with the ability to change tension on each cable. To measure these tension a method of acoustic tuning was used. Frequency of string vibrations were measured with a microphone and off-the-shelf software. These methods provide an easily generalizable method for constructing tensegrity models and a high degree of accuracy in measuring the tension in tensegrity cables.

Future Work:

These developments may be paired with computational algorithms to create easy instructions on how to adjust individual cable tensions to achieve structure-wide characteristics. This ability will allow for the accurate construction of physical tensegrity models that can better replicate desired characteristics of stiffness and strength currently represented primarily in computer simulations.

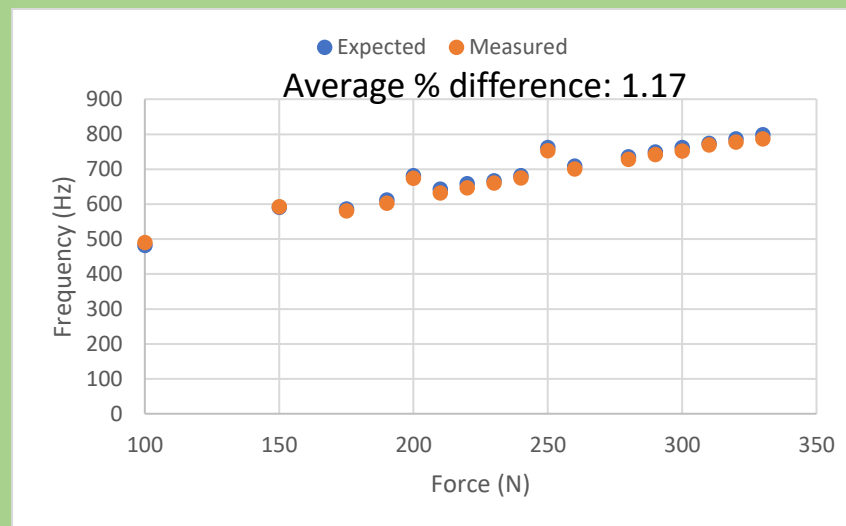
New Precision Way of Constructing and Tensioning Tensegrity

Construction:



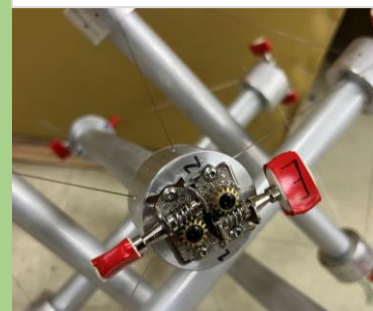
Novel Method of Tensegrity Construction via Acoustic String Tuning

Harrison Denning, Ammon Bullinger, Jeff Hill

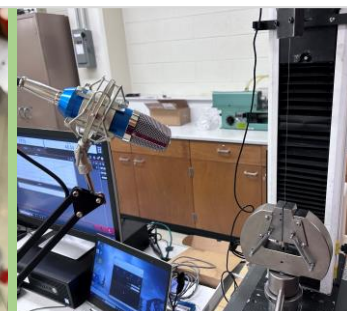


$$f = \frac{\sqrt{\frac{T}{M/L}}}{2L}$$

Mersenne's Law relates frequency and Tension



After Construction:



Validating Methods:



Gathering Data: