Optimizing Tensegrity Locomotion Using Bayesian Optimization

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What is a tensegrity?



How do we get a tensegrity to move?



Research question:

To what extent can we replicate Rieffel and Mouret's results by using Bayesian optimization to find motor frequencies which produce forward motion on our tensegrity?

Building the tensegrity

I worked with Alex Chu (ME), Kentaro Barhydt (ME), Riley Konsella (CPE) and Mitchell Clifford (EE) to produce a wireless-enabled tensegrity strut by writing Arduino control code



Bluetooth control process



Creating the testing setup

There are both hardware and software components:





Tensegrity tracking algorithm





What is Bayesian optimization?





Running the Bayesian optimization code





Running the Bayesian optimization code





Running the Bayesian optimization code





Tensegrity movement vectors



Results



Results









Results

Conclusions

- Working with Riley, Alex, Mitchell, and Kentaro, I helped improve our tensegrity by making it wireless and giving more features
- Working with Kentaro, I helped build a new testing setup to accompany the new tensegrity
- I developed a tracking algorithm using OpenCV to track our tensegrity and allow us to perform tests with it
- Using an out-of-the-box Bayesian optimization package for Python, I demonstrated that Bayesian optimization can be used to develop effective tensegrity gaits

Future work

This term:

• Test out different acquisition functions

Long-term:

• Use Bayesian optimization baseline to evaluate other methods of gait generation

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