Testing Method of Stiffening Actuators

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Objective & Research Question:

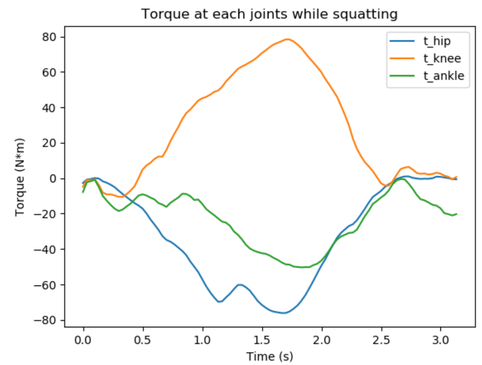
The goal of this project is to design a platform that can evaluate the performance of wearable robotic prototypes designed to stiffen on command for the purpose support and stabilization.

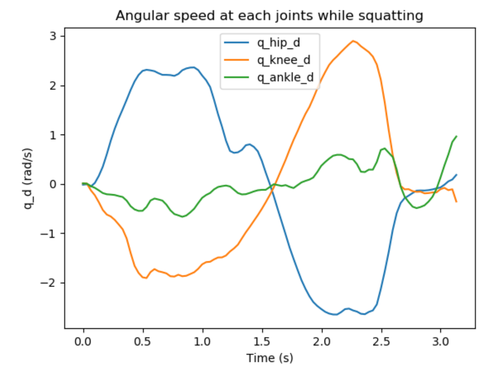
Background:

- Millions of elderly adults around the world experience loss of stability which can lead to falls and injury
- A wearable hybrid robotic system has been proposed to assist and support elderly users via a variety of potential prototyped solutions
- Being able to model the dynamic performance is essential to understanding these protypes
- The purpose of this test platform is to provide a generic interface to understand more about these designs

Methods:

- Based off data collected from motion capture
    - Torque ≅ 80.0 Nm
    - Angular Velocity ≅ 2.75 rad/s
    - Power ≅ 150 W
- Test actuators need to be able to achieve similar performance
- Design parameters that are available to change include motor selection, gear selection and lever arm lengths.





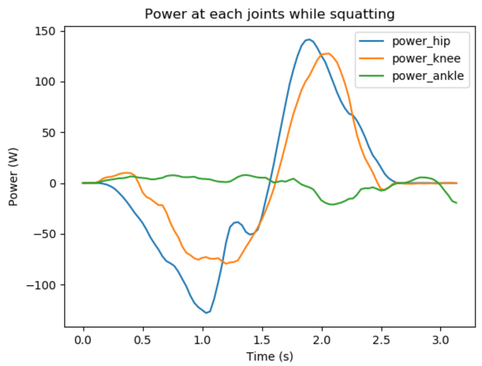


Figure 1: Squatting data collected from motion capture

Results:

- A rotary based test bench is proposed due to its decreased friction with in the system as well as its adaptability for future testing of multiple actuators with multiple degrees of freedom
- CIM was selected for the use of test bench with 70:1 gear reduction
- Future work will include obtaining and integrating components and developing a test protocol to implementation into Python

Figure 2: Calculated motor curve that will be used

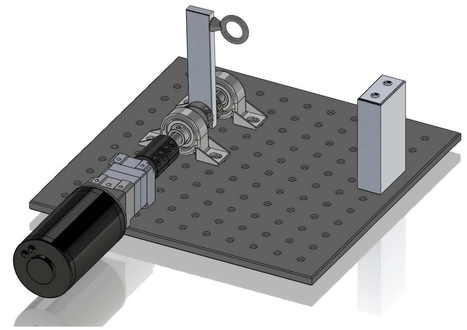


Figure 3: Proposed design modeled in Solidworks

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