MSU STARX

STRENGTH AUGMENTING ROBOTIC EXOSKELETON

Presented by: Katharine Walters, Chief Engineer

Introduction

- Inspired by rescue missions of firefighters
- Intended for healthy users
- Designed, manufactured, and tested by students
- Compete at annual ACE competition

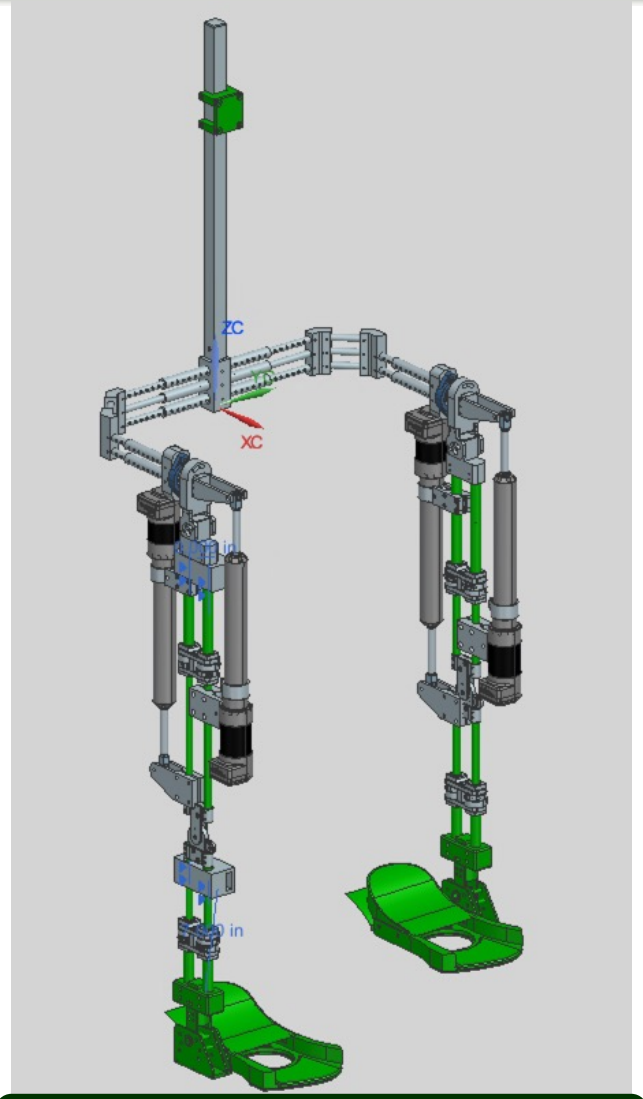


Figure 1: Model of exoskeleton lower body

Design Overview

- Solid aluminum frame transfers weight to floor
- Electric linear actuators
- Machine-learning algorithm with EMG sensor input predicts user intent

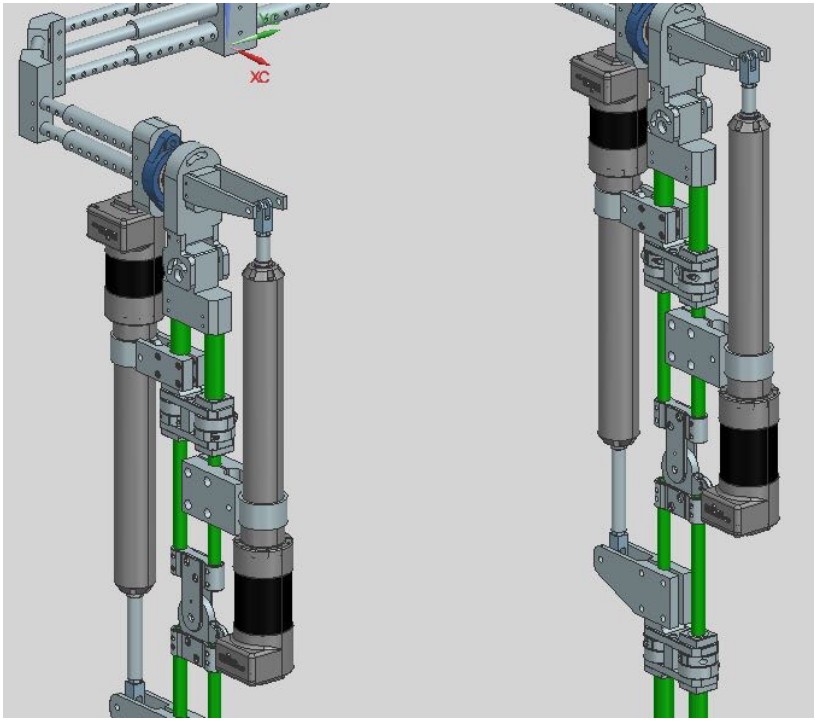


Figure 2: Electric linear actuators actuate hip and knee joints

Development Tool – Computer-Aided Design (CAD)

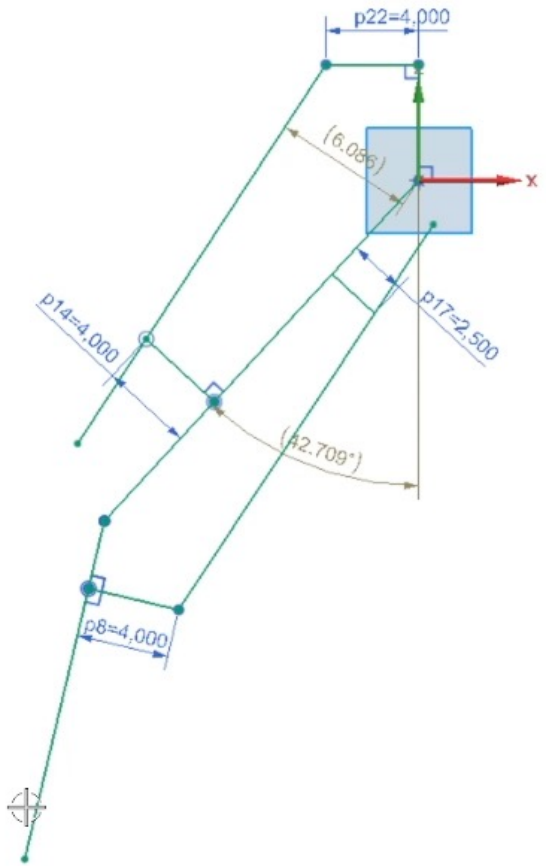


Figure 3: Simple CAD simulation to check interferences

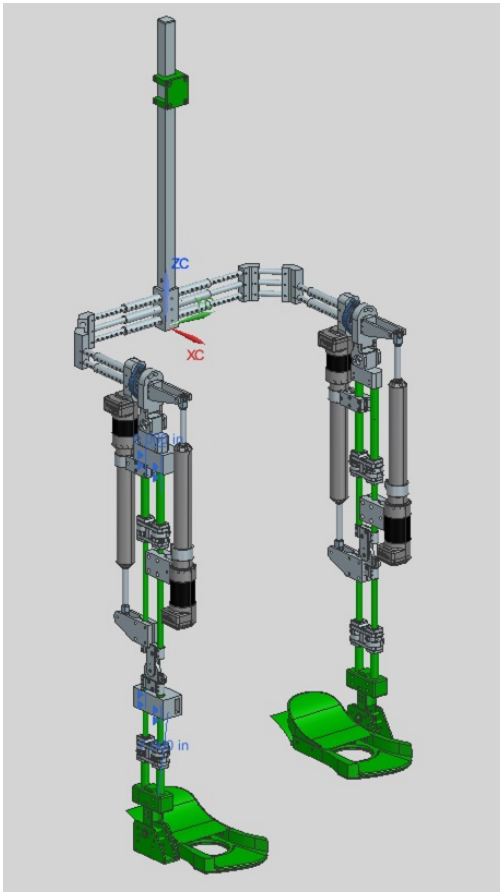
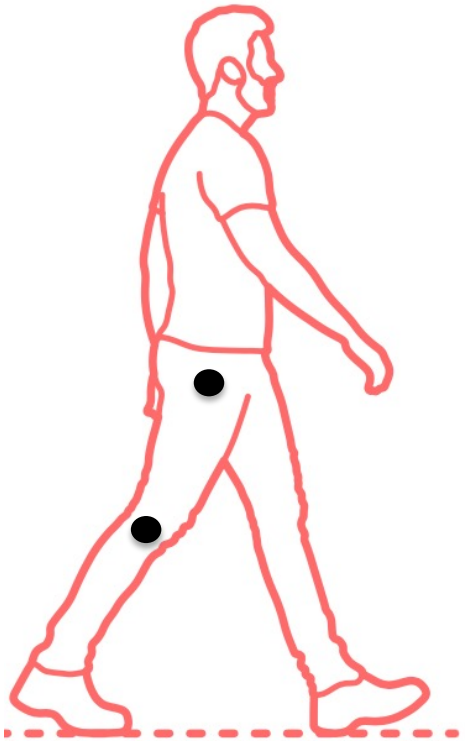


Figure 4: Full CAD assembly to test-fit components

Development Tool – Motion Capture Analysis



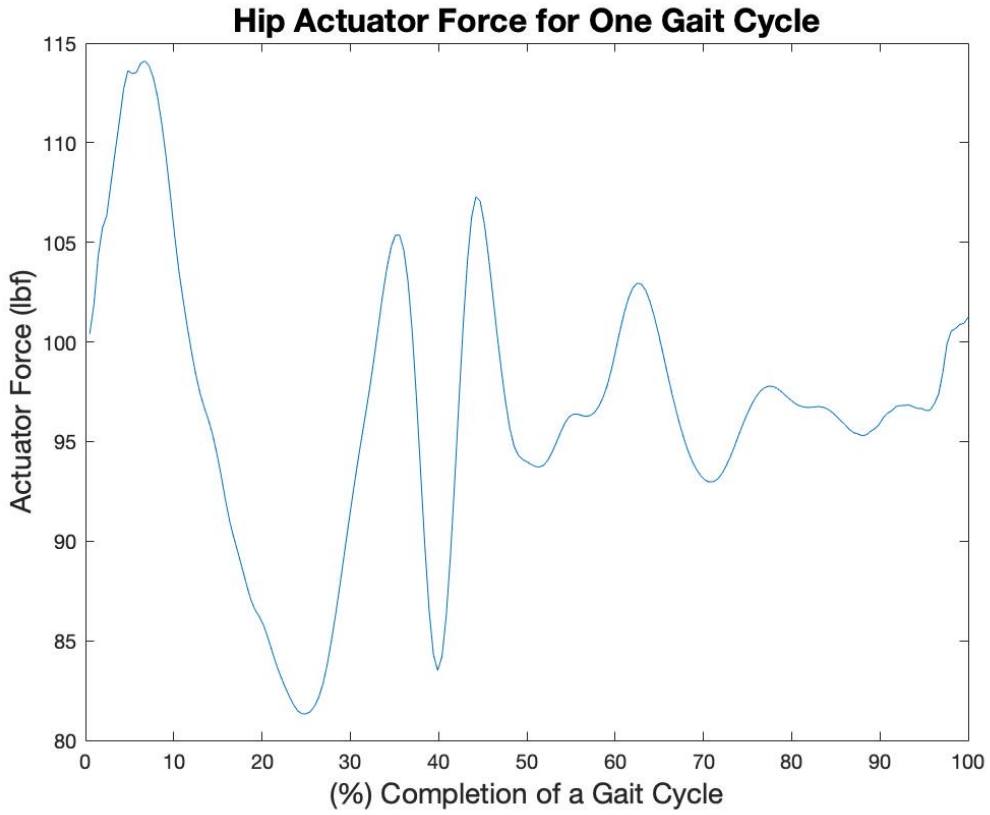


Figure 5: (Left) Motion capture using greater trochanter (hip) and lateral epicondyle (knee), (Right) Estimation of hip actuator force required at each point in gait cycle

Application for Virtual Humans

- Check for potential safety and discomfort issues
- Opportunity to determine load transferred onto the user prior to physical testing
- Reduce time and cost of development process