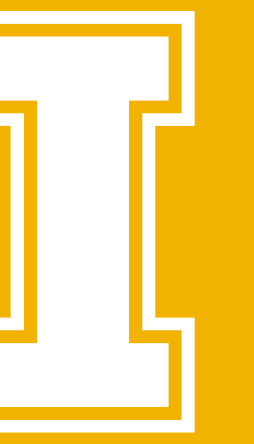




LEG EXOSKELETON FOR MULTIPLE SCLEROSIS

ASHLEY O'CONNOR (ME) JOSHUA WILSON (ME) TRENTEN PATTON (BE) JOSIE ALLEN (CS)



OBJECTIVE

Create a proof-of-concept prototype to validate the usage of linear actuators as a propulsion mechanism for future soft-suit exoskeleton prototype.

VALUE PROPOSITION

There are at least 35 million adults in the United States alone that are impacted by conditions that impair mobility. Powered assistance devices are notably expensive and hard to come by. The goal of this capstone design is to aid in the development of a future exoskeleton by finding a propulsion mechanism.

KEY REQUIREMENTS

- I Achieve ankle ROM of 30° total, 10° dorsiflexion and 20° plantarflexion
- I Follow joint angles that correspond to joint angles within a natural gait cycle
- I Function without warping

FUTURE RECOMMENDATIONS

- I Develop a form fitting foot brace
- I Acquire faster and stronger linear actuators
- I Implement spring series elastic mechanism

ACKNOWLEDGEMENTS

Client: Kevin Rhodes

Instructors: Dr. Steve Beyerlein

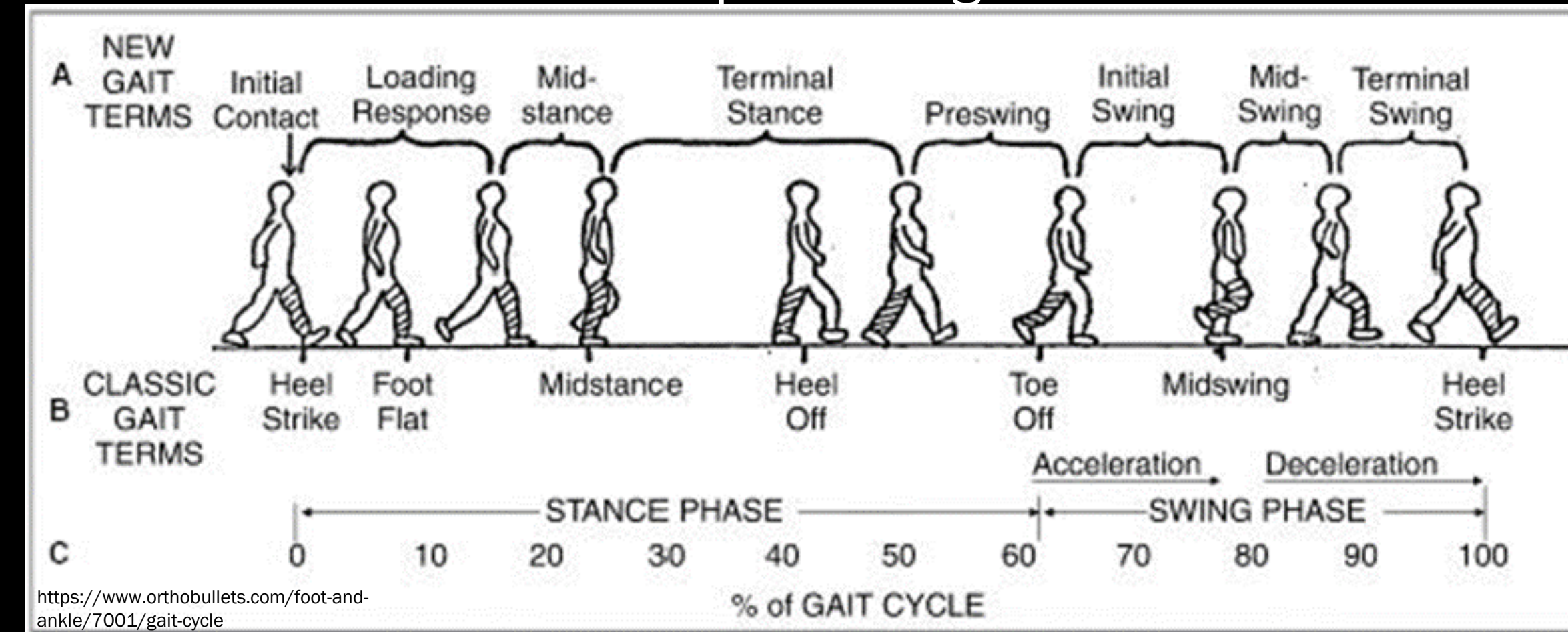
Dr. Joel Perry, and Dr. Eric Wolbrecht

Mentor: Jackson Stump

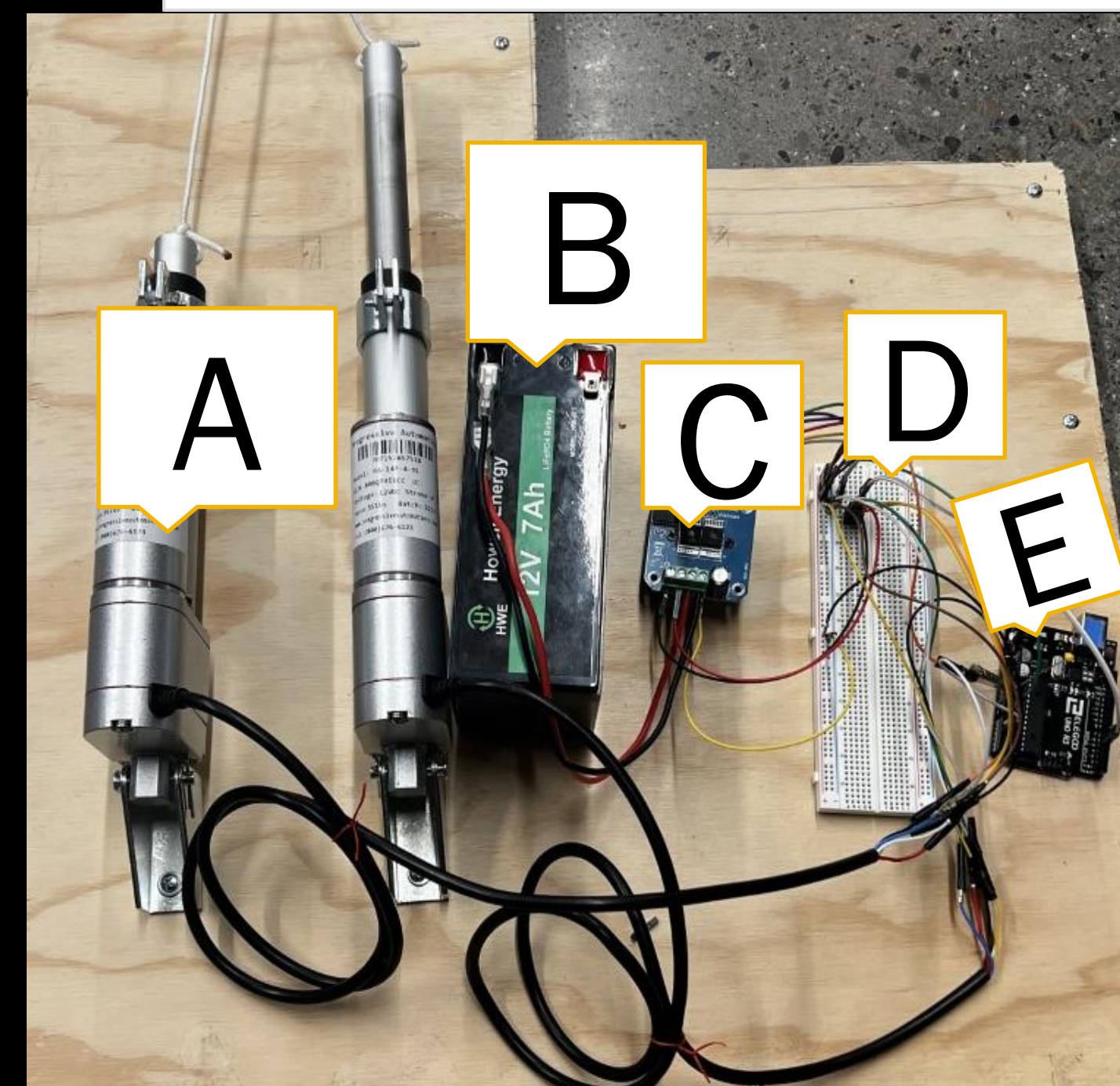
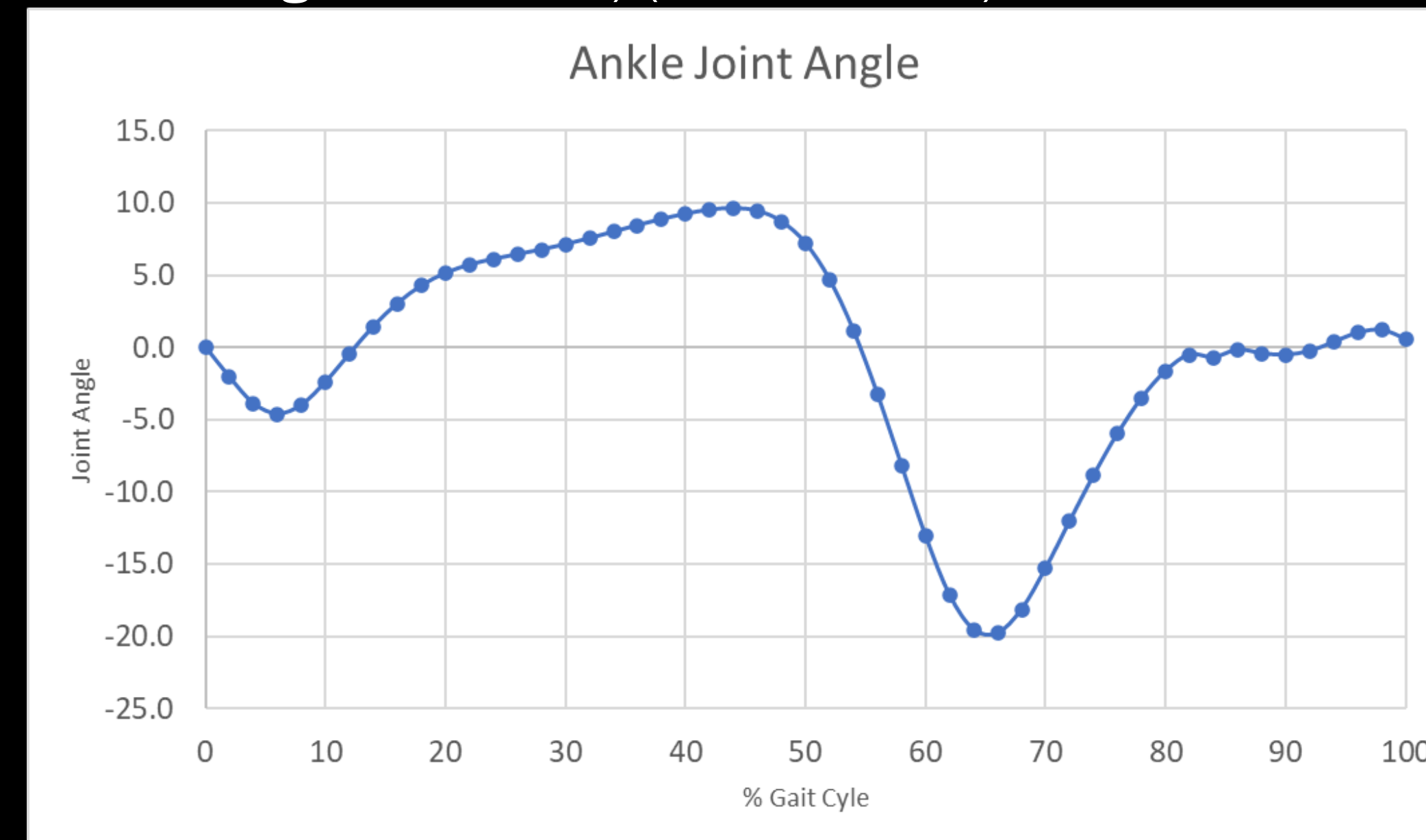
Made Possible by the Dean and Cindy Haagenson Endowment

BACKGROUND

This prototype focused on the ankle alone, we use data describing the ankle joint angle throughout the gait cycle to determine our minimum required range of motion.



The average range of motion for a normal walking gait is 10° dorsiflexion (toes up, positive values) to 20° plantarflexion (toes down, negative values) (Winter 1990).



VALIDATION

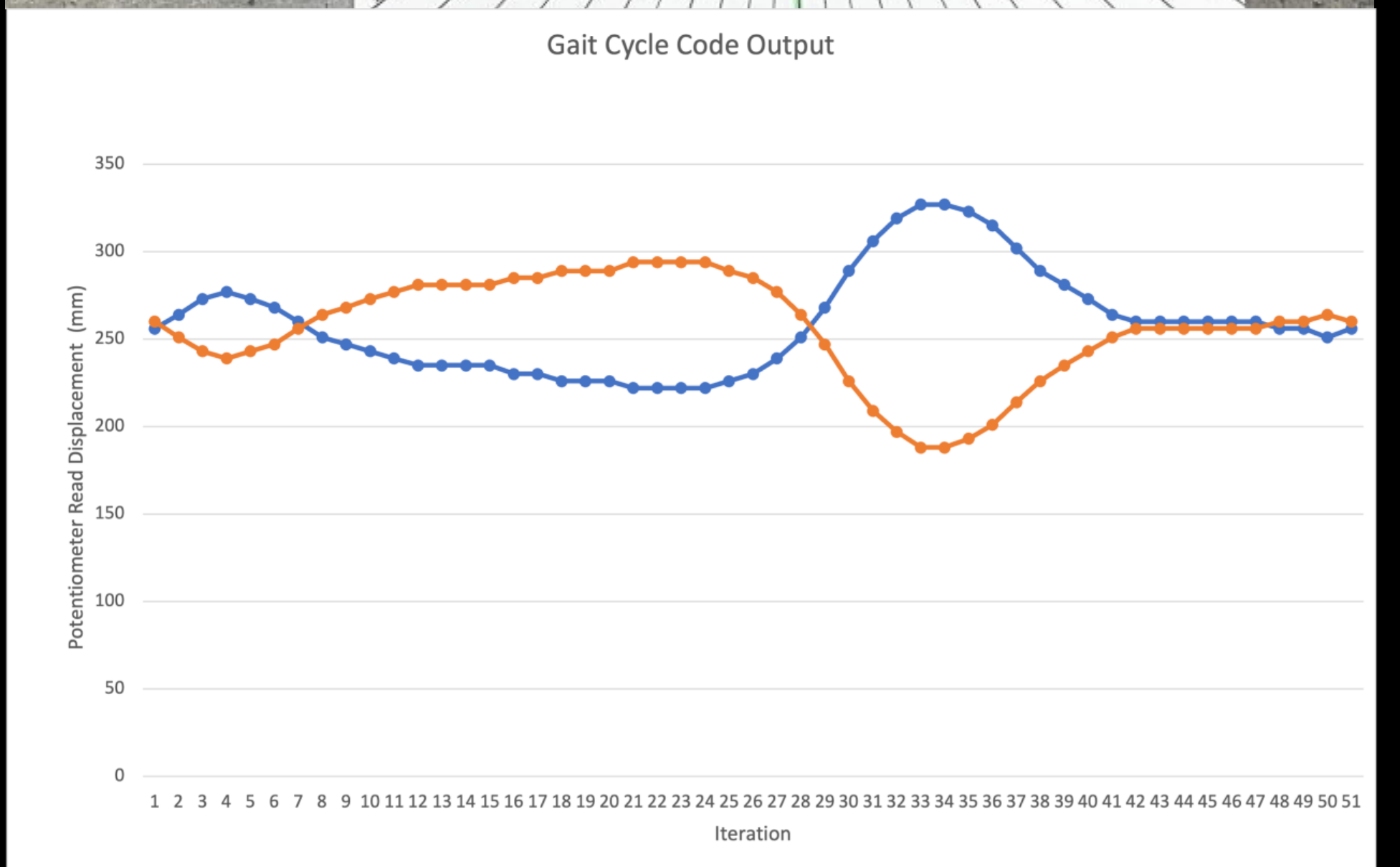
- I Enlarged protractor to ensure proper ankle range of motion is met using video analysis
- I Performed calibration of position output of actuators to ensure accuracy of measurement
- I Graphing of data from actuators and comparing it to original gait cycle data

FINAL DESIGN

Our prototype utilizes linear actuators and recorded gait cycle data to replicate proper ankle range of motion. By pulling a foot brace with the actuators, we have shown that our prototype has the potential to re-enable our clients' ability to walk. This would greatly improve mobility and enhance the overall quality of life for individuals with walking disabilities.



Gait Cycle Code Output



University of Idaho
College of Engineering

TEAM MS-EX02000
2023 Capstone Project