

COLLEGE OF ENGINEERING

Control Seminar



Sponsored by: Bosch, Ford, and Toyota

Walking Like a Robot: Improving Human Gait Through Modeling and Simulation



ANNE MARTIN

Martin W. Trethewey Early Career Professor;
Assistant Professor of Mechanical Engineering
Penn State University

September 25, 2020 3:30 - 4:30 pm
Event will take place via Zoom

ABSTRACT: While walking without falling seems trivially easy for most people, it typically becomes harder as people age. The consequences of falling also increase with age, motivating a desire to predict who is likely to fall so that preventative actions can be taken. However, despite a tremendous amount of research, we do not have good predictive measures for fall risk, in part because we lack predictive models of human walking and have generally ignored non-steady locomotion. The intermittent contacts and nonlinear nature of bipedal walking makes modeling and control of such systems challenging. By applying nonlinear, robot control theory to human gait, moderately complex models can be developed to better understand human locomotion. This talk will discuss how I have leveraged recent advances in legged robot control to develop computationally-tractable, predictive models of human walking and evaluate how the percentage of time spent on two feet affects disturbance rejection capabilities. I will describe how the variability at each joint impacts the number of steps to fall using the results from a simulation study. Finally, I will discuss how people transition between walking speeds.

BIO: Anne Martin is the Martin W. Trethewey Early Career Professor of mechanical engineering at the Pennsylvania State University. Prior to that, she was a postdoctoral associate in the Locomotor Control Systems Laboratory within the departments of Bioengineering and Mechanical Engineering at the University of Texas at Dallas. She received her PhD in mechanical engineering from the University of Notre Dame in 2014. For her dissertation research, she received the Eli J. and Helen Shaheen Graduate School Award in Engineering, which is awarded to the top doctoral graduate in the College of Engineering. In 2009, she graduated Summa Cum Laude from the University of Delaware with a bachelor's degree in mechanical engineering. Her research interests include modeling human gait, particularly impaired human gait, and using such models to develop clinically useful interventions.