DEPARTMENT OF MECHANICAL ENGINEERING
WILLIAM MAXWELL REED SEMINAR SERIES

"Towards a Unified Framework for Robotic Locomotion Control"

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Abstract: Bioinspired robots and wearable robotic devices are prime examples of complex cyber-physical systems with integrated computational and physical capabilities that can interact with humans and their environments in numerous modalities. Highly nonlinear and hybrid dynamics, nontrivial specifications involving constraints on the robotic system states and actuator inputs, and safety-critical demands due to interaction with humans, make the design and implementation of locomotion algorithms for these systems time-consuming and challenging.

In this talk, we present the virtual constraints framework that has been employed for achieving agile and efficient locomotion for powered prostheses, snake robots, and gymnast robots, amongst others. We demonstrate that this framework paves the path for employing advanced tools from computer algebra, pattern recognition, extremum-seeking and optimization-based control, and geometric mechanics, for gait generation and model-free control in robotic locomotion. We show how the virtual constraints framework can be effectively used for addressing modern robo- tic locomotion problems such as the curse of dimensionality, the tight safety-critical demands, and the need for hierarchy in robotic control systems architecture.

Abstract: Alireza Mohammadi received the PhD degree in Electrical and Computer Engineering from the University of Toronto, Canada in 2016. During his PhD studies, he collaborated with the Norwegian Centre for Autonomous Marine Operations and Systems (a Centre of Excellence for research in Norway) on locomotion control of ground and swimming snake robots. In 2011, he received the Master's degree from the University of Alberta, Canada where he was with the Telerobotic & Biorobotic Systems Laboratory. He received the Bachelor's degree in Electrical Engineering from Sharif University of Technology, Iran in 2009. He joined the Locomotor Control Systems Laboratory at the University of Texas, Dallas, as a Postdoctoral Research Associate in November 2016, where he is using neuromechanical principles in the context of feedback control theory to design wearable robot control systems. His research interests include bioinspired robotics, wearable robots, nonlinear control, hybrid systems, and cyber-physical systems.

Date: Wednesday, Feb. 21
Time: 3PM
Place: CB 122
Contact: Dr. Alexandre Martin 257-4462

Meet the speaker and have refreshments
Attendance open to all interested persons

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