MAE *Faculty Candidate* SEMINAR

The Challenge of Ant-Scale Robots

FRIDAY,
FEBRUARY 21
10:00 AM
206 FURNAS

Dr. Ryan St. Pierre

Postdoctoral Research Associate
Mechanical Engineering
Carnegie Mellon University

ABSTRACT

The highly dynamic mobility of insects inspires an entire field of microrobotics, with future visions of ubiquitous small-scale robots. However, current microrobots pale in comparison to insects not only in mobility and application capabilities, but overall in autonomy. Insects take advantage of their muscles as actuators, neural systems for control, mechanisms from multiple materials, and a variety of sensors to accomplish tasks. This leads to driving questions (1) what enables highly dynamic mobility, and ultimately autonomy, in insects and (2) how can we apply lessons learned about insects to small-scale robots that are inherently resource constrained?

To begin answering these questions, physical, robotic models are utilized as reduced parameter analogs to biological systems. An experimental platform and robots are presented to study locomotion that is scalable and adaptable for different robot designs from 1 g to 1 mg. Experimental data are coupled with numerical models to begin understanding the role of legs and material choice as robots scale down in size. Multiple materials enable dynamic behaviors in insects, while robots can use material to program desired behaviors. Bringing together experimental robotic platforms, biological system insights, and computation models, this work points toward directions to enable future autonomy in microrobotics platforms.

BIO SKETCH

Ryan St. Pierre is presently a post-doctoral researcher at Carnegie Mellon University working at the intersection of biological systems and microrobotics. He received his doctoral degree in 2018 from the University of Maryland, with a research focus on small-scale locomotion, and MS and BS degrees in 2013 from Northeastern University. His research interests include microsystems, robotics, and organismal biology to understand highly dynamic biological systems and create microrobot analogs, all at small size scales. His work in microrobotics has been recognized with the Best Paper award at the 2018 Solid-State Sensors, Actuators, and Microsystems Workshop and covered by IEEE Spectrum. Recently, Ryan has been highlighted on the 2020 Forbes 30 Under 30 Science list.