Formation Control Using Bearing-Only Sensing
Theory and Implementation Challenges

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Aerospace Engineering
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Wednesday, May 15th 2019, h:11.00
Aula 5.5, DEI

About the speaker

Daniel Zelazo is an Associate Professor of Aerospace Engineering at the Technion - Israel Institute of Technology. He received his BSc. (99) and M.Eng (01) degrees in Electrical Engineering and Computer Science from the Massachusetts Institute of Technology. Before beginning his doctoral studies, he worked for two years on audio compression algorithms as a research engineer at Texas Instruments, Japan. In 2009, he completed his Ph.D. from the University of Washington in Aeronautics and Astronautics. From 2010-2012 he served as a post-doctoral research associate and lecturer at the Institute for Systems Theory and Automatic Control in the University of Stuttgart, and he joined the Technion in 2012. He is an associate editor for the international journal on robust and nonlinear control, and the IEEE control system letters. His research interests include topics related to multi-agent systems, optimization, and graph theory.

Abstract

Formation control is one of the fundamental tasks for a multi-agent system. The basic problem of formation control is for a team of autonomous vehicles to arrange themselves into a desired spatial configuration. This should be accomplished, ideally, using only on-board sensing without the need for any global, or centralized coordinator. In this talk, we discuss formation control strategies that employ bearing sensors, most commonly realized by camera systems. We provide an overview of the recently developed bearing rigidity theory, which gives the framework for how to define bearing formations and provides the architectural requirements for a multi-robot system to solve the problem. We then discuss challenges and solutions for implementing the control strategies on a robotic platform.

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