

Jan 24, 2019

Hierarchical Control Systems for Robotic Swarms

ABSTRACT:

Technological advances have enabled the design of robotic swarms such as teams of interconnected vehicles. A major research area in robotic swarms is the development of distributed communication rules and coordination control algorithms such that robot teams perform given operations through local interactions. The key feature of utilizing local interactions is to ensure robustness and scalability of the closed-loop robotic swarm systems. While distributed control algorithms are important to effectively support a wide array of civilian and military operations that range from collaborative surveillance and reconnaissance to guidance and control of underwater, ground, aerial, and space vehicle teams, several scientific knowledge gaps currently inhibit this endeavor. In this seminar, we will focus on critical challenges related to control of robotic swarms such as presence of environmental disturbances and modeling uncertainties, limited actuation and unmodeled dynamics, lack of controllability and observability, heterogeneity, temporal constraints, and human interactions, and present hierarchical distributed control system architectures to allow teams of robots accomplish given operations with stability and performance guarantees. The presented system-theoretical findings will be also supported by experimental results in order to bridge the theory-practice gap.



Tansel Yucelen

*Assistant Professor
Department of
Mechanical Engineering,
University of South
Florida, FL*

BIOGRAPHY:

Tansel Yucelen is an Assistant Professor in the Department of Mechanical Engineering at the University of South Florida (since 2016). He received the Doctor of Philosophy degree in Aerospace Engineering from the Georgia Institute of Technology (2012). Prior to joining the University of South Florida, he held an Assistant Professor position in the Department of Mechanical and Aerospace Engineering at the Missouri University of Science and Technology (2013-2016) and a Research Engineer position in the School of Electrical and Computer Engineering and the School of Aerospace Engineering at the Georgia Institute of Technology (2011-2013). He was also a Summer Faculty Fellow at the Air Force Research Laboratory Wright-Patterson (2014) and Eglin (2015), and a consultant to NASA (2014-2016), Wichita State University (2017-2018), and the Missouri University of Science and Technology (2017-2018). He has co-authored more than 200 peer-reviewed papers in top internationally-recognized journals and conferences, and secured external grants and contracts through NSF, AFRL, AFOSR, ARO, DARPA, MDA, NASA, and ORAU. He was the recipient of the University of South Florida Research and Innovation Faculty Outstanding Research Achievement Award (2018), the University of South Florida College of Engineering Junior Outstanding Research Achievement Award (2017), the Aerospace Control and guidance Systems Committee Dave Ward Memorial Lecture Award (2016), the AIAA Technical Contribution Award (2016), the Oak Ridge Associated Universities Junior Faculty Award (2015), and the Class of 1942 Excellence in Teaching Award (2014). He is a member of the National Academy of Inventors, a senior member of the AIAA, and a senior member of the IEEE.