



**STEVENS INSTITUTE OF TECHNOLOGY
ROBOTICS & CONTROLS SEMINAR SERIES
DEPARTMENT OF MECHANICAL ENGINEERING**

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Carnegie Room 315, Time 1:30pm**

Automated synthesis of feedback policies for multi-robot teams and groups from high-level specifications

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Using multiple robots in place of a single complex robot to accomplish a task has many benefits, including simplified system repair, less down time, and lower cost. Combining groups of these multi-robot systems allows addressing multiple subtasks in parallel, reducing the time it takes to address many problems, such as search and rescue and automated warehouse systems. I will address the synthesis of controllers for groups of multi-robot systems that enable them to automatically create desired labeled formations and maintain those formations while traversing an environment with obstacles. The robots have constraints on communication, both within and across groups. In a group, individuals are capable of close coordination via high bandwidth communication, since they are within a specified distance of the other robots. Coordination across groups must be limited because communication links can be sporadic or more expensive. I will describe a method for developing feedback controllers for reconfiguring groups of robots that is entirely automatic, and provably correct by construction. I will also describe a method for navigating a large group of robots while managing complexity by using an abstraction. This work provides a framework with which navigation of multiple groups in environments with obstacles is possible, and enables scaling to many groups of robots.

Nora Ayanian received the B.Sc. degree in mechanical engineering from Drexel University, Philadelphia, PA, in 2005. She received the M.S.E. degree in mechanical engineering and applied mechanics in 2008 from the University of Pennsylvania, Philadelphia, PA, where she is currently a Ph.D. candidate in this field. She was a Co-Instructor for the University of Pennsylvania Summer Academy in Advanced Science and Technology Robotics Program in 2008 and 2009. Her research interests include multi-robot control in complex environments. Ms. Ayanian is a member of the American Society of Mechanical Engineers and the Institute of Electrical and Electronics Engineers. She is a National Science Foundation Fellow and the recipient of the 2008 IEEE International Conference on Robotics and Automation Best Student Paper Award.

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