

# Cooperation and Learning in Multiple Robot Teams

Lynne E. Parker<sup>1</sup>

Center for Engineering Science Advanced Research  
Computer Science and Mathematics Division  
Oak Ridge National Laboratory

## Abstract

This talk addresses the problem of achieving fault tolerant cooperation within small- to medium-sized teams of heterogeneous mobile robots. I will describe a software architecture I have developed, called ALLIANCE, that facilitates robust, fault tolerant cooperative control. Results from several implementations of ALLIANCE will be presented. I will then address issues in multi-robot learning, describing techniques used by myself and my ORNL colleagues to enable robot teams to learn and adapt cooperative actions based upon experience. One such technique is an extended version of ALLIANCE, called L-ALLIANCE, that incorporates an automated, dynamic parameter update mechanism that allows teams of mobile robots to learn from their previous experiences with other robots to improve their performance from trial to trial. Developing operational multi-robot teams involves research on a number of topics: fault tolerant cooperative control, adaptive action selection, distributed control, robot awareness of team member actions, improving efficiency through learning, inter-robot communication, action recognition, local versus global control, and metrics for measuring success. As time allows, I will discuss these issues of cooperation and learning and their impact on multi-robot team design.

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