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Computational Intelligence Society



Intelligent Control of Teams of Autonomous Robots

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Date: **Friday October 24, 2008**

Lecture Time: 6:30 pm

Lecture Location: **Carnegie Mellon Silicon Valley at Moffett Field**

Directions: sv.cmu.edu/who_we_are/visitor

Bldg. 23, room 129

RSVP: not required; no cost

Abstract:

Regulation of the actions of teams of collaborating autonomous robots poses problems that are significantly more complex than those considered when developing controllers for single robots. The multiplicity of team formations and interactions, the requirements imposed by communication needs, and the need to distribute resources and control functions substantially increase the dimensions of state and control spaces and the number of operational constraints that must be considered.

In this talk we will present ongoing research on topics related to the control of motions and actions of teams of interacting autonomous robots. We will start by reviewing basic notions of similarity, utility, and preference underlying similarity-based interpretations of fuzzy logic. On the basis of this conceptual framework we will introduce behavior-based approaches where behaviors are defined in terms of mappings, called desirability functions, that define relative preferences, from the perspective of a single goal or objective, for certain actions as a function of the robot state. We will then review blending mechanisms that gracefully combine multiple purposive and reactive behaviors employing fuzzy-logic techniques.

We will extend these notions to the realm of teams of autonomous robots introducing various approaches to the definition of team behaviors. In particular, we will review approaches for the synthesis of hierarchical controllers based on decomposition of the problem on identification of behaviors at the individual, internal organization, and external action levels. We will also review other experiments in the control of distributed robot teams and sensor networks at SRI such as the Centibots project.

Speaker: (see next page)



Enrique H. Ruspini from the University of California at Los Angeles. Prior to joining SRI, Dr. Ruspini held positions at the University of Buenos Aires, the University of Southern California, UCLA's Brain Research Institute, and Hewlett-Packard Laboratories. Dr. Ruspini is a pioneer in the development of fuzzy-set theory and its applications, having introduced its use to the treatment of numerical classification and clustering problems. He has also made significant contributions to the understanding of the foundations of approximate reasoning. His recent research has focused on intelligent planning and control, information fusion, adaptive sensing systems, qualitative system modeling, and knowledge discovery in databases. Dr. Ruspini, who has recently been awarded the 2009 Fuzzy Systems Pioneer Prize by the IEEE, is a Fellow of the Institute of Electrical and Electronic Engineers, a First Fellow of the International Fuzzy Systems Association, a Fulbright Scholar, and a SRI Institute Fellow. Dr. Ruspini was the General Chairman of the Second IEEE International Conference on Fuzzy Systems (FUZZ-IEEE'93) and of the 1993 IEEE International Conference on Neural Networks (ICNN'93) and the 2001 President of the IEEE Neural Networks Council (now IEEE Computational Intelligence Society). Dr. Ruspini is a member of the Advisory and Editorial Boards of numerous technical journals and the author of over 100 research papers.