Multi-Objective Optimization in Multiagent Systems

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Abstract

Cooperative multiagent systems are used as solution concepts in many application domains including air traffic control, satellite communications, and extra planetary exploration. As systems become more distributed and complex, we observe three phenomena. First, these systems cannot be accurately modeled, rendering traditional model-based control methods inadequate. Second, system parameters are highly coupled in a nonlinear manner, making it difficult for humans to develop heuristic-based control policies. Finally, these systems are distributed to the point that a centralized controller is either impractical or infeasible. These types of systems are often inherently multi-objective; unfortunately, they are not treated as such in most multiagent research. To date, there has been little research attention given to multi-objective multiagent systems.

This talk addresses these systems from a learning-based approach to optimize system performance in three ways: (i) incorporating high-level human input to specify changing system objectives while delegating low-level control and coordination to autonomous learning agents; (ii) deriving multiagent equivalents to state-of-the-art multi-objective evolutionary algorithms (MOEAs); (iii) developing a fast, effective multi-objective algorithm that outperforms state-of-the-art MOEAs in as little as one tenth of the computation time.

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