An Adaptive Task Assignment Method for Multiple Mobile Robots via Swarm Intelligence Approach

Dandan Zhang, Guangming Xie, Junzhi Yu, and Long Wang

Intelligent Control Laboratory, Center for Systems and Control Department of Mechanics and Engineering Science, Peking University Beijing 100871, P. R. China

Abstract. This paper describes an adaptive task assignment method for a team of fully distributed mobile robots with initially identical functionalities in unknown environments. The method is applicable for mediate-to large-scaled robot groups and tasks. A hierarchical architecture for task assignment is established for each individual robot. In the higher hierarchy, the self-reinforcement learning model inspired by the behaviors of social insects is employed to differentiate the initially identical robots into different kinds of high-level task "specialists"; while in the lower hierarchy, Ant System algorithm is adopted to organize low-level task assignment. To avoid using a centralized component, "local blackboard" communication mechanism is utilized for knowledge sharing. The proposed method allows the robot team members to adapt themselves to the unknown dynamic environments, respond flexibly to the environment perturbations and robustly to the modifications in the team arising from mechanical failure. Simulations of a cooperative collection task validate the effectiveness of the presented method.