Distributed Navigation in an Unknown Physical Environment

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ABSTRACT
We address the problem of navigating from an initial node to a goal node by a group of agents in an unknown physical environment. In such environments mobile agents must physically move around to discover the existence of nodes and edges. We assume that agents communicate by exchanging messages about their discoveries, their current locations and their intended plans. We also assume that an agent can only communicate with a predefined set of neighboring agents. A distributed algorithm, which is run independently by each agent, is presented. Given the current knowledge of the agent about the environment and the positions and intentions of other agents, the algorithm instructs the agent where to go next. An experimental evaluation of the algorithm is presented, with constrained and liberal neighborhood schemes. Results show that it is more beneficial to have a constrained neighborhood scheme because with this scheme the distributed intelligent behavior of agents generates a spread of knowledge throughout the environment more efficiently. Agents reach the goal node fast and the length of the path that they find is very close to that of the optimal path.