

Probabilistic Gathering of Agents with Simple Sensors: Distributed Algorithm for Aggregation of Robots Equipped with Binary On-Board Detectors

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Abstract : We present a probabilistic gathering algorithm for agents that can only detect the presence of other agents in front of or behind them. The agents act in the plane and are identical and indistinguishable, oblivious, and lack any means of direct communication. They do not have a common frame of reference in the plane and choose their orientation (direction of possible motion) at random. The analysis of the gathering process assumes that the agents act synchronously in selecting random orientations that remain fixed during each unit time-interval. Two algorithms are discussed. The first one assumes discrete jumps based on the sensing results given the randomly selected motion direction, and in this case, extensive experimental results exhibit probabilistic clustering into a circular region with radius equal to the step-size in time proportional to the number of agents. The second algorithm assumes agents with continuous sensing and motion, and in this case, we can prove gathering into a very small circular region in finite expected time.

Keywords : control, decentralized, gathering, multi-agent, simple sensors

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