

io-port 05853811**Elor, Yotam; Bruckstein, Alfred M.****Uniform multi-agent deployment on a ring.**

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Summary: We consider two variants of the task of spreading a swarm of agents uniformly over a ring graph. Ant-like oblivious agents having limited capabilities are considered. The agents are assumed to have little memory, they all execute the same algorithm and no direct communication is allowed between them. Furthermore, the agents do not possess any global information. In particular, the size of the ring (n) and the number of agents in the swarm (k) are unknown to them. The agents are assumed to operate on an unweighted ring graph. Every agent can measure the distance to his two neighbors on the ring, up to a limited range of V edges. The first task considered is dynamical (i.e. in motion) uniform deployment on the ring. We show that if either the ring is unoriented or the visibility range is less than $\lfloor n/k \rfloor$, this is an impossible mission for the agents. Then, for an oriented ring and $V \geq \lceil n/k \rceil$, we propose an algorithm which achieves the deployment task in optimal time. The second task discussed, called quiescent spread, requires the agents to spread uniformly over the ring and stop moving. We prove that under our model, in which every agent can measure the distance only to his two neighbors, this task is impossible. Subsequently, we propose an algorithm which achieves quiescent but only almost uniform spread. The algorithms we present are scalable and robust. In case the environment (the size of the ring) or the number of agents changes during the run, the swarm adapts and re-deploys without requiring any outside interference.

Keywords: multi agent; multi robot; distributed formation; uniform spread; coordination algorithms; deployment

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