A centralized immune-Voronoi deployment algorithm for coverage maximization and energy conservation in mobile wireless sensor networks

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Abstract:

Saving energy is a most important challenge in Mobile Wireless Sensor Networks (MWSNs) to extend the lifetime, and optimal coverage is the key to it. Therefore, this paper proposes a Centralized Immune-Voronoi deployment Algorithm (CIVA) to maximize the coverage based on both binary and probabilistic models. CIVA utilizes the multi-objective immune algorithm that uses the Voronoi diagram properties to provide a better trade-off between the coverage and the energy consumption. The CIVA algorithm consists from two phases to improve the lifetime and the coverage of MWSN. In the first phase, CIVA controls the positions and the sensing ranges of Mobile Sensor Nodes (MSNs) based on maximizing the coverage and minimizing the dissipated energy in mobility and sensing. While the second phase of CIVA adjusts the radio (sleep/active) of MSNs to minimize the number of active sensors based on minimizing the consumption energy in sensing and redundant coverage and preserving the coverage at high level. The performance of the CIVA is compared with the previous algorithms using Matlab simulation for different network configurations with and without obstacles. Simulation results show that the CIVA algorithm outperforms the previous algorithms in terms of the coverage and the dissipated energy for different networks configurations.

Keywords:

Mobile wireless sensor networks; Immune algorithm; Voronoi Diagram; Coverage area; Node deployment

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