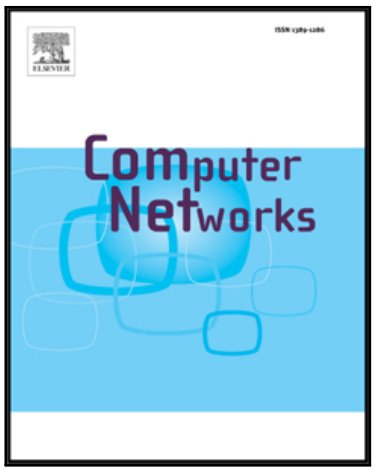

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Energy-efficient Sink Placement in Wireless Sensor Networks☆

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Abstract

Prolonging a wireless sensor network's *lifetime* is closely related to energy consumption and particularly the *energy hole* problem, where sensor nodes close to the *sink* consume a considerable amount of their energy for relaying purposes. To tackle the energy hole problem's effects, this paper proposes an analytical model for analyzing the available energy in the network. The next step is to analytically model the overall energy consumption as a *k-median facility location problem*, its solution corresponding to the location of *k sinks* in the network.

As analytically shown, when k sinks are placed according to the solution of the previous facility location problem, then the overall energy consumption is minimized, resulting in a higher energy-saving system. Thus, the saved energy can be further utilized, e.g., to extend the network's lifetime and support modern replenishing techniques such as energy harvesting and battery recharging.

Simulation results validate the analytical model that is the basis of the analysis and confirm the results with respect to the available energy in the network. In particular, significant energy savings are observed when the

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