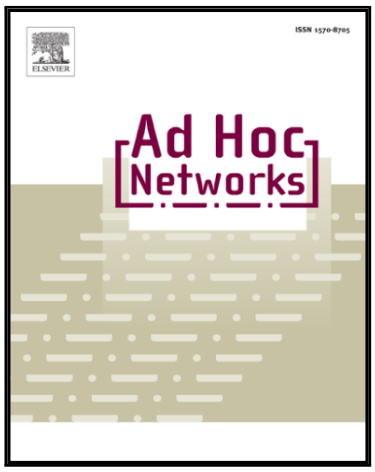

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A Recharging Distance Analysis for Wireless Sensor Networks

Georgios Tsoumanis[a,*], Konstantinos Oikonomou[a], Sonia Aïssa[b], Ioannis Stavrakakis[c]

[a] *Department of Informatics, Ionian University, Corfu, Greece*
[b] *Institut National de la Recherche Scientifique (INRS-EMT), University of Quebec, Montreal, QC, Canada*
[c] *National and Kapodistrian University of Athens, Greece - Universidad Carlos III de Madrid & IMDEA Networks Institute, Spain*

Abstract

Efficient energy consumption is a challenging problem in wireless sensor networks especially close to the sink node, known as the energy hole problem. Various policies for recharging battery exhausted nodes have been proposed using special recharging vehicles. The focus in this paper is on a simple *recharging policy* that permits a recharging vehicle, stationed at the sink node, to move around and replenish any node's exhausted battery when a certain *recharging threshold* is violated. The minimization of the *recharging distance* covered by the recharging vehicle is shown to be a facility location problem, and particularly a 1-median one. Simulation results investigate various aspects of the recharging policy – including an enahnced version – related to the recharging threshold and the level of the energy left in the network nodes' batteries. In addition, it is shown that when the sink's positioning is set to the solution of the particular facility location problem, then the recharging distance is minimized irrespectively of the recharging threshold.

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*Corresponding author

Email addresses: gtsoum@ionio.gr (Georgios Tsoumanis), okon@ionio.gr (Konstantinos Oikonomou), aissa@emt.inrs.ca (Sonia Aïssa), ioannis@di.uoa.gr (Ioannis Stavrakakis)