

An Energy Efficient Distributed Clustering Algorithm for Ad Hoc Deployed Wireless Sensor Networks in Building Monitoring Applications

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ABSTRACT

In recent years Wireless Sensor Networks (WSNs) have been deployed for Building Monitoring (BM) as they provide a low cost and reconfigurable alternative to centralized cable based sensor systems. Using WSNs gives rise to unique issues in its practical usage. Lifetime of a WSN is one such crucial issue to be addressed during deployment. Clustering is an effective way of extending the lifetime of a WSN. In this article we propose a distributed and energy driven clustering algorithm where the selection of the cluster heads (CHs) are based on relative residual energy level of sensors. Furthermore, the CHs are rotated only when their energy drops below a dynamic threshold computed by the algorithm. As a result, the overheads in the inter sensor communications will be reduced and thereby the proposed algorithm will favor more powerful nodes over the weaker ones to prolong the lifetime of the entire WSN. This will effectively prolong the usability of the monitoring system and thus the underlying safety of the building. The results will show that the proposed algorithm performs better when compared to existing clustering algorithms. Further we present theoretical analysis of the performance of the proposed algorithm in terms of correctness and complexity and explain how to identify the optimal values for key parameters such as transmission range R and re-clustering trigger threshold function value c in order to maximize the network lifetimes.
