Abstract

In Wireless Sensor Network, Device placement is a key factor for determining the coverage, connectivity, and cost along with lifetime. Managing the sensor nodes is not much easier while comparing mobile Ad Hoc Networks. But the same approach can be implemented to manage the WSN. Addressing the management of the whole network is omitted and a probabilistic scheme where only a subset of nodes is managed is provided for lightweight and efficient management. Relay node placement in heterogeneous WSN are formulated using a generalized node placement optimization problem to minimize the network cost with lifetime constraint, and connectivity. Based on the constraints two scenarios are used. In the first scenario relay nodes are not energy constrained, and in the second scenario all nodes are energy limited. As an optimal solution a two-phase approach is proposed. The placement of the first phase relay nodes (FPRN), which are directly connected to Sensor Nodes (SN), is modeled as a minimum set covering problem. To ensure the relaying of the traffic from the FPRN to the base station, three heuristic schemes are proposed to place the second phase relay nodes (SPRN). Some of the heuristic approaches available are Nearest to BS First algorithm (NTBF), Max Residual Capacity First algorithm (MRCF) and Best Effort
Relaying algorithm (BER). Our contribution is centered on a distributed self organizing management algorithm at the application layer by organizing the management plane by extracting spatiotemporal components and by selecting manager nodes with several election mechanisms applied to wireless sensor nodes. Furthermore, a lower bound on the minimum number of SPRN required for connectivity is provided.

Reference


Heuristic Approaches with Energy Management for Node Placement in wireless Sensor Networks

Index Terms

Computer Science

Communications

Wireless

Key words

Device placement

minimum set covering

wireless sensor networks

Network management

probabilistic analysis

facility location problem

lifetime