Abstract

Wireless Multimedia Sensor Networks (WMSNs) are widely used for surveillance applications. The promising advantages of WMSNs have opened up new application areas in challenging situations such as difficult and undulating terrains which requires various design issues to cope with such environment. These multimedia (audio and video) nodes are distributed according to different deployment strategies in a multi-tier heterogeneous architecture environment. Therefore, we feel that a network architect requires to select a particular deployment strategy under performance and cost requirements. Upon further investigation, we find that multimedia nodes may suffer from *energy-hole* problem due to exhaustion of battery or deliberate destruction of some sensor nodes. Moreover, these network requires an energy-efficient routing framework while preserving Quality-of-Service (QoS) parameters of the network. Therefore, we concentrate our work on deployment, redeployment, and energy-efficient design from wireless multimedia sensor network point of view. In our first work we address the minimization of network deployment cost under connected coverage constraints with surveillance requirements. We have developed two cost models. Using our proposed cost models, we have studied the effects of different deployment strategies of WMSNs over flat terrains, elevated terrains and in three-dimensional spaces. In our next work we investigate the redeployment problem with QoS parameters, coverage and connectivity in presence of energy-holes. The *energy-hole* problem is due to failure of the nodes which in turn leads to decrease in QoS parameters in some parts of the network. Two types of node failures, namely self and intentional, are modeled with the help of Uniform and Gaussian distribution respectively. Based on the coverage and connectivity parameters we perform redeployment within the budget constraints. Initially, only a portion of the sensors are deployed and the rest are spared for redeployment. The network designer selects the budget considering QoS requirements of the network. The redeployment budget refers to the portion of total sensors available during the network initialization phase. Further, based

on the demand, the spared sensors are deployed over the regions so as to maintain the QoS requirements of the network. We propose redeployment schemes for WMSN nodes that is based on a stochastic process in our third contributory work. The dynamic behavior of a multimedia node is used as a basis for developing a stochastic framework model. In our fourth work we address the problem of energy-efficient event surveillance in a *Region-of-Interest* with the help of multimedia nodes. We propose a two-tier architecture for surveillance application in which audio and Rotatable-Video (RV) nodes can work together to achieve the task of critical event detection. In our final work we propose a backbone framework utilizing graph sampling and Connected Dominating Set (CDS) strategy in sequence.

Keywords: WMSNs, Surveillance, Deployment Cost Modelling, Redeployment, Energy-efficient Framework.