ABSTRACT

Advances in Micro Electro Mechanical Systems (MEMS), computing and communication technology have made it possible to integrate sensing, processing and wireless communication capabilities and embedded microprocessors into tiny devices known as sensor nodes. Wireless sensor networks (WSN) are composed of large numbers of resource-constrained small sized battery-operated sensor nodes, these extends our capability to explore, monitor and control the physical world. Due to their cost viability and flexibility, WSNs have emerged as effective solutions in a variety of applications range from surveillance and environmental monitoring to healthcare and home automation.

Recently, WSNs have gained more research community interest because of their unique characteristics. The self-organization, co-operative processing, energy optimization and modularity are the some of the requirements for WSNs. These factors impact heavily on the nodes hardware and software architecture. Sensor nodes are usually deployed in remote and inaccessible terrain where human entry is impossible. Since the sensor nodes mainly depend on batteries for energy, which get depleted at a faster rate because of the processing, receiving, transmitting and overhearing of messages. Hence energy saving of sensor nodes is a major design issue. To maximize the networks lifetime, minimization of energy consumption should be implemented at all layers of the network protocol stack starting from the physical layer to the application layer. The research areas for WSNs extend from the design of small, reliable hardware to low-complexity algorithms and energy efficient communication protocols.

Energy is a scarce resource in WSNs, as nodes once deployed cannot be recharged in majority of applications. Clustering and Routing for wireless sensor networks play a significant role for reliable and energy efficient data dissemination. In cluster-based routing, coordinator nodes called cluster heads

form a wireless backbone to the sink. Each cluster head collects data from the member nodes belonging to its cluster, performs data aggregation and forwards it to the collecting center called sink/base station. In homogeneous networks all nodes have uniform and limited resource energy. So, it is extremely important to avoid quick depletion of cluster heads energy. Hence, the cluster heads are rotated periodically to balance the energy consumption. The research works shows that cluster-based routing protocols greatly reduces communication overhead and data redundancy, thereby extends the lifetime of the network.

In this thesis, we focus on the development of low complexity cluster based routing protocols for WSNs. The main goal is to reduce the number of communications with the base station and also intra-cluster communication to extend the lifetime of WSNs. In this thesis, we presented a three energy efficient cluster based routing protocols. The performances of the proposed protocols are evaluated in terms the network lifetime. The results of the proposed protocols are compared with the Low Energy Adaptive Clustering Hierarchy protocol.