ABSTRACT

Wireless Sensor Networks (WSNs) characterize a novel paradigm for the twenty-first century for the wireless technology that grows in the numerous fields of engineering. WSNs contain tiny, low power autonomous devices deployed randomly in highly distributed networks. Capability of such sensor in the wireless network is to meet the complex application demands. So, in WSNs the resource constraints are due to limited power supply, memory, processing capability, bandwidth, and unreliable wireless link etc. The power management is a very important agenda within the WSNs to restrict battery supply with inadequate computational capabilities. To elongate, the communication of nodes the power consumption should be minimized. Consequently several protocols are proposed but, so far no such protocol proved to be energy efficient and cost-effective to enhance the network life time of sensor nodes within the wireless sensor networks. Thus, the challenge of power management is to implement a cross-layer design instead of conventional layer design.

This thesis focuses on developing a novel cross-layer design protocol for power management in WSNs based on empirical analysis of important models. The cross-layer modularity protocol is adopted by integrating the
layer frame works of Network Layer and MAC layer in WSNs. By this concept, power management goal is achieved by standardizing cross-layer interactions, by implementing four important approaches like Clustering, Localization, Routing and Scheduling system.

The thesis abstract defines the assorted methodologies of designing an energy efficient wireless sensor in a distributed dynamic network. The research integrates the cross-layered design approach with a self-organizing medium access management protocol and a tightly integrated network routing protocol to develop the “top mobility sensor networks hardware” so that the protocol can be embedded within the Firmware.

In the distributed dynamic network, the sensor nodes deployment study is considered where the randomly deployed sensors are grouped into clusters by proposing a set of algorithms explained in Chapter 3. The empirical study shows the novel approach improves energy parameter and network lifetime.

The sensor node deployed as is explained in Chapter 4 has shown a limitation of identifying an exact position. So it is extremely essential to take hold of sensor coordinates that are deployed in the network otherwise; the energy is drained out of battery in wrong communication. The thesis adds a focus towards a unique algorithm to identify the location and optimizes the coordinates of every sensor as explained in Chapter 4.
The vital requirements of the WSNs are to route the data through the energy efficient path. Thus, in this thesis we tend to brand a new approach for routing the cluster nodes. The Chapter 5 discusses on the prominent routing methods for the nodes that consume minimum energy in the networks.

The sensor nodes waste most of its energy during listening period than during transmission. So the MAC protocol needs to improve by considering the methods to turn inactive nodes into sleep mode. In Chapter 6 the thesis discusses on potential power utilization, by optimal means of sleep scheduling for WSNs.

Finally, Chapter 7 shows the embedded architecture that integrates the cross-layer interaction of MAC layer and the network layer for power management of WSNs.

All the four proposed methods of empirical study are tested by simulation in the real-time situation in wireless sensor networks. This considerably improves the lifetime of the network by balancing the equal amount of energy among wireless sensor nodes.