CHAPTER 7

CONCLUSION AND SCOPE FOR FUTURE WORK

7.1 CONCLUSION

The theme of the research work is centered around Energy efficiency which is an important aspect of WSNs. The limited energy source of the sensor nodes calls for design of energy efficient schemes. Cluster based techniques were found energy efficient. In this research work, various energy efficient schemes has proposed for cluster based sensor networks. First a novel Energy Efficient Clustering approach for single-hop Wireless Sensor Networks has been proposed, which best suits the periodical data gathering applications.

In this research work, Clusters are formed by appropriate cluster head selection process and distribution of the clusters can reduce energy consumption of the network and prolong the network lifetime. The value of CH competition range produces a good distribution of cluster heads. The performance of the proposed Energy Efficient Clustering technique analyzed with the other well known clustering protocols such as LEACH, HEED and EECS. Simulation results show that E2C outperforms existing protocols in terms of network lifetime and number of data transmitted to the sink node.

In order to conserve energy, multi-hop communication among the cluster heads can be adopted during the inter cluster communications in the data transmission phase. This work has analyzed Energy Efficient Clustering

technique with cluster based hierarchical routing techniques like Cluster ID based Hierarchical Routing, Multi-Tier Hierarchical Routing and Multilevel Hierarchical Routing. As per the analysis results of three hierarchical routing techniques, it was found that Multilevel Hierarchical Routing is more effective in terms of energy efficiency in Wireless Sensor Networks.

The research work has further investigated to enhance the energy efficiency of WSN by using the Compressed Sensing technique for in network data aggregation. Compressed sensing was an effective approach to achieve much lower sampling rate for sparse signals. In order to reduce the number of data transmissions and save more energy, CS concept has been applied to gather and reconstruct the sparse signals in energy-constrained large-scale WSN. After clusters are formed, nodes transmit data to cluster head without using CS. CHs use CS to transmit data to sink. The application of CS for data collection in Cluster Based Multilevel Hierarchical wireless sensor networks has been investigated.

The performance of the CS-based approach is compared in terms of number of transmissions and the energy consumption. CS-based approach outperforms the traditional approach and requires fewer transmissions to achieve a desired reconstruction quality. From the results of various proposed schemes, it can be concluded that the cluster based multilevel hierarchical routing with compressed sensing for data aggregation has proven the energy efficiency when compared to the existing algorithms in WSNs.

This research work also has provided a service oriented framework for real-time monitoring of agricultural parameters using WSNs and data collection task has presented as a web service. This research work have described the system architecture, physical setup, sensor node hardware and software for real time monitoring and management of agricultural parameters through a simple graphical user interface and available as a service on the

Internet. Real life framework has brought out the actual challenges and important aspects related to large scale deployment of sensor networks.

7.2 FUTURE DIRECTIONS

Careful attention must be paid on further reduction of energy consumption in wireless sensor networks. Future work may be focused on Wireless Energy transfer by means of diverse mechanisms like Laser beam, piezoelectric principle, radio waves , microwaves, Inductive coupling and electromagnetic resonance.

In future, mobility based energy conservation schemes are relatively new in the field of wireless sensor networks and many aspects need to be studied with more attention. Developing a scheduling mechanism based on the past history and choosing appropriate communication parameters to achieve the above goals can be considered as a future work. The work on mobile sensor network mainly calls for design of a framework to select appropriate protocols when nodes follow different mobility patterns.

An analytical model to investigate the statistics of the energy consumption in sensor networks is an interesting area to pursue. Such models can provide probabilistic lifetime assurance in time critical sensor network applications. Security is another important issue in data aggregation applications and has been largely unexplored. Integrating security as an essential component of data aggregation protocols is an interesting problem for future research. Data aggregation in dynamic environments presents several challenges and is worth exploring in the future. Hence there is a wide scope for future research in the domain of sensor networks.