CHAPTER 9
CONCLUSION & FUTURE WORK

9.1 INTRODUCTION

Most existing work on sensor networks consider homogeneous sensor networks where all sensor nodes are assumed to have the same capabilities in communications, computation, memory storage, energy supply, reliability and other aspects. To avoid more delay in the data delivery that happens through multi-hop communication, clusters are formed in the sensor network and a cluster head is selected for each cluster. Here, all nodes in a cluster can communicate with the cluster head directly but the energy consumed and the time involved while selecting the cluster head is more. Heterogeneous Sensor Networks consists of two physically different types of sensor nodes and several recent papers have studied about HSNs and these literatures showed that HSNs can significantly improve sensor network performance in terms of energy consumption.

In this work, a new energy optimization scheme is introduced to reduce the energy consumption of nodes in HSN during packet transmission based on queue threshold by considering channel contention and node failures into account. An analytical model of a sensor node in a cluster based sensor network is developed and the performance of the proposed scheme is analyzed in terms of performance parameters such as average energy consumption and mean delay. The expression for the optimal value of threshold for which the node consumes minimum energy is also derived. Results show that the average energy consumption savings is 68% and 62% for the optimal threshold value when compared to no threshold condition when there is no contention and contention respectively. It is shown from the results obtained that the mean delay increases due to contention and node
failures. The trade-off that exists between the average energy consumption and mean delay are also explored through the results. Simulations are performed for 100 runs and a confidence interval of 95% is obtained and thus the results obtained show that the analytical results match with the simulation results, validating the accuracy of this approach.

9.2 SUGGESTIONS FOR FUTURE WORK

In this work, the packets are transmitted from CH to BS directly since the H-sensors which acts as cluster head has more energy and longer transmission range. Though the CH has more energy supply, longer transmissions consumes more energy. Hence, the energy consumption at CH should be reduced because the failure of CH causes a cluster itself getting isolated from the BS. The energy consumed during the direct communication between the CH and BS should be considered to increase the lifetime of the CH. The savings in energy consumption can be achieved by introducing intra cluster routing within HSN so that the packets from CH to BS goes through multi-hop communication (between CH to CH). This method significantly reduces energy consumption during the packet transmission from CH to BS. Hence, providing intra cluster routing in a HSN will be another interesting model of future extension.

This energy optimization technique is well suited for all delay insensitive applications where delay is not an important issue. By selecting an optimal threshold, this technique increases the overall network lifetime to a larger extent. For example, a WSN application for studying the climatic conditions for a period of year, delay is not an issue and hence such technique can be applied which increases the network lifetime. This technique can also be suitable for WSN applications where tolerable delay is acceptable within delay bound. Here, a queue threshold is selected based on the delay bound.