

# Chapter 7

## Conclusions and Future work

The WSN technology enables low cost solution to many real time applications. The WSNs are used to operate in hostile or harsh environment where human participation is not possible. They detect and report the data of the ambient environment in real time. The energy is critical factor in order to maximize the lifetime of the network. Typical sensor nodes are battery powered and cannot be replaced or recharged after deployment. In order to achieve longer network lifetime, the cluster based routing/hierarchical routing approaches are preferred. The cluster based routing techniques significantly reduces the energy consumption in sensor nodes compared to other type of routing.

### 7.1 Conclusions

In this thesis we proposed an energy balanced fixed clustering protocol to maximize the network lifetime. The network is divided into number of equal sized clusters. The energy efficiency of the protocol is increased by reducing the intra-cluster communication by employing the next head selection approach. The selection of next heads by the current round CHs significantly reduces amount communication required to negotiate among the sensor nodes to select new heads. The protocol do not address the hot spot problem, which was due

to the non-uniform energy load distribution among the CHs. The results show that proposed protocol clearly improves the network lifetime compared to LEACH.

In the sector based multi-hop routing protocol the network is portioned into number of unequal clusters using leveling and sectoring concept. The nodes in the cluster communicate with the CH using multi-hop approach via neighboring nodes. The inter-cluster communication is used to forward the data to the BS. The energy load among the CHs is evenly distributed due to unequal cluster size. It is evident from the results that the proposed protocol greatly contribute in maximizing the network lifetime.

The UCBR protocol also increases the lifetime of the network compared to LEACH. The CH sequence table approach, greatly reduces the intra-cluster communication overhead needed after completion of every round to select new CHs. The protocol synchronizes the network operation by transmitting beacon signal into the network to initiate next round of operation.

The hot spot problem is dealt both in SBMC and as well as in UCBR protocol. The energy consumption among the CHs is well balanced in both the protocols. The results obtained show that the proposed models perform better in terms of energy efficiency compared to LEACH.

## 7.2 Future work

The nodes and the BS may be stationary or mobile after deployment. In certain real-world WSNs applications, the nodes and the BS may be mobile. The mobility of the nodes and BS continuously changes the network topology. The protocol proposed for quasi-stationary nodes do not support the node mobility. Developing a new algorithms with node mobility is great challenge for the research community. In the future work, the node and BS mobility will be considered to route the data to BS.

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