CHAPTER 7

SUMMARY OF FINDINGS AND CONCLUSIONS

7.1 SUMMARY OF THE RESEARCH FINDINGS

One of the most fundamental issues in WSNs designing is the deployment problem. This specific problem has different appellations like placement, layout, coverage or positioning problem in WSNs. A novel deployment strategy is required to maximize the potentials of the sensor networks in the region of interest. The major issue is to deploy mobile sensor nodes in region of interest, using corresponding detection mechanism. The deployment of sensors should be, such that the sensors are able to provide useful data to the system. The available resources are utilized to the maximum, in order to place the sensors optimally. Depending upon the coverage of each point in the sensing field, the sensors provide better Quality of Service. The maximum network coverage needs to be achieved by effectively deploying the sensors in an appropriate manner. The proposed approach employs, a new concept of determining the moving distance based on node degree, link quality, residual energy and traffic load using fuzzy logic. The energy dissipation is reduced by reducing the longer and shorter distance of the CH. The optimal CH position is found by PSO when the minimum energy consumption is achieved. The simulation results show that the proposed technique improve the network coverage, as well as the energy efficiency when compared with the related works.

In distributed detection problems, the sensors transmit data to the fusion center. However, the transmission of non-critical data involves use of excessive battery power and network bandwidth. To circumvent this problem, the concept of Mobile Agent based Distributed Sensor Networks is used where the mobile agent selectively visits the sensors and incrementally fuses the data. The implementation
of mobile agent saves almost 90 percent of data transfer time as it avoids raw data transfers. Algorithms based on the local closest first and the global closest first heuristics is used to compute mobile agent routes for distributed data integration. The performance of these algorithms deteriorates as the network size grows making the sensor distributions become more complicated. These approaches consider only spatial distances between sensor nodes for route computation. The computation of mobile agent routes involves tradeoffs between energy consumption, path loss and detection accuracy. For instance, as the number of sensors in the route increases, the quality of fused data improves, but the energy consumption and the path loss increases. In order to minimize the energy consumption and path loss, a hybrid optimization technique for routing of sensor nodes is proposed in this research work. This technique is able to discover satisfying routes with high detected signal energy, while minimizing the energy consumption and path loss. It obtains routes with fewer numbers of hops, even when the network size is large.

Packet collision in Wireless Sensor Networks is one of the major problems which can even affect the whole system performance. Excessive packet collisions lead to packet losses and retransmissions, resulting in significant overhead costs and latency. Event-driven sensor networks operate under an idle or light load and then suddenly become active in response to a detected or monitored event. As a result, collisions between packets can be a considerable obstacle to achieving the required throughput and delay for such applications. As the data load increases, there is a severe degradation of network performance. Packet success ratio drops due to frequent collisions and retransmissions. In this research work, a solution for packet collision problem with energy efficient approach is proposed. The proposed algorithm uses a grid based prediction system. The grid uses a time slot method for avoiding the packet collision and the prediction approach is used for the selection of the cluster head. By using the history information, the cluster predicts the energy consumption of node, with high residual energy and low energy consumption ratio. This algorithm can effectively prolong the life of network.
The Sensor network holds a lot of promise in applications, where gathering sensing information in remote location is required. Many factors can influence the energy consumption in WSN. Their energy-constrained nature necessitates one to look at more energy efficient design and operation. The concept of scheduling SLEEP and WAKEUP Procedure seems to be very effective. The observation is that nodes must sleep most of the time in order to achieve multi-year battery life. Asynchronous schemes avoid the tight synchronization among network nodes required by scheduled rendezvous schemes. They allow each node to wakeup independently of the others by guaranteeing that neighbors always have overlapped active periods within a specified number of cycles.

7.2 CONCLUSION

In this research work, a hybrid optimization technique using fuzzy based PSO is proposed for deployment and routing in wireless sensor network. Initially for each sensor, the node degree, link quality, residual energy and traffic rate are estimated in order to ensure the coverage, connectivity, network lifetime and traffic load. Depending upon the values of node degree, link quality, residual energy and the traffic rate from the fuzzy rules, the moving distance are estimated. By using PSO based optimization technique the CH position is determined. In routing PSO iteration is done to maximize the total detected signal energy while minimizing the energy consumption and path loss. Using multi-objective PSO optimization, the obtained solutions have lower energy consumption and path loss while maximizing the detection accuracy. The collision avoidance is achieved by the Prediction based Energy Efficient Clustering method, which uses the energy dissipation ratio generated from the history information to predict the time, that the node may survive. Asynchronous Sleep and Wakeup scheme is activated to avoid the tight synchronization among network nodes.
7.3 SUGGESTIONS FOR FUTURE WORK

The objective of the proposed research work is to minimize the energy consumption in order to improve the network coverage. The possible extensions of the present work are listed below:

- Both the physical factors (friction of movement) and environmental factors (obstacles) can be included while deployment and routing.
- The fuzzy adaptive PSO can be used to design a fuzzy system, which dynamically adapts the inertia weight and the learning factors for the deployment problem.
- Devising of new Nature inspired optimization algorithms for deployment and routing.