ABSTRACT

WSN is the network that consists of nodes with different abilities such as diverse computing power and sensing range. In WSN, many organizational and communication issues arise. The most critical issue of WSN is in terms of energy as the entire node, which is to be reorganized for diverse application needs to assign energy each and every time. Nowadays development of an energy efficient architecture and design for such wireless Sensor Networks has been attracting more attention among researchers. Hence this work focuses on proposing a methodology to increase the network lifetime.

The aim of this thesis is to create an energy efficient mechanism to improve the lifetime of WSN by the combination of energy efficient modulation techniques, error control codes and clustering architectures. Hence the proposed work comes apart into following divisions

- Energy efficient clustering architecture for wireless sensor networks
- Energy efficient modulation and error control codes for wireless sensor network.
- Location Aware Adaptive Modulation and Coding technique for wireless sensor network.

In wireless sensor networks (WSN), the key challenge is to prolong the network lifetime by reducing the energy consumption among sensor nodes and reduce energy dissipation in network operation, to improve network load and stability. Hence, the work concentrates on developing energy efficient protocols for Wireless Sensor Network. At the outset development of energy efficient clustering techniques consists of following components

- Energy efficient sensor network protocol for QoS enhanced base station controlled dynamic clustering protocol.
- Energy efficient cluster head selection for QoS enhanced base station controlled dynamic clustering protocol.
- Energy efficient grouping and mobility aware clustering algorithm (EEGMAC) for wireless sensor network.

The first two clustering mechanism is measured with existing protocols such as Low energy adaptive clustering hierarchy (LEACH) and LEACH-QBCDCP. The next one compares with balanced energy efficient Clustering Protocol (BEEG). The number of alive nodes is taken as a performance measure for calculating the lifetime of the sensor network. The simulation results demonstrate that the proposed method considerably improves the network lifetime. Other performance metrics considered for this work are throughput, energy consumption, End-to-End Delay, Packet delivery Ratio and packet drop.

The most useful techniques for reducing the radio power consumption are named as modulation scaling that explores the trade-off between transmission energy and the time duration by adapting the modulation level to match the traffic load. An ECC mechanism along with an optimal selection of modulation techniques, based on the characteristics of communication channels can be utilized in energy efficient clustering architecture to improve the overall system performance. Hence the work, subsequently focus on energy efficient modulation and error control codes. It discusses the following works, Performance analysis of modulation techniques with error control codes to optimize the lifetime in different channel condition. Performance of BPSK, QAM, MSK, QPSK, 16QPSK, 16PSK, 16FSK, GMSK is analyzed with block code, convolutional code, LDPC and HARQ schemes.

The simulation study of this work considers the following parameters, channel state, energy per transmitting bit, BER, the distance between nodes and cluster head. Simulation and mathematical results show that the improved energy gain of MSK is obtained with respect to other modulation schemes. It furthermore shows that if the distance between the nodes is brought up. MSK performed fighting fit without the addition of ECC in AWGN channel condition. The consequences also disclose that when MSK is added with convolutional coding, it gives higher energy consumption in sensor nodes when the distance between nodes is neither short nor long.

The result besides shows that 16FSK with Golay codes in AWGN and 16QAM with Golay codes in Rayleigh channel is the further energy efficient than other combinations of modulation and coding techniques. GMSK with Golay codes in AWGN & Rayleigh channel is more energy efficient than other combinations of coding techniques. It shows that the performance of GMSK in AWGN Channel is further competent than a Rayleigh channel environment.

In the last part of the work, location aware adaptive modulation, coding is therefore proposed to enhance network lifetime and performance. It furthermore intended to reduce the energy consumption of sensor nodes by analyzing the performance of adaptive modulation and coding techniques for the energy efficient clustering architecture. In proposing a solution for physical layer adaptive channel coding and modulation scheme, modulation and channel code is selected founded on the state of the communication channel. After that, energy efficient clustering technique, cooperative communication technique is implemented in order to improve the energy efficiency of the proposed work. The performance study is built on the adaptive selection of the modulation and coding pair with ensuring QoS services.

The proposed location aware Adaptive Modulation and Coding Technique (LAAMC) is compared with the existing physical layer Adaptive Modulation Scheme. The performance is measured mainly, according to the following metrics, throughput, energy consumption, end-to-end delay, packet delivery ratio and packet drop. Simulation result has proved that, how energy efficient modulation and ECC are adaptively chosen by the transmission mechanism to extend the lifetime and QoS performance of HMWSN. It is evident from the simulation results, permutation of diverse energy efficient design and protocols can improve the longevity of the Wireless Sensor Network.