ABSTRACT

Over the past years, there has been a remarkable increase in the usage of wireless sensor networks in various applications. Network operations are guaranteed to be effective and fruitful with more efficient MAC protocol. In this thesis enhanced MAC methods are designed for various Wireless Sensor Networks. Hence, the present study proposes Cross Layer based Virtual Backoff Algorithm (CLM-VBA) for wireless sensor networks. The designed cross layer architecture involves three layers: physical, MAC and Network. Neighbouring nodes were given priority which was determined using the cross layer architecture. Two different counters were maintained to keep track of number of accesses and number of attempts along with sequence number. Delay sensitive applications were given preference than delay insensitive applications. Sleep mode was used for each node in order to conserve energy at every node. A buffer was maintained at each node in order to improve the performance of the system.

Mobility of the sensor nodes in WSNs create some falsifications. To avoid this issue, a modified version of Virtual Backoff Algorithm (M-VBA) was designed. Two different counters were maintained for each node in the network which was used to determine the node to acquire the channel. As the sensor nodes are critical in battery power, sleep mode was introduced for all the nodes in network which was used to enhance the energy savings. The proposed algorithm was tested for energy consumption, packet delivery ratio, and delay. The observed results indicate M-VBA algorithm performs promisingly when compared to the legacy protocols like VBA and S-MAC algorithm.

Sensor nodes in the network are considered to be mobile in nature. Hence the topology of the network is dynamic. To handle dynamic topology in WSNs, an Ant colony and tolerable delay based M-VBA is proposed. The algorithm which queues the packets based on the delay that application can tolerate and ant colony optimization technique is used to choose the best of all available forwarding nodes.
Medium Access Control (MAC) plays an essential role in wireless communication networks for making efficient utilization of bandwidth, fairness among the nodes, latency management and scalability. Unlike other networks, sensor networks required dedicated MAC protocols considering the energy efficiency to improve life time of the node along with efficient bandwidth utilization. In the present study, Energy Aware Virtual Backoff Algorithm (EAVBA) is proposed for successful channel access over the medium. In this approach, overall network energy consumption is managed by maintaining the details of transmission energy and receiving energy of a node. Simulation was accomplished by considering the delay, packet delivery ratio and energy consumption factors to identify the performance of the proposed algorithm.