ABSTRACT

The need for remote monitoring and surveillance in anti-third environment has increased the growth of WSN. Sensor nodes are battery-powered and as a result, are frequently limited in their energy capacity due to their inability to be recharged. As a result, one of the most significant bottlenecks in protocol design is energy consumption. The effective protocol design should be able to balance network life-time and other parameters. Sensor networks should be adaptable and sensitive to the changing environment in which they operate. As sensor nodes are battery-powered and communicate via radio, they are more prone to failure. The sensor network should be dependable and capable of providing relevant data via information gathering techniques. The proposed research work concentrates on improving the lifetime of the network by effective utilization of the available energy.

The algorithms designed in this research work concentrate on providing better energy management with power starving and power generating sensor nodes. The Battery Recovery based Lifetime Enhancement (BRLE) algorithm provides detailed analysis on battery on/off time and full utilization of the battery residual energy. The influence of temperature on battery recovery is analyzed in Battery Recovery based Lifetime Enhancement with Temperature dependence (BRLE-T) algorithm. The effective utilization of node's waiting time for transmission is achieved through Battery Recovery based Efficient MAC protocol (BREMAC). The nodes in many monitoring areas are powered through solar and piezo-electric methods. A novel Energy Harvesting Cluster Head Rotation Scheme (EHCHRS) algorithm aims on reducing the energy overflow and outage issues in limited energy storage nodes.

The energy harvested is modelled as Double Chain Markov Model (DCMM) for effective selection of CH and battery energy management. The influence of temperature on energy harvesting network is analysed in Energy Harvesting Cluster Head Rotation Scheme with Temperature dependence (EHCHRS-T). The nodes subjected to a concealed Region of Interest (RoI) undergo reduced training time to adjust its network parameters. A Reinforcement Learning (RL) based algorithm is proposed for faster learning and effective energy utilization.

Keywords: Wireless Sensor Networks (WSN), Energy Efficient, Cluster Head (CH), Reinforcement Learning (RL), Double Chain Markov Model (DCMM), Discrete Time Markov Chain (DTMC), Battery Recovery Effect