Abstract

Topology Control (TC) is an important technique amongst the most imperative procedures. It is utilized as a part of the remote sensor system, decreased energy consumption and radio interference. In the remote sensor systems, the length of the corresponding range suffices; so, all nodes can build up a connection with each other. It makes a mesh topology system, which is not energy efficient. Another issue is that, during the operation of the system, few nodes may debilitate their energy more quickly than others, while a few nodes may get to be useless. A topology control algorithm manages every one of this advancement and guarantees that the system associated with energy efficient links. This thesis proposes solving pertinent the topology control issues and difficulties in sensor systems, specifically, the design of energy efficient topology control algorithm.

A comprehensive survey of topology control algorithms, in the remote sensor system, is displayed to distinguish the extent of the commitment of this thesis. It is vital to note that in order to achieve lifetime dragging out in sensor systems, it is basic to minimize per node energy consumption, and additionally, load distribution over the sensor field, in an exquisite manner. In that capacity, this thesis continues in proposing energy-effective topology control algorithms for sensor systems. Novel energy efficient topology control techniques are proposed in this thesis, based on methods such as link efficiency, IPOLY, and cellular automata. The proposed algorithms are energy efficient, provide good coverage and connectivity as compared to its competitors. Contributions proposed in this thesis achieve network lifetime, high reliability, connectivity, and coverage. The practical analysis and validation of this work are conducted through the MATLAB simulation tool.

The Link Efficiency based Topology Control Algorithm maximizes the lifetime of the network. The energy efficiency of wireless sensor network and the lifetime maximization problem is handled by overall link efficiency and a fair selection of node for the transmission . IPOLY algorithm is more reliable than its competitors, and it reduces message complexity as compared to other CDS based techniques. The developed algorithm performs well in static as well as the dynamic environment. Proposed solution provides the reliability of more than 100% compared to CDS Rule K, EECDS, A3. It reduces the message complexity by almost 27%. A Self-

reproduction system is a decentralized computing model. Using local information, it provides an excellent platform for performing complex calculations. Topology control algorithms, which is based on the selection, in a deterministic or randomized way of a suitable subset of sensor nodes, must remain active. Comparative performance analysis of algorithms has been done with the research work and it has been found that proposed algorithm ImpCCA is the best performer algorithm in the category of cluster-based algorithms. Considering coverage as a performance metric ImpCCA is approximately 40% better than the LEACH. For active nodes and connectivity ImpCCA is performing well. By considering approximately 65 different scenarios ImpCCA is 20% better than the ImpTCA1, ImpTCA2, Weighted Blocks, Weighted Morgules, Von Neuman and Moor.

Keywords : Topology Control, Wireless Sensor Network, Cellular Automata, Clustering, Lifetime, Reliability, Connectivity, Coverage.