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CONCLUSION AND FUTURE SCOPE
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The work mainly focused on to the study, analyze and investigate the potential energy aware routing protocols under a real time environment that covers the study of the routing protocols based on energy and their challenges in Wireless Ad hoc Sensor Network

7.1 Conclusions

As studied in the literatures, most of energy aware routings are static in nature and few are mobility based but they are in semi-mobile wireless environment and most of the protocols are still under development stage. To understand the changes, issues and limitations that happened to WASN in terms of Energy Complexity in routing under random real time mobility of nodes, compared to static one with analysis has been presented. A Hybrid Multi-hop Mobility Assisted Heterogeneous Energy Efficient Cluster Routing Protocol has been proposed in this work, where the intensity of mobility in terms of new mobility factor is being used in the threshold calculation for the clustering process along with other attributes. Heterogeneity of WASN depends on the functionalities of deployed nodes and functionality is directly proportional to the energy consumption level of individual nodes and network as well as stated by distinguished authors earlier. This theory seems vital in a static network environment. But, in this work it has been found and analyzed that the mobility pattern and mobility count of nodes as an important factor in network heterogeneity in terms of energy in the hierarchical cluster based mobile WASN. The hybrid nature of the proposed protocol is to take the best features of various existing routing protocols are in place in the algorithm. The network performance of proposed one has been described based on evaluation parameters like, Network Lifetime, Cluster Count, Packets to BS, Packets to CH, Network Energy Level, Success Rate and System throughput with respect to LEACH(M). In the proposed protocol, it has been observed that under the heterogeneous random mobility of nodes the average success rate is nearly 66% with extended network life. To enhance the capability of this protocol in terms of energy and throughput further the protocol has been optimized. WASN routing has many conflicting issues as stated in many literatures. Hence, to search a quick finest approximate
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solution is a challenge as compared to classical algorithms and methods. Quick meta-heuristics not only reduces communication overhead in routing protocol designing but also reduces computational energy too to a better extent. The need of Multi-objective Optimization (MOO) arises because one solution can never be taken as finest with respect to all the objectives. Multi-objective decision making can provide best strategic solutions to solve real world complex problems associated with more than one contradictory issue. In this work energy and throughput have been taken as objectives to design and implement the new Non-dominated Sorting based Genetic Algorithm (NSGA-II) based energy and throughput model with a new set of equations on the propose algorithm to address the limitations of existing one. The use of NSGA-II is in this work is due to its fastest convergence towards a solution and proven successful in such kind of network issues as discussed in several literatures. Finally, the result is compared with the existing protocol on Pareto optimal front. The proposed protocol in this work outperforms LEACH (M) and LEACH-ME in terms of energy, throughput and others. The assessment of Link Quality and energy consumption in packet routing with hands on devices has been made to understand the routing in a variety of real time network scenarios which are helpful to design different operations on WASN at physical layer implementation.

7.2 Future Scope

This work can be extended to make wireless network congestion free in terms of energy efficiency and can be helpful to model new system to check energy leakage in the network at different stages of packet routing process. On the other hand, the work can also be enhanced with respect to the several other conflicting issues available in designing of protocols with respect to the energy for optimization. Similarly, one of the major aspects of next generation of research is to reduce carbon footprints by making communication energy aware and to make the system green enabled.