Volume 3, Issue 10, October 2013 ISSN: 2277 128X
International Journal of Advanced Research in Computer Science and Software Engineering
Research Paper
Available online at: www.ijarcsse.com

Improvements in QoS Parameters using ACO in Wireless Sensor Networks

Satvir Singh , Meenaxi
ECE, SBSSTC Ferozepur, Punjab
India

Abstract— Wireless sensor network applications have gained the attention of researchers in the last few years due to the rapid growth of wireless technology. In this paper, wireless sensor network is deployed and secondly the sensor nodes are communicated among themselves so as to find out the shortest path. Then Low Energy Aware Clustering Hierarchy (LEACH) is compared with proposed algorithm. This paper presents the best QoS network parameters with the help of Swarm Intelligence (SI) technique which serves an ideal model of developing routing protocols for WSNs.

Keywords— QoS, PDR, PLR, EED, LLEAP, LEACH, ACO, WSN, Routing

I. INTRODUCTION

A WSN consists of spatially distributed sensors to sense physical or environmental conditions, such as temperature, sound, pressure, etc. and to communicate through the network. The wireless sensor networks are used in many industrial and consumer applications, such as industrial process monitoring and control, etc. The WSN is composed of several nodes from a few to hundreds or even thousands, where each node is linked to one or several sensors. The topology of the WSNs can vary from a simple star network to an advanced multi-hop wireless mesh network. Sensor nodes are tightly constrained in terms of transmission power, on-board energy, processing capacity and storage and thus require careful resource management.

II. ROUTING IN WIRELESS SENSOR NETWORKS

Each of the scattered sensor nodes communicate with each other, i.e. has capability to collect and route data either to other sensors or back to external base stations. A base station may be a fixed node or a mobile node capable of connecting that sensor network to the existing communication network.

Low Energy Adaptive clustering hierarchy (LEACH) [1] is one of the most popular hierarchical routing protocol for sensor networks. The idea is to form clusters of the sensor nodes based on the received signal strength and use local cluster heads as routers to the sink. This will save energy since the transmissions will only be done by such cluster heads rather than all sensor nodes. Cluster heads change randomly with time in order to balance the energy dissipation of nodes. The node becomes a cluster head for the current round if the number is less than the following threshold:

$$T(n) = \begin{cases} \dfrac{p}{1 - p * (r \bmod 1/p)} & \text{if } n \in G, \\ 0 & \text{otherwise,} \end{cases}$$

where p is the desired percentage of cluster heads (e.g. 0.05), r is the current round, and G is the set of nodes that have not been cluster heads in the last $1/p$ rounds.

[2] PEGASIS show better results as compared to LEACH by removing overhead of dynamic cluster formation, decreasing the number of transmissions and uses only one transmission to the base station or sink per round. The authors used the concept of naturally occurring behaviour of real ants [3]. This help in obtaining the better paths. This protocol has very less number of dead nodes as compared to other algorithms. This is multi-path energy-aware routing protocol which demonstrates the better results because once a route has been established it is reliable as far as the energy of that route is concerned. Basioni et.al [4] proposed EAP which includes the QoS of an energy efficient cluster based routing protocol in terms of lifetime, loss percentage, delay and throughput. The drawback is that the protocol slightly degrades lifetime of the network without affecting the other parameters. [5], [6] improves the QoS and network parameters after implementing ACO on LLEAP.

III. IMPLEMEMTATION

This section describes the way in which simulations are carried out. The objectives of this section are:

1. Deploying a Wireless Sensor Network.

2. Implementing LLEAP and LEACH & measure performance parameters which includes PDR, EED.
3. Optimizing LLEAP along with ACO.
4. Comparison of LEACH with proposed algorithm

The simulation is carried out using Custom Built Iterative based simulator in MATLAB 7.12.0.635 (R2011a) which simulates the transmitting, receiving of data in terms of packet delivery and packet loss ratio. The simulation parameters [5] are :

1. *Packet delivery ratio (PDR)*: The ratio of number of packets sent from the source to the number of packets received at the destination. The greater the value of PDR means better performance of the protocol.

2. *Packet loss percentage (PLR)*: The ratio of number of raw packets lost due to death of the node to the total number of raw packets transmitted in the network until the last node dies.

3. *End-to-End Delay (EED)*: The average time taken by raw packets to transverse from the simple

IV. CONCLUSIONS

This section concludes the comparison between LEACH and the proposed algorithm (implanting ACO on LLEAP routing protocol). The graphical as well as tabular representation is :

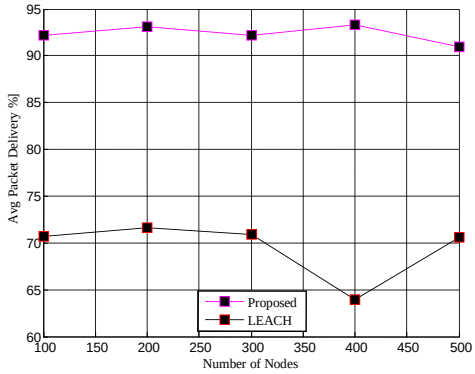

Fig. 1 PDR of LEACH and Proposed algorithm

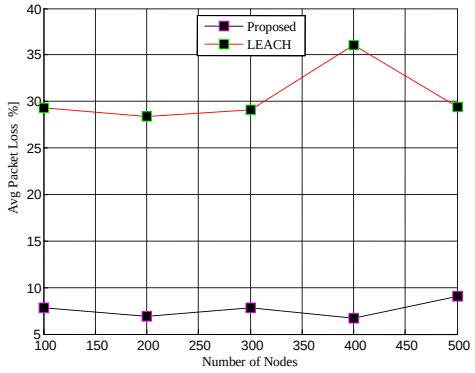

Fig. 2 PLR of LEACH and Proposed algorithm

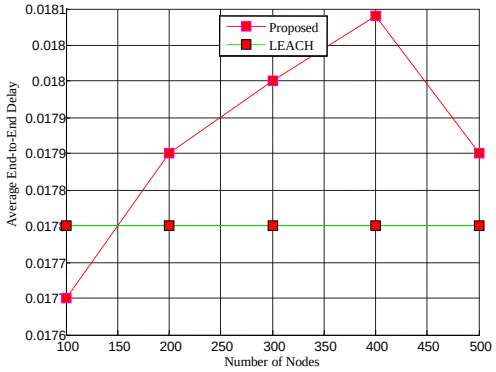

Fig. 3 End to End Delay of LEACH and Proposed algorithm

TABLE I: RESULTS SHOWN IN TABULAR FORM

Parameters	LEACH					Proposed Algorithm				
	n=100	n=200	n=300	n=400	n=500	n=100	n=200	n=300	n=400	n=500
Packet Delivery Ratio	70.91	71.91	71.11	64.21	70.81	93	94	93.10	94.20	91.80
Packet Loss Ratio	29.08	28.08	28.88	35.78	29.18	6.9	5.9	6.89	5.79	8.194
End-to-End Delay	0.017	0.017	0.017	0.017	0.017	0.0177	0.0179	0.0180	0.0181	0.0179

REFERENCES

[1] Ameer Ahmed Abbasi, Mohamed Younis , *A survey on clustering algorithms for wireless sensor networks*, Elsevier Computer Communications 30 (2007) 2826–2841.

[2] S. Lindsey and C. S. Raghavendra *PEGASIS: Power- Efficient Gathering in Sensor Information Systems* 02 WZ IEEE EEFAC p a p #242, Updated Sept 29,2001

[3] Karl Doerner, Walter J. Gutjahr, Richard F. Hartl, Christine Strauss, Christian Stummer ―*Ant Colony Optimization in Multiobjective Portfolio Selection*‖, MIC'2001 Citeseer - 4th Metaheuristics International conference.

[4] Basma M. Mohammad El-Basioni, Sherine M. Abd El-kader, Hussein S. Eissa, Mohammed M. Zahra, *An Optimized Energy-aware Routing Protocol for Wireless Sensor Network*, Egyptian Informatics Journal (2011) 12, 61–72 ELSEVIER.

[5] S. Singh and Meenaxi, *COMAPARATIVE ANALYSIS OF QOS PARAMETERS IN WIRELESS SENSOR NETWORKS USING ANT COLONY OPTIMIZATION*, International Conference on Control, Communication and Computer Technology, March 2013.

[6] Satvir Singh, Meenaxi, *A Survey on Energy Efficient Routing in Wireless Sensor Networks* , International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 7, July 2013.

