Hybrid Protocol based on HBO and ACO for routing in Wireless Sensor Network

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ABSTRACT: Due to the energy restriction of each nodes, in Wireless Sensor Network efficient routing is very important. The results of new protocol i.e. hybrid have been compared with EEPB and IEEPB. Simulation results show that the lifetime of Hybrid is better as compared to IEEPB. Throughput has been increased in the Hybrid since in 50% node mobility IEEPB give 1981 and HEEPB gives 2420. Thus, the proposed protocol is more energy efficient as compared to chain based protocols i.e. IEEPB sensor node and to enhance the lifetime of the network. In this dissertation, a new Optimization Tech. i.e. HYBRID (ACO and HBO) with Improved PEGASIS protocol has been designed. A new approach has been used to overcome the problem of long links in PIGASIS

KEYWORDS: Wireless sensor network, Energy efficient PIGASIS based, Improved Energy efficient PIGASIS based, Hybrid Energy efficient PIGASIS based, Improved

I. WIRELESS SENSOR NETWORKS

A Wireless Sensor Network (WSN) consists of a large number of tiny wireless sensor nodes it is also referred as sensor nodes which are, deployed typically or densely. Ad hoc networks are also category as wireless networks that utilize multi-hop radio relaying since the nodes are dynamically located. Ad hoc networks are not dependent on infrastructure.

• Sensor Node: A sensor node is the core component of a WSN. The sensor nodes have multiple roles in a network, such as sensing; data storage; routing; and data processing.

• Clusters: Clusters are the organizational unit for WSNs. Because of the dense nature of these networks it requires the need for them to be broken down into clusters to simplify tasks such a communication [2].

• Cluster heads: Cluster heads are the organization leader of a cluster. They often are required to organize activity in the cluster[3].

• Base Station: The base station is at the upper level of the hierarchical WSN. It provides the communication link between the sensor network and the end-user.

II. ENERGY EFFICIENCY IN WIRELESS SENSOR NETWORKS

A sensor network consists of a large number of small devices with sensing processing, and transmitting capabilities. Main goal of the operation is to observe a region and gather and information to a sink node called Base Station (BS). Forwarding the data to the BS is possible in two ways: using direct or multihop communication. In the first case every sensor transmits its data directly to the sink
In the Second case, the sensors are communicating with the neighbours that forward the information in the direction of the sink [3].

A primary design issue in sensor networks is energy efficiency. The main goal is to prolong the lifetime of the network, which can be defined in several ways [4]

- The time when the first node depletes its battery,
- The time until a given percentage of the sensors has enough energy to operate,
- The time until a given percentage of the region is covered by alive sensors.

III. ROUTING PROTOCOLS IN WSN

Energy consumption can be reduced by the use of various techniques like data aggregation, clustering, data-centric methods, etc. The routing protocols can be classified as
1. Flat
2. Hierarchical
3. Location-based

- Hierarchical networks: In hierarchical networks, the nodes are partitioned into a number of small groups called clusters. Each cluster has a cluster head (CH) which is the coordinator of other nodes. These CHs

perform data aggregation so that energy inefficiency may be reduced. The cluster heads may change. The node which has the highest energy acts as the CH. Hierarchical routing is an efficient way to lower energy consumption within a cluster. It has major advantages of scalability, energy efficiency, efficient bandwidth utilization, reduces channel contention and packet collisions. Low Power Adaptive Clustering Hierarchy (LEACH), Power efficient gathering in sensor information and (PEGASIS), Hybrid Energy-Efficient Distributed Clustering (HEED), etc. are examples of hierarchical networks.

PEGASIS: Hierarchical-based routing protocols are widely used for their high energy-efficiency and good expandability. The idea of them is to select some nodes in charge of a certain region routing. These chosen nodes have greater responsibility relative to other nodes which leads to the incompletely equal relationship between sensor nodes. PEGASIS is a classical chain-based routing protocol. Chain based protocol saves significant energy compared with the LEACH protocol by improving the cluster configuration and the delivery method of sensing data. However, the PEGASIS protocol also has many problems requiring solutions. In recent years, researchers have proposed many improved algorithms based on PEGASIS such as PEG-Ant, PDCH and EEPB et al.

•When EEPB builds a chain, the threshold adopted is uncertain and complex to determine, which causes the inevitability of LL if valued inappropriately.

• When EEPB selects the leader, it ignores the suitable proportion of nodes energy and distance between node and BS which optimizes the leader selection according to various application environments. Based on the above analysis, this paper presents an improved energy-efficient PEGASIS-based routing protocol called IEEPB. IEEPB compares the distance between nodes twice, finds the shortest path to link the two adjacent nodes. This chain-building method is more simplified and effectively avoids the formation of LL between neighbouring nodes.

IV.WSN USING HYBRID HBO AND ANT OPTIMIZATION TECHNIQUE

Swarm intelligence: It is the collective behavior of decentralized, self-organized systems these systems may be natural or artificial. This concept is employed in artificial intelligence. The expression was introduced by Gerardo Beni and Jing Wang in 1989.These systems consist typically of a population of simple agents interacting locally with one another and with their environment. The inspiration comes from nature, especially biological systems. The agents follow very simple rules, and although there is no centralized control structure dictating how individual agents should behave, local, and to a certain degree random, interactions between such agents lead to the emergence of "intelligent" global behavior, unknown to the individual agents. Examples in natural systems of SI include ant colonies, bird flocking, animal herding, bacterial growth, and fish schooling. The definition of swarm intelligence is still not quite clear. In principle, it should be a multi-agent system that has self-organized behavior that shows some intelligent behavior. The two algorithms from Artificial intelligence will be used in our work. Also the PEGASIS protocol will be enhanced and then implemented in the WSN scenario. In our work, we will take following parameters into consideration:

I. Average energy per iteration
II. No. of alive nodes per iteration
III. Residual energy per iteration
IV. No. of dead node per iteration

V. SIMULATION ENVIRONMENT

A 100 node field is used and generated by randomly placing the nodes in a 100 m x 100 m square area. The simulation focuses on number of sensor nodes alive, Average Energy of network Residual energy per iteration and No. of dead node per iteration which is important indicators to measure performance of different algorithms. The simulation parameters used are shown below:

Table 1 Simulation Parameters

Parameters	Values
Number of Nodes	100
Area Size	100×100
Base Station	(50, 300)
Energy Transmitted	50nj/bit
Energy Received	100pj/bit/m^2
Amp Energy	0.0013pj/bit/m^4
Data Packets	1600

V1. SIMULATION RESULTS

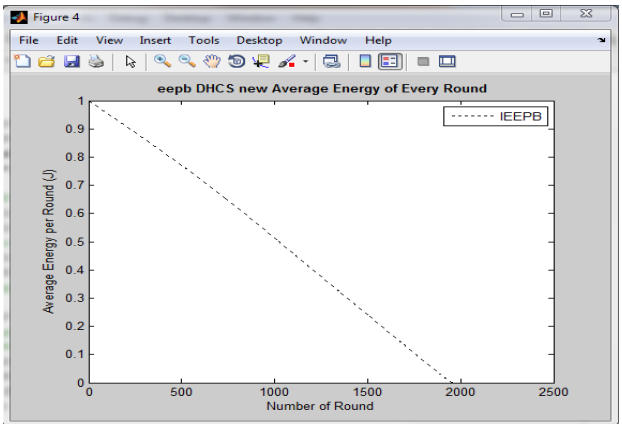

Fig5.1 PEGASIS based graph between energy and rounds

Fig 5.2 shows the graph between alive nodes per round in PEGASIS in this node's keep starting dead from 1750 rounds (approx).

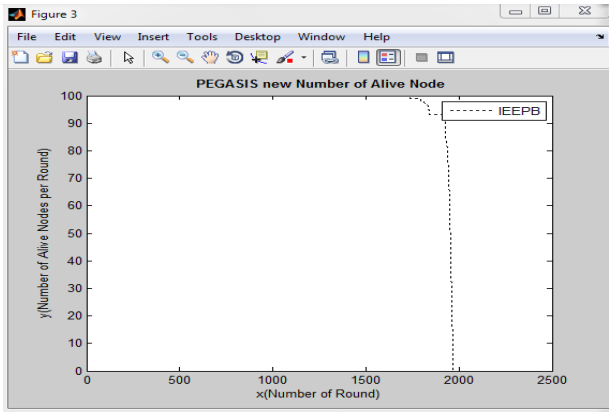

Fig 5.2 PEGASIS based graph between No.of alive nodes and rounds

Fig5.3 shows the average energy per round in HEEPB is more as compare to the PEGASIS

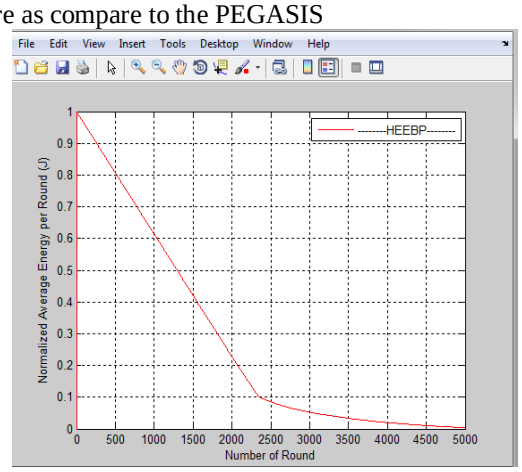

Fig 5.3 HEEPB based graph between Energy and rounds

Fig 5.4 shows the average energy per round in more as compare to the PEGASIS

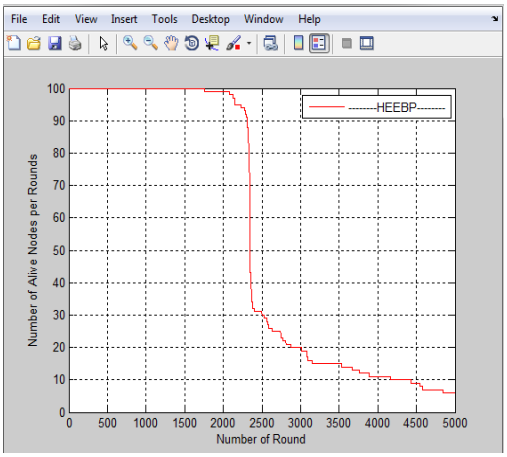

Fig 5.4 HEEPB based graph between No.of alive nodes and rounds

Table 2 Network life time

Node Mobility	IEEPB	HEEPB
1%	1750	1981
50%	1981	2420
100%	2047	5000

VII. CONCLUSION & FUTURE SCOPE

A new enhanced scheme based on artificial intelligence has been proposed for Wireless Sensor Networks which helps to improve the energy efficiency as well as lifetime of the Wireless sensor network. Energy efficiency is the most required quality in a sensor network where each node consumes some energy with each transmission over the network. Energy efficiency is also required to improve the network life. The results of the proposed scheme are evaluated in MATLAB. The simulation results shows that the proposed scheme that is hybrid Honey bee optimization and ant colony optimization with improved PEGASIS has the better results as compare to previous techniques. In this proposed work chain complexity is reduced by using hybrid optimization technique and is more efficient in energy saving.

In future, the work can be extended by reducing the complexity of chain further by optimizing the energy parameter along with the distance parameter or the nutrient function can be changed.

REFERENCES

[1] Z. M Wang, S.Basagni, E.Melachrinoudis and C.Petrioli, ‘‘Exploiting Sink Mobility for Maximizing Sensor Networks Lifetime’’, Proceedings of the 38th Hawaii International Conference on System Sciences, IEEE Computer Society, 2005.

[2] E. H. Callaway, Wireless Sensor Networks, Architectures and Protocols, Auerbach Publications, Taylor & Francis Group, Boca Raton, Fla, USA, 2003.

[3] Thanos Stathopoulos, R. Kapur, D.Estrin, “Application-Based Collision Avoidance in Wireless Sensor Networks”, Conference of Computer society, July-December 2005.

[4] K. Padmanabhan, Dr. P. Kamalakkannan,“ Energy-efficient Dynamic Clustering Protocol for Wireless Sensor Networks”, International Journal of Computer Applications, Vol. 38, Issue. 11, January 2012.

[5] S. R. Das, C. E. Perkins, and E. M. Royer, “Ad hoc on-demand distance vector (AODV) routing”, IETF Internet draft, draft-ietf-manet-aodv- 13.txt, Feb 2003.

[6] S.K Singh, M. P Singh and D K Singh , “Routing Protocols in Wireless Sensor Networks –A Survey,” International Journal of Computer Science & Engineering Survey (IJCSES) Vol.1, No.2, November 2010.

[7] P.Tyagi, R.P Gupta, R.K Gill,” Comparative Analysis of Cluster Based Routing Protocols used in Heterogeneous Wireless Sensor Network”, International Journal of Soft Computing and Engineering (IJSCE), Vol. 1, Issue. 5, November 2011.