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ENERGY EFFICIENT CLUSTERING HIERARCHY FOR HETEROGENEOUS WIRELESS SENSOR NETWORKS

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Abstract: *A Clustering Hierarchy is a key technique to Increase the scalability. Wireless sensor Network has increased importance of sensor network to connect the physical World to Real World. Development in Sensor Network Means design new protocols for Wireless Sensor Networks. Methods for Clustering to improve energy efficiency or sensor nodes are generally battery-powered devices, the main concern how to reduce the energy consumption of nodes Hierarchical Clustering is very important for increasing Network's life time.*

A hierarchical approach breaks the network into Clustered Nodes or Nodes are grouped into clusters that has the responsibility of routing from one clusters to other clusters. data move from low cluster to high Cluster. Which is called hierarchical clustering In this paper we study the impact of heterogeneity of nodes in terms of their energy in wireless sensor networks that are hierarchically clustered .This Protocol is an Improvement of LEACH-MOP. Simulation shows that the proposed algorithms increases the lifetime of the whole network and performs better than LEACH, LEACH-E, LEACH-C, HEED.

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1 INTRODUCTION

A Wireless Sensor Network is a collection of nodes. Each node has many processing capability may contain multiple types of memory (program, data memory), have a Radio transceiver (used with a Omni-directional antenna) have a power source and sensors. The nodes communicate with each other wirelessly and organized in an sensor Network [1].

Wireless Sensor Networks with access to them through the Internet though it can be considered as the Internet becomes a physical network. so new technology is coming with importance for many application areas include environmental, medical, military, transportation, entertainment, management, defense, and spaces. In a medium access control protocol defines actions over a shared channel.

The commonly used solutions are contention-based. And contention-based strategy is for a node which has a message to send to test the channel to see if it is busy, if not busy then it send, otherwise if busy it waits and tries again. After colliding, nodes wait random amounts of time trying to avoid re-colliding. If two or more nodes send at the same time then there is a collision and all the nodes colliding many wireless MAC Protocols [1].

Sensing technology means small and autonomous devices are called sensor nodes. Collect and send information to users. Sensor nodes in Wireless Sensor Networks are capable of gathering, sensing and process the data. Wireless Sensor Network devices are used in power, efficiency, communication, memory and the application has been used to simple data, monitoring, reporting applications. Wireless Sensor Network nodes are battery powered which are used to perform a task for a long period of time[2].

Heterogeneous Sensor Network have a hierarchical organization. Heterogeneous Sensor Network consisting of two types of sensors: high-end (H-sensor) and low-end (L-sensor).HSNs are preferred because they provide better performance and security solutions for scalable applications in dynamic environments.

1.1 Wireless Sensor Network Architecture

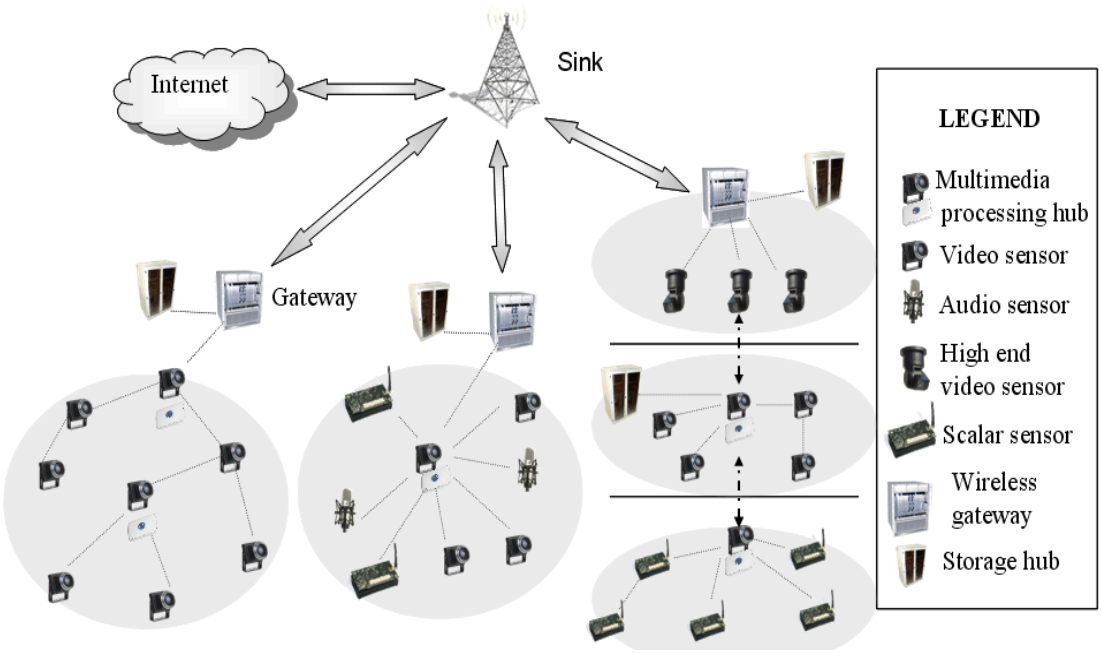


Figure:1.1 Architecture of a wireless sensor Node

1.2 Applications

Time synchronization, localization and query dissemination can all reduce the number of messages thereby increasing lifetime. Military sensor networks range from large-scale rveillance systems force an surveillance to small networks of unattended ground sensors for detection. However, the availability of low-cost sensors and communication networks has resulted in the development of many other important applications, from security to industrial sensing.

Infrastructure Routing:-Sensor networks can be used for infrastructure security and terrorism applications. buildings and facilities such as power plants and communication centres have to be protected from terrorists. Networks of video and other sensors can be deployed around these facilities.

Industrial sensing:-Commercial industry has long been interested in sensing as a means of lowering cost and improving machine performance and maintainability. Factories have continued to automate production with remote sensing nets, implementing on-line quality control tests enabled by the sensors.

Medical Applications:-Sensor networks are also widely used in healthcare area. In some modern hospital sensor networks are constructed to monitor physiological data, to control the drug administration track and monitor patients and doctors and inside a hospital.

Military Applications:-Now Wireless Sensor Networks can be an part of military command, control, communications, computing, intelligence, surveillance, and targeting systems.

Military sensor networks could be used to detect and gain as much information as possible about enemy movements, explosions, and other phenomena of interest, such as battlefield surveillance, nuclear, biological and chemical attack detection.

2. SCOPE

In Energy Efficiency Radio-Frequency (RF) signals, a multihop RF network provides a energy saving over a single-hop network for the same distance. Using more nodes not only increases the cost, but also the power consumption of other RF components. An optimal design to balance the two factors for an overall cost and energy efficiency. Data aggregation plays an important role in energy conservation of Sensor Network. Data aggregation methods are used not only for finding an path from source to destination but also to eliminate the redundancy of data, since transmitting raw data is an energy operation, and thus minimizing the number of data transmission.

3. OBJECTIVES

The nature of node energy consumption caused by wireless communications. Develop energy-efficient network layer algorithms that effectively organize the densely deployed sensor nodes. Explore energy-efficient low-complexity algorithms in lower layers (below the network layer) to directly save a node's energy in carrying out wireless communications. [14]

(1) Hierarchical Clustering is very important in increasing Network's life time. A Hierarchical approach breaks the network into Clustered Nodes are grouped into clusters that has the responsibility of routing from clusters to other clusters. the impact of heterogeneity of nodes in terms of their energy in wireless sensor networks that are Hierarchically clustered. This Protocol is an Improvement of LEACH-MOP.

(2)The proposed algorithms increase the lifetime of the whole network. The main purpose of Cluster based Protocol is to maintain energy Consumption of sensor nodes by multi-hop

communication within a cluster and by performing data aggregation and number of transmitted messages.

(3)It assumes that sensor nodes communicate with each other by single-hop only. In heterogeneous clustering schemes where all the nodes of the sensor networks are equipped with different amount of energy such as SEP, EECS, DEEC.

(4)Sep is developed for two level heterogeneous Networks .Network and performs better than LEACH, LEACH-E, LEACH-C, and HEED. HEED was proposed with four primary goals Network Lifetime by distributing energy consumption, Terminating the clustering process and Minimizing control overhead HEED Algorithm is a combination of two parameters.

4. RESULTS AND DISCUSSION

Load Balancing Heterogeneous Sensor Network with ATPC

The overall system design problem involves determining the number of cluster head nodes. The cluster is a circular region and the cluster head is located at the centre of this region. The communication between nodes and node to base station takes place in a single hop. Propagation loss constant k , for communication within a cluster, and k0 for communication between the H nodes and base station. Since the cluster head to base station communication is long range, it is likely that k0 > k.

According to the distance between them, the L nodes reduce its transmission power adaptively. Hence, reduction in the power consumption takes place according to at the same time network life increases compared with HSN.

ATPC(Adaptive transmission power control)

The Quality of radio communication between low power Sensor devices varies significantly with time and environment. This phenomenon indicates that the previous topology control solutions, which use static transmission power, transmission range, and link quality, might not be effective in the physical world. ATPC, a lightweight algorithm of Adaptive Transmission Power Control for wireless sensor networks. In ATPC, each node builds a model for each of its neighbors, describing the correlation between transmission power and link quality. With this model, we employ a feedback-based transmission power control algorithm to dynamically maintain individual link quality over time.

1) with pair wise adjustment, ATPC achieves more energy savings with a capability

2) with online control, ATPC is robust even with environmental changes over time.

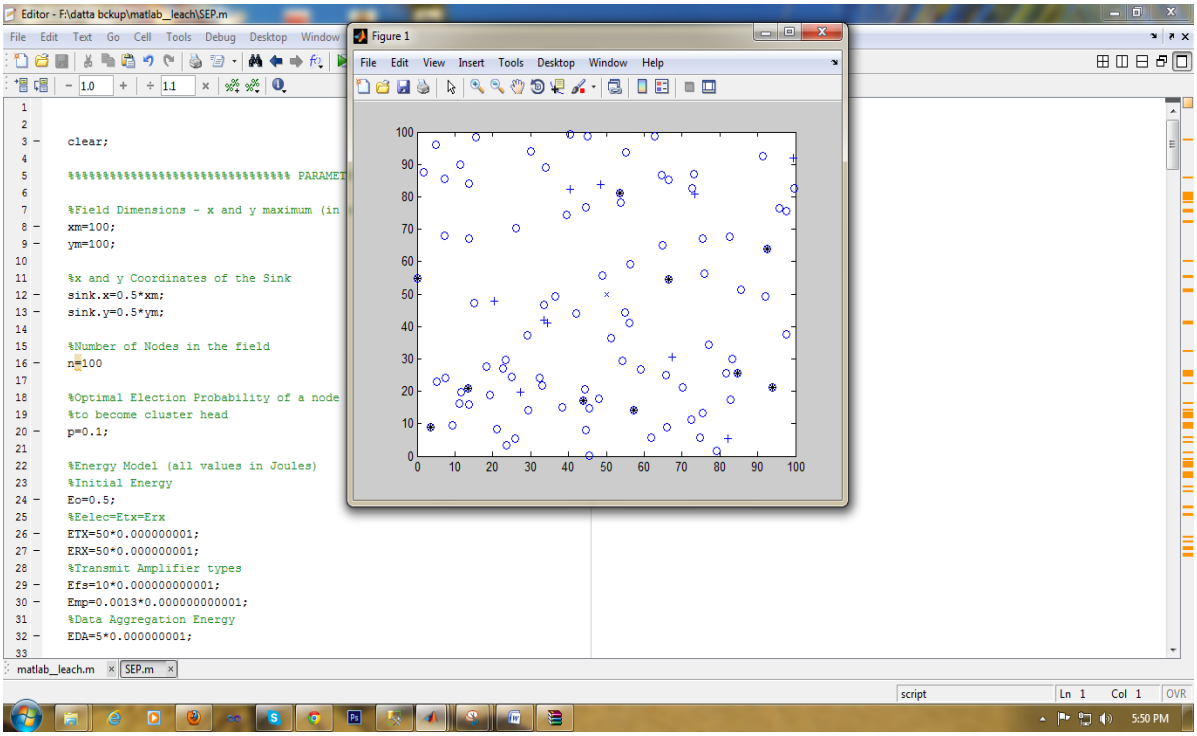
Matlab Cluster Head Heterogeneous energy saving in Wireless Sensor Networks

```
xm=100;
ym=100;
sink.x=0.5*xm;
sink.y=0.5*ym;
n=100
p=0.1;
Eo=0.5;
rmax=4999
PACKETS_TO_CH(r+1)=0;
PACKETS_TO_BS(r+1)=0;
if (dead==1)
   if(flag_first_dead==0)
end

if (min_dis>do)
            S(i).E=S(i).E- ( ETX*(4000) + Emp*4000*( min_dis * min_dis * min_dis * min_dis));
End

%Energy dissipated
 if(min_dis>0)
         S(C(min_dis_cluster).id).E = S(C(min_dis_cluster).id).E- ( (ERX + EDA)*4000 );
         PACKETS_TO_CH(r+1)=n-dead-cluster+1;
end

countCHs;
rcountCHs=rcountCHs+countCHs;
```



5. FUTURE WORK AND CONCLUSION

This work introduces a New Approach to fault detection and using Wireless Sensor Networks with an emphasis on the application for bridges in remote area. First what should be the location of Sensor. At the lower tier measurement of from two heterogeneous sensors are combined to perform local fault detection. The dynamic relation between these two measurements is used and then in order to give a physical meaning to this relation, the sensors need to be positioned so that the energy in the system will go from the location of the measurement used as input, to the one of the measurements used as output in the model-based approach.

Second, it has been shown that a high density of sensor nodes in the network increase the fault detection power of a single node. EECA is implemented over Load balanced mobile sink HSN. This paper shows that EECA protocol performs significantly better compared to other Rumor Routing protocols. Heterogeneous sensor network with ATPC is implemented and compared with heterogeneous sensor network for energy consumption and network life time.

REFERENCES

1. John A. Stankovic,(2006) “Wireless Sensor Networks”, published in University of Virginia.

2. Dr. Sarat Kumar Patra,(2010) "Energy Efficient routing Algorithms For Wireless Sensor Networks performance and Evaluations of Quality of Service", Department of Electronics, Rourkela.
3. Shio Kumar Singh, M P Singh, D K Singh,(2010) "A Survey of Energy Efficiency Hierarchical cluster based routing in Wireless Sensor Networks", Electronics and Communication Engineering Department, Birla Institute of Technology, Dhanbad.
4. I. F. Akyildiz, W. Su, Y. Sankarasubramaniam, and E. Cayirci, "A survey on sensor networks," Communications Magazine,IEEE, vol. 40, pp. 102-114, 2002.
5. D. Culler, D. Estrin, M.Srivastava, "Overview of Sensor Networks,"*Computer Magazine,IEEE*, vol. 37, no. 8, pp. 41-49, August 2004.
6. C.R. Lin, M. Gerla, "Adaptive clustering for mobile wireless networks", *Journal on Selected Areas Communications,IEEE*, vol. 15, no. 7, pp. 1265-1275, 1997.
7. K. Xu, M. Gerla, "A heterogeneous routing protocol based on a new stable clustering scheme", in Proceeding of IEEE Military Communications Conference, vol. 2, Anaheim,CA, 2002, pp. 838-843.
8. Mhatre, Vivek P. and Catherine Rosenberg, "Homogeneous vs. Heterogeneous Clustered Sensor Networks: A Comparative Study," in Proc. IEEE Int.Conf. on Communications".
9. Dilip Kumar a, Trilok C. Aseri b,1, R.B. Patel(2008), "EEHC: Energy efficient heterogeneous clustered scheme for wireless sensor networks", published in Computer Communications in year 2008.
10. Stefano,C.,Chilaamkurti,N.and Zeadally,S, "Novel Centralized Algorithm for Energy Efficient Wireless Sensor Networks," International Journal of Autonomous Adaptive Communication Systems,1.Vol.1,pp.242_261(2008).
11. W.heinzelman, A.Chandrakasan, H.BalaKrishnan, "Energy efficient Communication protocol for wireless micro sensor networks", in: proceedings of the 33rd Hawaii international conference on System Sciences, January 2000.S.Lindesey,C.S.
12. A.Manjeshwar,D.P.Agrawal,TEEN: "A protocol for enhanced efficiency in wireless sensor networks",in:Proceedings of the 1st International Workshop on Parallel and distributed Computing issues in Wireless Networks and Mobile Computing, san Francisco,CA,April2001.

13. Shudong Fang, “Energy Efficient Clustering For wireless Sensor Networks”, China, April 2006.
14. Sudarmani R.,K.R.shankar Kumar, Energy Efficient Clustering algorithm For Heterogeneous sensor Networks with Mobile sink.