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Energy Efficient A New Hybrid Routing Protocol for Wireless Sensor Networks: ANHR

Gadhave Dattaprasad D[1]., Mane Vikram A[2]., Nalwade Rajkumar B[3].

[1,2]Department o E&TC Annasaheb Dange COE, Ashta, Maharashtra, India
[3]Department of Electronics, RSCOE, Pedhambe Maharashtra India

Abstract: Wireless Sensor Networks (WSNs) are wireless networks consisting of a group of small, inexpensive nodes, which collect and disseminate significant data. Nodes in a wireless Sensor Networks have various energy and computational constraints due to their inexpensive, random method of deployment. Due to wide variety of real time applications Wireless Sensor Network (WSN) is the hottest research field in the world of computer network. Wireless Sensor Network consists of tiny, autonomous sensor nodes deployed in a remote area to detect, collect and process data and transmit it to the user. In such network nodes are able to move and synchronize with the neighbours. Due to mobility of nodes, network changes dynamically and nodes get added and removed. In this paper, we are going to survey different hybrid routing protocols in WSN. Different hybrid routing protocols perform well in different scenario and their performance is compared based on different metrics. Also, we have proposed Energy Efficient A New Hybrid Routing Protocol (ANHR) in WSN.

Keywords: WSNs; energy-aware; hybrid routing.

I) INTRODUCTION

WIRELESS Sensor Network (WSN) is basically combination of different technologies like wireless communication, information technology and electronics field [1]. .Sensor nodes in WSNs are small sized and have ability to sense, gather and process data while communicating with other nodes in the network, via radio frequency (RF) channel. The process of determining path between source and destination for data transmission is called as routing. In WSN network layer is mostly used for implementing routing of incoming data and designing routing protocol is one of the challenging task in WSN. Due to node deployment recharging sensor node is normally impracticable. Therefore, energy saving is one of the important design issue in wireless sensor network. Also, data transmission and reception dominates the energy consumption of sensors. Therefore, ultimate objective behind designing the routing Protocol should be energy efficient as possible to prolong the network lifetime. Various hybrid routing protocols have been proposed to meet the application requirements of WSNs. A new hybrid routing in WSNs is proposed in this paper combines the plane routing protocols with hierarchical routing protocols and determine the current state of last hop node and the current residual energy according to the received signal strength of the node. This protocol has highest generation efficiency of cluster head which can effectively reduce the network load, energy consumption and best on the aspect of successful packet delivery rate. Also, it maximizes the network lifetime.

II) RELATED WORK

Routing protocols in WSN have to deal with number of challenges and design issues. WSNs have some restrictions on sensor nodes like limited battery power, bandwidth constraint, limited computation power and limited memory. Single routing protocol in WSN cannot meet all the application requirements. Thus, many routing protocols are proposed in WSN based on application and network architecture. Based on different classification standards, routing protocols are classified into different categories [3]. Routing protocols in WSN can be categorized depending on network structure, protocol operation and path establishment. Figure 1 shows the categorization of routing protocols. Routing path can be established in one of the three ways namely proactive, reactive or hybrid [4]. In proactive protocol all the routes are computed before they are actually needed and then store these routing in a routing table in each node. As WSN consists of thousands of small sensor nodes, the routing table that each node would have to keep could be huge and therefore proactive protocols are not suitable for WSNs. Reactive protocols computes routes only when they are needed i.e. dynamically. Hybrid routing protocol is combination of both the ideas [5].

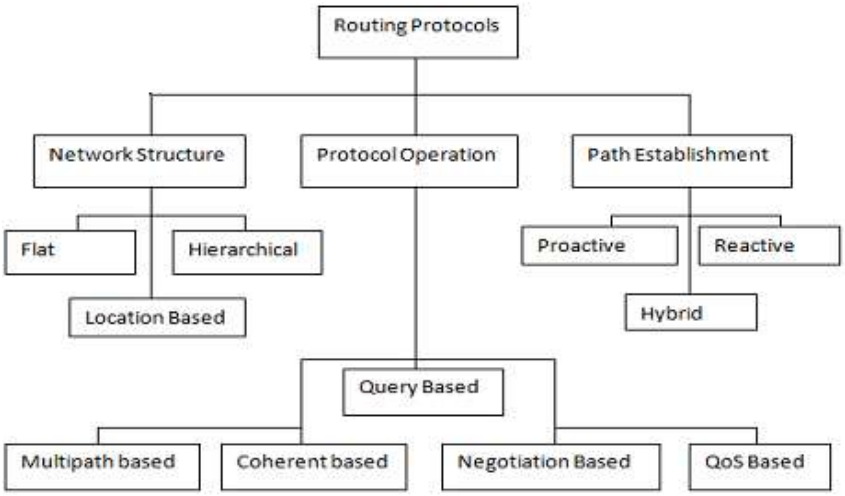

Figure 1. Categorization of routing protocols in WSN.

Parameters, which can possibly impose constraints on the system. These methods are suitable for prolonging the network lifetime rather than for the entire needs of WSN.

IV) A NEW HYBRID ROUTING PROTOCOL (ANHR) IN WSN

In our approach two-way query mechanism based on destination node query and source node detection and the way of distributed data processing is adopted. The signal strength indicator received by each node in the network is set to a number of gradient: RRSI ={i1,i2,ik & i1≤ i2≤i3} . Each gradient represents an intensity level of the node communication.

A. The establishment of routing

In a N nodes network, the entire network is considered as an undirected graphG = (V,E) , V is the set of vertices, E is the set of edges in a graph. N(i, j) is the set of next hop neighbors j of the node i , in which i, j∈V . w(u,v) is the weight of the edge (u,v) (the signal strength value between two nodes SI in this article), in which w(u,v)∈E .Now, to construct the routing from the Sink node to source node as an example. Sink node send communication request information to sensor nodes around, and then the routing process Sink node started is as follows:

Step1: Firstly, Sink node first constructs data message routing request packets (DRREQ) that contain relevant information (similar to SPIN using the attribute/value pairs named) and broadcast the route request message to all neighboring nodes N(sin k,i) in the next hop. The format of data message routing request packets (DRREQ) is as follows: DRREQ = (Rid , Seq, SrcAddr, DataTypes, RRSI, path) . In this formula, Rid is the identification number of the latest routes for Sink node, Seq is packet sequence number, ScrAddr is source node of routing packet (That is Sink node is the initiator). DataTypes is the type information in data property list requested to query by routing, RRSI is the signal strength of the data the node received sent by neighbor node(It is set +∞ for the node who sends queries), path is the path of the group.

Step2: After the next a hop neighbor nodes N(sin k,i) around Sink node receive data routing request packet, first of all, to judge whether Rid has been received before, if then the request packet is discarded; if not and DataTypes is the data contained in their own, then turns to step3, if it has only a part of the data in Data Types , then turns to step4,otherwise turns to step5.

Step3: Fill in Data Types of request packet with the data required. The format of data response request packets (DRREP) is as follows:

DRREP=(Pid,Peq,SrcAddr,DestAddr,DataValues,RRSI = S,rpath). In this formula, Pid is the identification number of the latest routes, Peq is packet sequence number, SrcAddr is address of data source node. DestAddr is the address of the node, to which the data returns (the address of Sink node). DataValues is the value of monitoring data related to the node(property value of DataTypes), RRSI is the signal strength of the data the node received sent by Sink node(when RRSI > S , set RRSI = S). rpath is the reverse path of request packet.

Step4: Continues to broadcast this information to this node's neighbor node N(i, j) . After received Information from the nodes, the neighbor node N(i, j) judge whether the data contained in their own is the data in Rid packet or a part of the packet, if then send the reply packet to this node. When this node receives these response packages sent by the neighbor node N(i,j), according to RRSI value received from surrounding nodes, select one of the node whose RRSI value is maximum as cluster head node, after finish acquisition and integration of related data then returns the information to Sink node along the reverse path(The path is the link in all paths from Sink node to the node whose RRSI value is maximum. This ensures the reliability of communication links.). If the data contained in their own is the data in Rid packet or a part of the packet, the routing in this trail fails, and then returns failure information.

Step5: If routing did not reach the related information node, this node set path domain to its own address and modify the next hop neighbor node N(sin k,i) in step1 to N(sin k,i) and let RRSI = S , and continue to transfer route request.

Step6: Repeat steps 2, 3, 4 and 5 until sin k node get the query data. If the routing process is always in step5 and Sink node did not get relevant information, the routing is failure. For two-way query mechanism based on destination node query and source node detection is adopted by this paper, when data source node detects the latest information or information of interest, it will send probe packets to send the sensor information to Sink node. This process is similar to the above process from Sink node to data source node, so we will not
repeat it.

B. Route Maintenance

In the above process of establishing the route, Sink node, the query path of node i in N(sin k,i) and the intermediate nodes contained Sink node's required information save the query routing link information of each other. In the communication in the future, they only need to send a test message CI to the other according to the path in their respective routing table information. If Sink node receives the same CI from node i , it shows that this is a reliable communication link. If Sink node does not receive the message CI from node i in unit time, then the link may be broken, so it must be repaired or re-routing. "Minimum Change Principle" is adopt the route maintenance in this paper, that is to say, if there are link problems, let the start node of this link broadcast an online search signal ONCI . When this node receives the response message PACI from neighbor node, transfers it to Sink node. View whether the response node returns PACI is in the routing table of the link, if not, add the node to path of the routing table and modify the routing from Sink node to node i so as to update routing table.

V) PROTOCOL SIMULATION AND ANALYSIS

To analyze and evaluate the performance of the algorithm, we use MATLAB, to implement evaluation and analysis to ANHR in this paper, LEACH protocol, and AODV protocol. on four aspects: generation efficiency of cluster head, successful data delivery rate throughput, network load and average energy consumption. Generation efficiency of cluster head is the average generation time of each cluster head which is a good measure of the cost and delay of the generation of cluster head in the entire communication. Successful data delivery rate is the rate the number of successful data delivery divided by the total number of delivery in the entire network node communication. It is a measure of the quality of the entire network traffic and success delivery ratio of data packets .Network load is measure of communication and computation of the entire network, which can reflect the complexity of communication protocol and its requirements of communications infrastructure. Average energy consumption is the measure of the average energy consumption of communication in the whole network.

VI) SIMULATION RESULTS AND ANALYSIS

ANHR proposed in this paper is compared with LEACH and AODV in the aspect of the generation efficiency of cluster head. It can be seen from Fig.1 that generation efficiency of cluster head of each protocol increased slightly with the increase of node density (the number of the next hop node). But generation efficiency of cluster head of ANHR is significantly higher than the other LEACH protocol, AODV is the flat routing protocol, therefore cluster generation is not required. Hierarchical routing clustering first and then communicate. While ANHR refers to the thoughts of "best effort" and "forced" in this communication. Sink node obtain all the necessary information from one node in a communication and send them back to Sink node. If it fails, the node whose RRSI value is maximum in routing process is used to generate cluster head dynamic and adaptively to finish the collection and collation of local information, and then the information is sent back to Sink node. The algorithm is simple and quick to establish cluster.

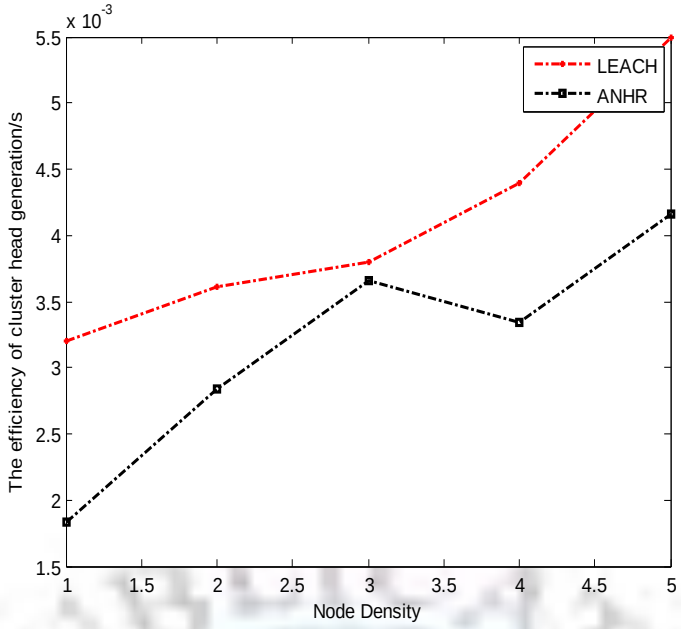

Figure 1. The efficiency of cluster head generation

As is shown in Fig. 2, compared with other two protocol, ANHR has obvious advantages on the aspect of successful packet delivery rate, so there are big cumulative errors and delay contradiction. Although. When the node communication reaches its storage capacity for calculation, the packet delivery rate is significantly lower than ANHR.

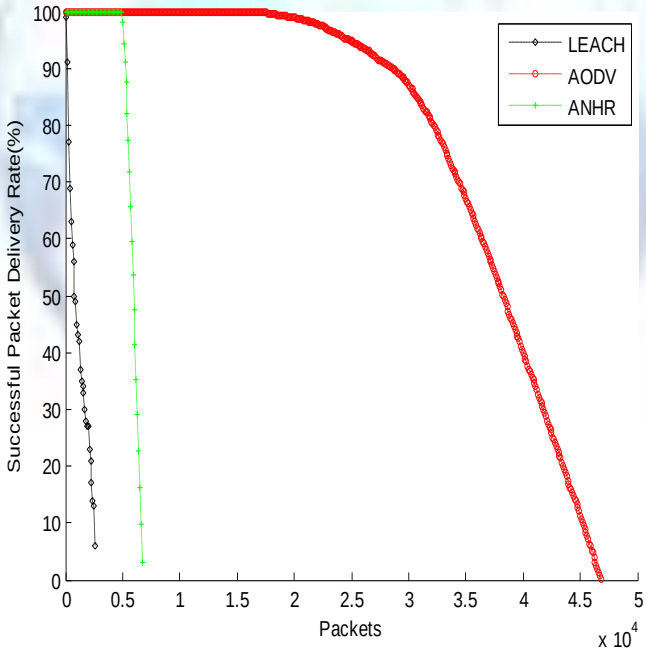

Figure 2. Successful packet delivery rate

Network load is shown in Fig. 3. It can be found with the increasing of the node density, the traffic has the trend to decline. Because in the circumstance that the number of nodes is certain, higher the node density is and the shorter its routing path is, closer forward traffic is to direct communication. The data services "try my best" of ANHR reduce some of the cost, also ANHR is smaller than other 3 protocols on the aspects of the storage required and calculation of routing information, therefore the network load of ANHR is relatively small.

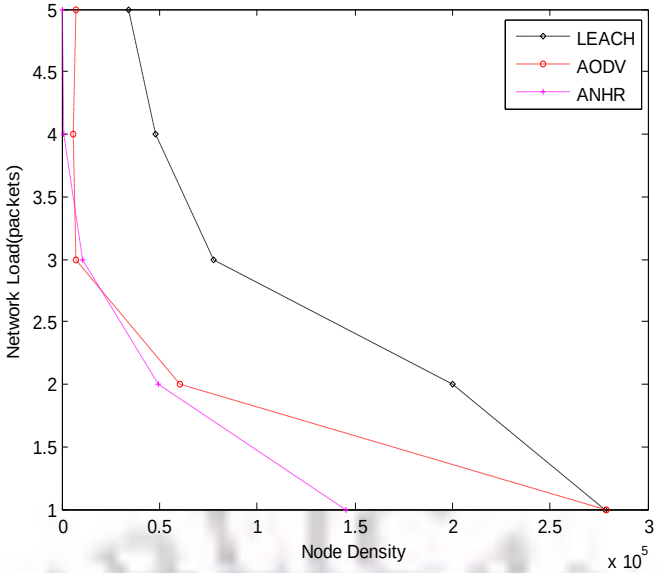

Figure 3. Network loads

The comparison of energy consumption of four protocols is shown in Fig. 4. The energy consumption of LEACH and AODV is highest. energy consumption of ANHR is minimum. This is because LEACH and AODV protocol should always track the location of the node, detect the changes of data and the load of routing calculations which need to consume a large amount of energy in the network that the mobility of nodes is uncertain. For ANHR simplified the generation algorithm for cluster head and the constraints of node state, it has a lower energy consumption and a very good scalability.

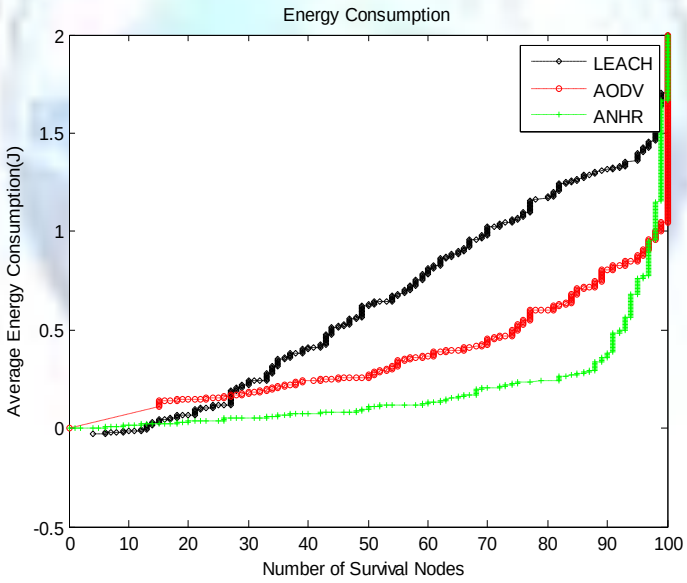

Figure 4. Energy consumption

Conclusion

Traditional generation algorithm for cluster head uses the residual energy and distance between the nodes as reference factor has been improved in this paper. The ways signal strength of sense node and "best effort" are used in the selection of cluster head and the query of network data so as to avoid some defects of first clustering and then routing. Simulation results show that the method in this paper is more efficient on the aspects of the production rate of cluster head and the success rate of data delivery, and it can effectively reduce the network load and network energy consumption.

References

[1]. Guangcong Liu, Hua Zhang, Fangjie Lei, Dongli Wei, Faculty of Computer Guangdong University of Technology Guangzhou, China "A New Hybrid Routing Protocol in WSNs". Proceedings of the 2011 IEEE International Conference on Cyber Technology in Automation, Control, and Intelligent Systems March 20-23, 2011, Kunming, China.
[2]. S. Hedetniemi and A. Liestman, "A Survey of Gossiping and Broadcasting in Communication Networks," IEEE Networks, pp. pp. 319-349, 1988.
[3]. J. Kulik, W. Heinzelman, and H. Balakrishnan, "Negotiation-Based Protocols for Disseminating Information in Wireless Sensor Networks," in Mobicom'99, vol. 8, 2002, pp. 169-185.
[4]. C. Intanagonwiwat, R. Govindan, D. Estrin, J. Heidemann, and F. Silva, "Directed Diffusion for Wireless Sensor Networking," IEEE/ACM Transactions on Networking, vol. Volume 11, Issue 1, pp. 2-16, February 2003.
[5]. Karthickraja NP, Sumathy V. A study of routing protocols and a hybrid routing protocol based on rapid spanning tree and cluster head routing in wireless sensor networks. International Conference on Wireless Communication and Sensor Computing, Chennai,2010.pp:1-6.
[6]. P. Kumar, M.P.Singh and U.S.Trair, "A review of routing protocols in wireless sensor network", IJERT, ISSN: 2278- 181, Vol.1 Issue, June-2012.
[7]. Karthickraja NP, Sumathy V. A study of routing protocols and a hybrid routing protocol based on rapid spanning tree and cluster head routing in wireless sensor networks. International Conference on Wireless Communication and Sensor Computing, Chennai, 2010.pp:1-6.
[8]. A. Manjeshwar and D. P. Agrawal, "APTEEN: A Hybrid Protocol for Efficient Routing and Comprehensive information Retrieval in Wireless Sensor Networks," Proc. Int"l. Parallel and Distrib. Proc. Symp., pp. 195–202.
[9]. Badr CHAHIDI, Abdallah EZZATI FST, Hassan 1st University, Settat, Morocco," Hybrid Routing Protocol For wireless sensor networks", IJCSI International Journal of Computer Science Issues, Vol. 9, Issue 2, No 1,ISSN (Online): 1694-0814, March 2012.