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An Efficient Deduction Of Data Loss Rate In Wireless Sensor Network

K. Aarthi Priyamvadha, R. Mohanasundaram
Department Of ECE-KSRCE, Tiruchengode

Abstract: *The emerging achievements in the field of wireless sensor networks in communication and information technology has largesse its presence in automation trait with its unique characteristics of reliability and flexibility. The peculiar feature of WSN spins the entire world in soft keys. The key challenge in WSN design is the efficient data transmission with minimum power consumption and prolonged network lifetime. The data transmission in existing active measurement mainly feigns on the collection of energy reports and reduction of network overhead which proceeds in the languishment of scalability and data loss. This has been overcome with the passive measurement of data monitoring that provides the efficiency of data transmission in distributed network environment. This further achieves the power conservation for the entire network. Thereby, it saves the time in transmitting and receiving the data and further allows the consistent data flow in the shortest path provided from source to destination.*

Keywords: *Data aggregation, multicast, WSN, power.*

I. INTRODUCTION

The data communication network has its physical connection in two different way as point to point and multipoint. While many sensors connect to controllers and processing stations directly to a centralized processing station. The emerging trends use multipoint for its data transmission to other networks. Since multipoint environment shares the capacity of the channel either spatially and temporally. With these enhancements, a sensor node is often not only responsible for data collection, but also for in-network analysis, correlation, and fusion of its own sensor data and data from other sensor nodes. When many sensors cooperatively monitor large physical environments, they form a wireless sensor network (WSN). Sensor nodes communicate not only with each other. The primary equipment sensor plays a major role in sensing, processing and transmitting the data from source to destination which also aids in forming the wireless sensor networks. However, the WSN gives the key challenge in various factors include reliable transmission, power management [12] data accuracy in the end to end performance.

The WSN also enhance the communication by finding the shortest distance between the sensor nodes. This can be achieved through algorithms available in the multicast routing protocol. When data being collected from multiple source, there exists the property of redundancy which results in the reduction of efficiency in WSN. Hence, to avoid this bogus message, the wireless communication network introduces the data aggregation.

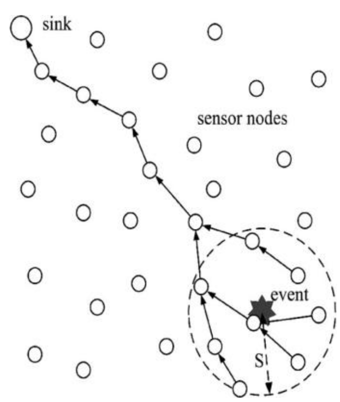


Fig.1 Data aggregation in reverse multicast tree

In the process of data aggregation, a subset of nodes in the network attempts to forward the sensing data they have collected back to the sink via a reverse multicast tree. When an intermediate node in the reverse multicast tree receives data from multiple source nodes, it checks the contents of incoming data, combines them by eliminating redundant information and then forwards the aggregated packet to its parent. The data can be transmitted in reverse multicast routing to the sink through constrained path and data aggregation aids in achieving the end to end performance. A tree structure is commonly used for data aggregation [13]. The inherent data transmission in the multicasting gives the delay.

II. RELATED WORKS

WSN elevates in providing reliable communication but finds it difficult to overcome the latency which is the major hindrance to achieve the accuracy in multicasting. The latency is mainly due to data aggregation[23] in the cluster head. The attacks against the data aggregation in results in faking the sensed data or duplicate the original message without any information in it. As the data aggregating took place with the fake or malicious code, the energy consumption and transmission load increases in wireless sensor network environment. Nodes in the network transmit measurements to parents subject to the interference constraints which is node exclusive. Parents fuse information and transmit it to their parents. Then the Sink computes the sum which it got from its leaf nodes. This allows significant savings but the interference increases the delay. The Aggregated event data needs to reach sink within a deadline, which is specified by each sensor node. It has arbitrary set of source nodes. The sink requires aggregated form of data. This has the main drawback of unreliable links which need to retransmit the data multiple times to achieve success.

III. SYSTEM MODEL

Consider a sensor nodes in which source node has a data packets to send .All these packets are send periodically. The nodes must travel in the shortest path so that it reduces the inherent time delay of the data transfer from source to destination it should also noted that the data should be in consistent flow.
Now consider a sample network where nodes 1,2,3,4, an7 are the sources.

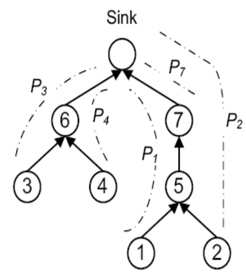


Fig 2.network includes multiple source and single destination

Also, p_1, p_2, p_3, p_4, and p_7 represents the path from source to destination. The path from different sources to destination not only involves in the correct delivery of data but also the accuracy and efficiency of data should show it improving the network performance to find shortest path and to save the power. This can be achieved only through the passive measurement of WSN. It passively monitors the traffic in the network and it includes the algorithms to infer the loss rates of packet. The data can be collected by a single node to avoid excess of data and it get incremented to reach the destination. The power should be calculated in order to find the capability of the node to receive and transmit the given data to the respective destination.

IV. PROBLEM FORMULATION

Consider a set of nodes (V) and set of links (L) in a tree (T) represented as , T=(V,L) in a multicast tree. In this, directed graph, the non-negative weight function w and source s terminates with d[U]=δ(U,V) for all vertices U϶ V. This tree also includes the sub-tree with its leaf nodes. Let α_k be the probability the sink receives data without any loss. So, the loss rate can be calculated accordingly as, $\bar{\alpha}_k = 1 - \alpha_k$ and β_k be the probability in which sink receives data at least from one node. Such that the loss rate can be deduced in WSN by finding the shortest path to reach the destination. This could be achieved in calculating the power consumption of each node and in the process of reducing it. The process can be done by calculating the total power consumption of node and by finding the shortest path to reach the destination.

V. PERFORMANCE EVALUATION

The performance can be evaluated using algorithms and is simulated using NS-2 simulator. In the simulations, the network consisting of random numbers of nodes are generated.

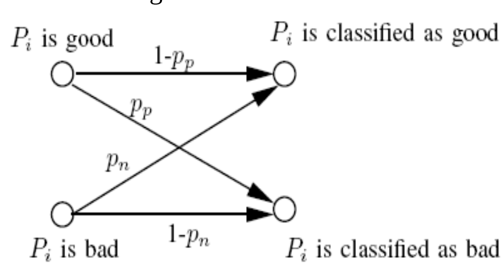


Fig.3 False negative and false positive path generated.

Accordingly, the length of the path can be calculated in which a path is called path positive if the path is good actually and the path is called false negative if it is bad and it is shown in Fig.3.An event is scheduled to drop a packet and in the quick retransmission of lost data to reach the destination provided in the shortest path from source to destination.
It is necessary to evaluate the power consumption of each node and steps must be taken to reduce the maximum power consumption of the node.

ESTIMATION OF SHORTEST PATH: The algorithm used states that heuristic function h is optimal in a closed set such that the length of edge between adjacent nodes x & y in the closed set S.

It must have its heuristic function as,

$$h(x)\leq d(x,y)+h(y)$$

Also, the initial node x to any path X is given by,

$$L(X)+h(x)\leq L(X)+d(x,y)+h(y)=L(Y)+h(y)$$

In whish Y can be defined as the extension path X to include y.

ESTIMATION OF POWER CONSUMPTION: The power consumption and minimization can be achieved in any networks.

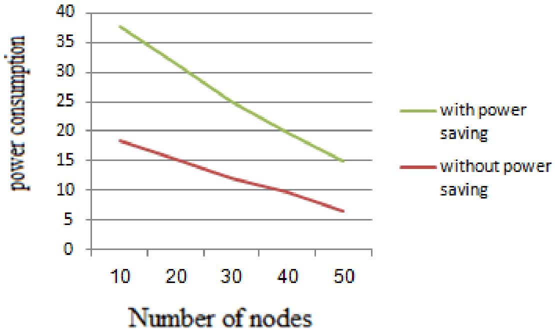


Fig.4 comparing the nodes with power saving and without power saving mechanisms

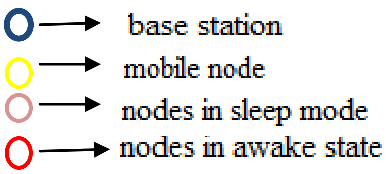
Consider T=(V,E') for G=(V, E, w). the positive edge function is represented as w and s in v such that power P(V) is assigned to every node v, which gives,

$$P(V)= \max u:(v,u) \in Ew(v,u).$$

The power minimization mechanism mainly deals in putting the system to sleep mode when it is not receiving the data. We have to consider feasible scheduling for minimum power consumption. The power consumption in any network can be minimized in network with different states include sleep, idle and awake which reduce the power to some extent.

VI. RESULTS AND DISCUSSION

Thus, the algorithm results in achieving the shortest path in multicast tree. The algorithm is first evaluated with that of existing algorithms[13]-[16] where we could achieve in finding the shortest path with small number of nodes and the simulation result with less execution represented in the fig.5.



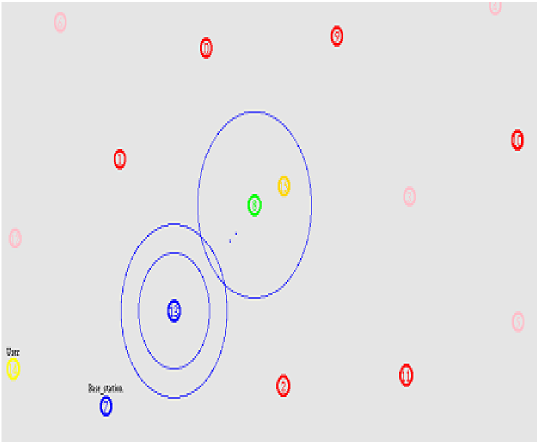


Fig.5. The simulation result shows the data transmission from source to destination in the intermediate nodes in sleep and awake mode.

In this section we compare our proposed algorithm with the event of monitoring the energy consumped per nodes.The link loss rate are selected randomly. The results are averaged over several simulation runs. We notice that the number of links which takes part in data communication in each simulation run depends on the topology of the network and the routing tree. The results shows an improved efficiency in consuming less energy while transmitting the data from the source node to the sink. This also gives the qualified link to transmit the data in the reverse multicast routing. The bad links are identified which results if it does not have the sufficient energy to forward the packet and hence it takes another shortest path to reach the destination. The reasons for path loss includes various factors.

VII. SIMULATION REPORT

M 0.00000 15 (62.00, 145.32, 0.00), (4.95, 196.42), 1300.00
M 0.00000 15 (62.00, 145.32, 0.00), (83.68, 476.63), 1300.00
s -t 0.002983000 -Hs 8 -Hd -2 -Ni 8 -Nx 282.27 -Ny 260.38 -Nz 0.00 -Ne -1.000000 -Nl AGT -Nw --- -Ma 0 -Md 0 -Ms 0 -Mt 0 -Is 8.42 -Id 13.42 -It message -Il 84 -If 0 -Ii 0 -Iv 32
r -t 0.002983000 -Hs 8 -Hd -2 -Ni 8 -Nx 282.27 -Ny 260.38 -Nz 0.00 -Ne -1.000000 -Nl RTR -Nw --- -Ma 0 -Md 0 -Ms 0 -Mt 0 -Is 8.42 -Id 13.42 -It message -Il 84 -If 0 -Ii 0 -Iv 32
s -t 0.002983000 -Hs 8 -Hd -2 -Ni 8 -Nx 282.27 -Ny 260.38 -Nz 0.00 -Ne -1.000000 -Nl RTR -Nw --- -Ma 0 -Md 0 -Ms 0 -Mt 0 -Is 8.255 -Id -1.255 -It AODV -Il 48 -If 0 -Ii 0 -Iv 30 -P aodv -Pt 0x2 -Ph 1 -Pb 1 -Pd 13 -Pds 0 -Ps 8 -Pss 4 -Pc REQUEST
s -t 0.003518000 -Hs 8 -Hd -2 -Ni 8 -Nx 282.27 -Ny 260.38 -Nz 0.00 -Ne -1.000000 -Nl MAC -Nw --- -Ma 0 -Md fffffff -Ms 8 -Mt 800 -Is 8.255 -Id -1.255 -It AODV -Il 100 -If 0 -Ii 0 -Iv 30 -P aodv -Pt 0x2 -Ph 1 -Pb 1 -Pd 13 -Pds 0 -Ps 8 -Pss 4 -Pc REQUEST
r -t 0.004318640 -Hs 13 -Hd -2 -Ni 13 -Nx 132.57 -Ny 140.15 -Nz 0.00 -Ne -1.000000 -Nl MAC -Nw --- -Ma 0 -Md fffffff -Ms 8 -Mt 800 -Is 8.255 -Id -1.255 -It AODV -Il 48 -If 0 -Ii 0 -Iv 30 -P aodv -Pt 0x2 -Ph 1 -Pb 1 -Pd 13 -Pds 0 -Ps 8 -Pss 4 -Pc REQUEST
r -t 0.004318666 -Hs 0 -Hd -2 -Ni 0 -Nx 191.67 -Ny 438.49 -Nz 0.00 -Ne -1.000000 -Nl MAC -Nw --- -Ma 0 -Md fffffff -Ms 8 -Mt 800 -Is 8.255 -Id -1.255 -It AODV -Il 48 -If 0 -Ii 0 -Iv 30 -P aodv -Pt 0x2 -Ph 1 -Pb 1 -Pd 13 -Pds 0 -Ps 8 -Pss 4 -Pc REQUEST
r -t 0.004318707 -Hs 2 -Hd -2 -Ni 2 -Nx 335.70 -Ny 55.04 -Nz 0.00 -Ne -1.000000 -Nl MAC -Nw --- -Ma 0 -Md fffffff -Ms 8 -Mt 800 -Is 8.255 -Id -1.255 -It AODV -Il 48 -If 0 -Ii 0 -Iv 30 -P aodv -Pt 0x2 -Ph 1 -Pb 1 -Pd 13 -Pds 0 -Ps 8 -Pss 4 -Pc REQUEST
r -t 0.004318816 -Hs 9 -Hd -2 -Ni 9 -Nx 434.75 -Ny 451.83 -Nz 0.00 -Ne -1.000000 -Nl MAC -Nw --- -Ma 0 -Md fffffff -Ms 8 -Mt 800 -Is 8.255 -Id -1.255 -It AODV -Il 48 -If 0 -Ii 0 -Iv 30 -P aodv -Pt 0x2 -Ph 1 -Pb 1 -Pd 13 -Pds 0 -Ps 8 -Pss 4 -Pc REQUEST
r -t 0.004318821 -Hs 15 -Hd -2 -Ni 15 -Nx 62.37 -Ny 150.92 -Nz 0.00 -Ne -1.000000 -Nl MAC -Nw --- -Ma 0 -Md fffffff -Ms 8 -Mt 800 -Is 8.255 -Id -1.255 -It AODV -Il 48 -If 0 -Ii 0 -Iv 30 -P aodv -Pt 0x2 -Ph 1 -Pb 1 -Pd 13 -Pds 0 -Ps 8 -Pss 4 -Pc REQUEST
r -t 0.004343640 -Hs 13 -Hd -2 -Ni 13 -Nx 132.57 -Ny 140.15 -Nz 0.00 -Ne -1.000000 -Nl RTR -Nw --- -Ma 0 -Md fffffff -Ms 8 -Mt 800 -Is 8.255 -Id -1.255 -It AODV -Il 48 -If 0 -Ii 0 -Iv 30 -P aodv -Pt 0x2 -Ph 1 -Pb 1 -Pd 13 -Pds 0 -Ps 8 -Pss 4 -Pc REQUEST
s -t 0.004343640 -Hs 13 -Hd 8 -Ni 13 -Nx 132.57 -Ny 140.15 -Nz 0.00 -Ne -1.000000 -Nl RTR -Nw --- -Ma 0 -Md 0 -Ms 0 -Mt 0 -Is 13.255 -Id 8.255 -It AODV -Il 44 -If 0 -Ii 0 -Iv 30 -P aodv -Pt 0x4 -Ph 1 -Pd 13 -Pds 4 -Pl 10.000000 -Pc REPLY

r -t 0.004343666 -Hs 0 -Hd -2 -Ni 0 -Nx 191.67 -Ny 438.49 -Nz 0.00 -Ne -1.000000 -Nl RTR -Nw --- -Ma 0 -Md ffffffff -Ms 8 -Mt 800 -Is 8.255 -Id -1.255 -It AODV -Il 48 -If 0 -Ii 0 -Iv 30 -P aodv -Pt 0x2 -Ph 1 -Pb 1 -Pd 13 -Pds 0 -Ps 8 -Pss 4 -Pc REQUEST
r -t 0.004343707 -Hs 2 -Hd -2 -Ni 2 -Nx 335.70 -Ny 55.04 -Nz 0.00 -Ne -1.000000 -Nl RTR -Nw --- -Ma 0 -Md ffffffff -Ms 8 -Mt 800 -Is 8.255 -Id -1.255 -It AODV -Il 48 -If 0 -Ii 0 -Iv 30 -P aodv -Pt 0x2 -Ph 1 -Pb 1 -Pd 13 -Pds 0 -Ps 8 -Pss 4 -Pc REQUEST
r -t 0.004343816 -Hs 9 -Hd -2 -Ni 9 -Nx 434.75 -Ny 451.83 -Nz 0.00 -Ne -1.000000 -Nl RTR -Nw --- -Ma 0 -Md ffffffff -Ms 8 -Mt 800 -Is 8.255 -Id -1.255 -It AODV -Il 48 -If 0 -Ii 0 -Iv 30 -P aodv -Pt 0x2 -Ph 1 -Pb 1 -Pd 13 -Pds 0 -Ps 8 -Pss 4 -Pc REQUEST

VIII. CONCLUSION

In this paper, we studied the loss inference problem in wireless sensor networks while the nodes perform data aggregation. This also aids in providing a shortest path and also the correct path to reach the destination. We characterize the condition to achieve this consistent flow of data in the multicast routing and thus achieving the efficient path. By calculating the power consumed per node we can know power consumed for the entire network which proves the reduction in power and energy consumed per node and in the entire network. This gives the reduction in another factor,time. Further, the simulation results showed that our proposed algorithm is accurate in achieving the above mentioned factors.

REFERENCES

[1] Yu yang and Yongjun Xu, “A loss inference algorithm for wireless sensor networks to improve data reliability of digital ecosystems”, IEEE transactions on industrial electronics, vol.58, no.6,june 2011.
[2] M. Ulieru, “e-networks in an increasingly volatile world: Design for resilience of networked critical infrastructures,” in Proc. Inaugural IEEE Int. Conf. Digital Ecosyst. Technol., Feb. 21–23, 2007, pp. 540–545.
[3] M. Sohail and M. Ulieru, “Opportunistic communication for eNetworks cyberengineering,”in Proc. 33rd Annu. Conf. IEEE Ind. Electron. Soc.,Nov. 5–8, 2007, pp. 950–955.
[4] I. F. Akyildiz, T. Melodia, and K. Chowdhury, “A survey on wireless multimedia sensor networks,” Comput. Netw., vol. 51, no. 4, pp. 921–960, Mar. 2007.
[5] J. A. Stankovic, I. Lee, A. Mok, and R. Rajkumar, “Opportunities and obligations for physical computing systems,” Computer, vol. 38, no. 11, pp. 23–31, Nov. 2005.
[6] J. A. Stankovic, “When sensor and actuator networks cover the world,” ETRI J., vol. 30, no. 5, pp. 627–633, Oct. 2008.
[7] V. C. Gungor, B. Lu, and G. P. Hancke, “Opportunities and challenges of wireless sensor networks in smart grid,” IEEE Trans. Ind. Electron, vol. 57, no. 10, pp. 3557–3564, Oct. 2010.
[8] S. Yoo, P. K. Chong, D. Kim, Y. Doh, M. L. Pham, E. Choi, and J. Huh, “Guaranteeing real-time services for industrial wireless sensor networks with IEEE 802.15.4,” IEEE Trans. Ind. Electron., vol. 57, no. 11, pp. 3868–3876, Nov. 2010.
[9] B. Lu and V. C. Gungor, “Online and remote motor energy monitoring and fault diagnostics using wireless sensor networks,” IEEE Trans. Ind. Electron., vol. 56, no. 11, pp. 4651–4659, Nov. 2009.
[10] R. Caceres, N. G. Duffield, J. Horowitz, and D. Towsley, “Multicast based inference of network internal loss characteristics,” IEEE Trans. Inf.Theory, vol. 45, no. 7, pp. 2462–2480, Nov. 1999.
[11] N. G. Duffield, J. Horowitz, F. L. Presti, and D. Towsley, “Multicast topology inference from measured end-to-end loss,” IEEE Trans. Inf. Theory, vol. 48, no. 1, pp. 26–45, Jan. 2002.
[12] V. C. Gungor, “A forecasting-based monitoring and tomography frameworkfor wireless sensor networks,” in Proc. IEEE Int. Conf. Commun.,
[13] X. Meng, T. Nandagopalz, L. Li, and S. Lu, “Contour maps: Monitoring and diagnosis in sensor networks,” Comput. Netw., vol. 50, no. 15,pp. 2820–2838, Oct. 2006.
[14] Y. Li and M. Li, “Iso-Map: Energy-efficient contour mapping in wireless sensor networks,” in Proc. Int. Conf. Distrib. Comput. Syst., Jun. 25–27, 2007, pp. 36–43.
[15] G. Hartl and B. Li, “Loss inference in wireless sensor networks based on data aggregation,” in Proc. Int. Symp. Inf. Process. Sensor Netw., Apr. 26/27, 2004, pp. 396–404.
[16] Y. Mao, F. R. Kschischang, B. Li, and S. Pasupathy, “A factor graph approach to link loss monitoring in wireless sensor networks,” IEEE J. Sel. Areas Commun., vol. 23, no. 4, pp. 820–829,Apr 2005.