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Reducing End-to-End Delay and Balancing the Energy Consumption in Wireless Sensor Networks

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ABSTRACT:

This investigates the problem of energy consumption in wireless sensor networks. Wireless sensor nodes deployed in harsh environment where the conditions change drastically suffer from sudden changes in link quality and node status. The end-to-end delay of each sensor node varies due to the variation of link quality and node status. On the other hand, the sensor nodes are supplied with limited energy and it is a great concern to extend the network lifetime. To cope with those problems, this paper proposes a novel and simple routing metric, predicted remaining deliveries (PRD), combining parameters, including the residual energy, link quality, end-to-end delay, and distance together to achieve better network performance. PRD assigns weights to individual links as well as end-to-end delay, so as to reflect the node status in the long run of the network.

KEYWORDS: Routing metric, WSNs, Sensor node

1] INTRODUCTION:

Wireless sensor networks have attracted great attention due to their various potential applications in the area of forest fire detection, transportation and industrial automation, etc. [1]. Generally, sensor nodes are deployed in a specific region and cannot move after deployed. The main task of the sensor nodes is to periodically sense the environment and transmit the information to the data center known as the sink. Sensor nodes are usually battery-powered, and it is difficult to replace or recharge the battery. Due to the limited energy, sensor nodes drain their energy quickly, leading to the sensing are a uncovered. Therefore, energy observation becomes a critical concern in WSNs. In recent years, many energy-efficient techniques for wireless sensor networks have been developed to extend the network lifetime, including duty cycle scheduling [2], medium access control techniques [3]and compressive sensing [4].

2] LITERATURE SURVEY:

[1] X. Mao Opportunistic routing, has been shown to improve the network throughput, by allowing nodes that overhear the transmission and closer to the destination to participate in forwarding packets, i.e., in forwarder list. The nodes in forwarder list are prioritized and the lower priority forwarder will discard the packet if the packet has been forwarded by a higher priority forwarder. One challenging problem is to select and prioritize forwarder list such that a certain network performance is optimized. In this paper, we focus on selecting and prioritizing forwarder list to minimize energy consumption by all nodes. We study both cases where the transmission power of each node is fixed or dynamically adjustable. We present an energy-efficient opportunistic routing strategy, denoted as EEOR.

[2]D. Wei This paper proposes a distributed clustering algorithm, Energy-efficient Clustering (EC), that determines suitable cluster sizes depending on the hop distance to the data sink, while achieving approximate equalization of node lifetimes and reduced energy consumption levels. We additionally propose a simple energy-efficient multihop data collection protocol to evaluate the effectiveness of EC and calculate the end-to-end energy consumption of this protocol; yet EC is suitable for any data collection protocol that focuses on energy conservation.

3] PROBLEM DEFINTION:

Zuo et al. [22] exploited the benefit of cross-layer information exchange and applied the normalized energy consumption (NEC) needed to relay a packet from the source to the destination as the routing metric, whereas the calculation of NEC is complicated and may become a challenge for the limited computational ability of WSNs. DFD [23] is a weighted function based on multiple context

information such as link quality, progress, residual energy and link validation duration.

The authors used DFD to set a local timer for each relaying candidate and the candidate that generates the shortest DFD becomes the relay. However, using a timer is critical for the time synchronization. PTX [17] metric takes the residual energy into account, whereas it still cannot cope with the long delay problem for WSNs deployed in harsh environments.

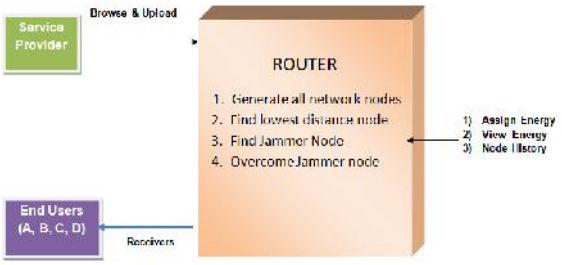
4] PROPOSED APPROACH:

The proposed system implemented to achieve energy conservation while balancing the energy consumption among sensor nodes, so as to extend the lifetime of the network. In the literature, several definitions about the lifetime of the WSN has been proposed, including the time until the first sensor node dies, the time until half of the sensor nodes die and the time until the last sensor node dies.

As the communication range of the sensor nodes is limited and much smaller compared with the sensing area, the WSN is disconnected if all the key nodes in the vicinity of the sink drain their energy. Therefore this paper defines the lifetime of the network as the time until all the key sensor nodes in the vicinity of the sink die.

Energy Balance Factor (EBF): The energy balance factor is defined as the standard deviation of the residual energy of the sensor nodes. The EBF is calculated as shown in the proposed system. EBF is used to quantify the amount of the variation of the residual energy of the sensor nodes. A low EBF indicates that the residual energy of the sensor nodes tends to be close to the average residual energy, whereas a high EBF indicates that the residual energy of the sensor nodes are spread out over a wide range.

5] SYSTEM ARCHITECTURE:



6] PROPOSED METHODOLOGY:

Service provider:

The service provider will browse the data file path and then send to the particular receivers. Service provider will send their data file to wireless router and router will connect to networks, in a network smallest distance sensor node will be activated and send to particular receiver (A, B, C…). And if any jammer node will found, then service provider will reassign the energy for sensor node.

Wireless Router

The Wireless Router manages a multiple networks (network1, network2, network3, and network4) to provide data storage service. In network n-number of nodes (n1, n2, n3, n4…) are present, in networks every node consists of distance and energy. In a network shortest distance sensor node will communicate first. The service provider can assign energy for sensor node, view energy for all networks and node history details (view routing path, view boundary nodes, view jamming nodes & view total time delay) in router. Router will accept the file from the service provider and then it will connect to different networks; the all networks are communicates and then send to particular receiver. In a router we can view time delay, jammed nodes and also routing path.

Network

In this module the networks (network 1, network 2, network 3 and network 4) consists of n-number nodes. In networks every node consists of distance and energy. In a network shortest distance sensor node will communicate first. The node consists of lesser energy then that node will be jammed by the jammers. And then it will forward to next lesser distance node within the network. In a network last node will be considered as boundary node.

Receiver (End User)

The receiver can receive the data file from the service provider via wireless router. The receivers receive the file by without changing the File Contents. Users may receive particular data files within the network only.

Jammer

In this system, the lesser energy sensor node will be considered as a jammer node. Once the jammer became active, affected nodes lost their neighbors partially or completely, lost all of their neighbors and became jammed nodes.

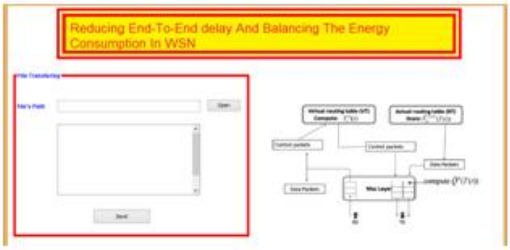
7]ALGORITHM:

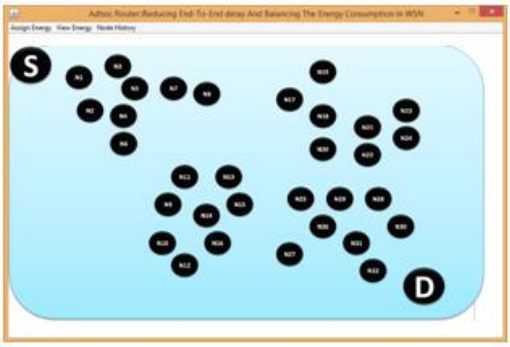
Step1: In the neighbour discovery phase, each sensor node advertises a HELLO message containing its node ID to other nodes.

Step2: Receiving Hello messages from neighbour nodes, each sensor node stores the information of its neighbours and builds a neighbour list.

Step3: Calculate the ETX between each pair of sensor nodes.
Step4: In the metric calculation phase, each sensor node sends out a message to its neighbour nodes. The message contains the node ID, the residual energy level, the delay and the ETX value.
Step5: Each sensor node calculates the routing metric for each neighbour and stores the metric in the neighbour table.
Step6: Each sensor node calculates the route score for its neighbour nodes that act as next-hop candidates and determine the best score.
Step7: each sensor node advertises the best route score for the score update.
Step8: the best route score is then chosen as the parent node to forward sensed data

8]RESULTS:





Enhancement]:
Energy-efficient routing mechanism based on the cluster-based method for the mobile sink in WSNs with obstacles. According to the cluster-based method, the nodes selected as cluster heads collect data from their cluster members and transfer the data collected to the mobile sink. In this paper, the mobile sink starts the data-gathering route periodically from the starting site, then directly collects data from these cluster heads in a single-hop range, and finally returns to the starting site

9] CONCLUSION:

This paper proposes a novel link-delay aware energy efficient routing metric called PRD for the routing path selection tailored for WSNs deployed in harsh environments, where the networks are exposed to extremely long end-to-end delay and unbalanced energy consumption among sensor nodes. PRD captures the predicted remaining deliveries within one unit of delay, which reflects the ability of each sensor node to forward packets. PRD also takes the end-to-end delay into consideration. The main purposes of PRD are to balance the energy consumption of the sensor nodes and extend the network lifetime, as well as controlling the end-to-end delay.

10] REFERENCES:

[1] A. A. Kumar S., K. Øvsthus, and L. M. Kristensen, “An industrial perspective on wireless sensor networks—A survey of requirements, protocols, and challenges,” IEEE Common. Surveys Tuts. vol. 16, no. 3,pp. 1391–1412, 3rd Quart., 2014.

[2] R. C. Carrano, D. Passes, L. C. S. Magalhaes, and C. V. N. Albuquerque,

“Survey and taxonomy of duty cycling mechanisms in wireless sensor networks,” IEEE Common. Surveys Tuts. vol. 16, no. 1, pp. 181–194, 1st Quart, 2013.

[3] P. Huang, L. Xiao, S. Soltani, M.W. Mutka, and N. Xi, “The evolution of MAC protocols in wireless sensor networks: A survey,” IEEE Common. Surveys Tuts. vol. 15, no. 1, pp. 101–120, 1st Quart., 2013.

[4] S. Qaisar, R. M. Bilal, W. Iqbal, M. Maureen, and S. Lee, “Compressive

sensing: From theory to applications, A survey,” J. Common. Netw., vol. 15, no. 5, pp. 443–456, 2013.

[5] J. Yan, M. Zhou, and Z. Ding, “Recent advances in energy-efficient routing protocols for wireless sensor networks: A review,” IEEE Access, vol. 4, pp. 5673–5686, 2016.

[6] N. A. Pantazis, S. A. Nikolidakis, and D. D. Vergados, “Energy-efficient routing protocols in wireless sensor networks: A survey,” IEEE Commun. Surveys Tuts., vol. 15, no. 2, pp. 551–591, 2nd Quart., 2013.

[7] O. Gnawali, R. Fonseca, K. Jamieson, D. Moss, and P. Levis, “Collection tree protocol,” in Proc. 7th ACM Conf. Embedded Netw. Sensor Syst.,2009, pp. 1–14.

[8] D. S. De Couto, D. Aguayo, J. Bicket, and R. Morris, “A high-through put path metric for multi-hop wireless routing,” Wireless Netw., vol. 11,no. 4, pp. 419–434, 2005.

[9] R.Draves, J. Padhye, and B. Zill, “Routing in multi-radio, multi-hop

wireless mesh networks,” in Proc. ACM 10th Ann. Int. Conf. Mobile Compute. Newt., 2004, pp. 114–128.

[10] G. Mao, B. Fidan, and B. D. O. Anderson, “Wireless sensor network localization techniques,” Compute. Netw., vol. 51, no. 10, pp. 2529–2553,2007.

[11] S. Lin, J. Zhang, G. Zhou, L. Gu, J. A. Stankovic, and T. He, “ATPC: Adaptive transmission power control for wireless sensor networks,” in Proc. ACM 4th Int. Conf. Embedded Netw. Sens. Syst., 2006, pp. 223–236.

[12] W. B. Heinzelman, A. P. Chandrakasan, and H. Balakrishnan, “An application-specific protocol architecture for wireless microsensor networks,” IEEE Trans. Wireless Commun., vol. 1, no. 4, pp. 660–670, Oct. 2002.

[13] Y. Yang and J. Wang, “Design guidelines for routing metrics in multi hop wireless networks,” in Proc. IEEE INFOCOM, Apr. 2008, pp. 1615–1623.

[14] J. Luo and J.-P.Hubaux, “Joint mobility and routing for lifetime elongation in wireless sensor networks,” in Proc. IEEE INFOCOM, vol. 3. Mar. 2005, pp. 1735–1746.

[15] J. B. Andersen, T. S. Rappaport, and S. Yoshida, “Propagation measurements and models for wireless communications channels,” IEEE Commun. Mag., vol. 33, no. 1, pp. 42–49, Jan. 1995.

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