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An Energy Efficient Sleep Scheduling Based On Moving Directions in Target Tracking Sensor Network

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Abstract- In wireless sensor networks during critical event monitoring only a small number of packets have to be transmitted. The alarm packet should be broadcast to the entire network as earlier, if any critical event is detected. Therefore, broadcasting delay is an significant problem for the request of the unsafe event monitoring. To extend the network lifetime some of the sleep scheduling methods are forever employed in WSNs it results in a important broadcasting delay. A novel sleep scheduling technique to be planned it is based on the level-by-level offset schedule to attain a low distribution delay in wireless sensor networks (WSNs). There are two phases to set the alarm broadcasting primary one is, if a node detects a critical event, it make an alarm message and quickly transmits it to a center node the length of a pre-determined path with a node-by-node offset way. Then the center node broadcasts the alarm message to the other nodes along another prearranged path without collision. An on demand distance vector routing protocol is recognized in one of the traffic direction for alarm transmission. The proposed system is used in military and forest fire application.

Keywords—Wireless Sensor Network (WSN), critical event monitoring, sleep scheduling, broadcasting delay.

I. INTRODUCTION

A wireless sensor network contains of spatially isolated autonomous sensors to check physical or environmental condition like as attacker etc., and to helpfully pass the data from side to side the network to precise location. The modern networks are bi-directional and it also enabling control for sensor activity. Monitoring is a ordinary application for WSNs. The WSN is deployed over a area where some phenomenon is to be monitored. This can be practical in the field of armed where they use sensors to sense intruders. When the sensors detect the event being monitored, the event is reported to one of the stand station then it takes appropriate action.

As sensor nodes for result monitoring are predictable to work for a extended occasion without recharging the batteries, sleep preparation technique is forever used throughout the monitoring process. Recently, many sleep schedules for event monitoring have been designed. However, most of the techniques focus on minimizing the energy use. In the critical event monitoring, only a little number of packets need to be transmitted. If any event is detected the alarm packet should be transmit to the entire network. Therefore, broadcasting holdup is an significant problem for the request of the critical event monitoring. Here, illegal user enter into the network misbehavior nodes in system that node is a critical node these event are detected by the any sensor node in WSN.

In view of wake-up patterns, most sleep scheduling schemes can be categorized into two kinds:

(1) Synchronous wake-up pattern.
(2) Asynchronous wake-up pattern.

Sleep scheduling is a usual way for power management to save energy. Lots of works have studied it in WSNs, which can be classified into two main categories: 1) determined transmission pattern; 2) dynamic transmission pattern. In the first category, nodes periodically wake up and transmit at the determined time in each duty cycle, and time synchronization is always assumed. While, in the second category, nodes wake up and transmit at variation time in each duty cycle according to current traffic and time synchronization may not be needed. Among these works, most of them try to keep nodes sleeping as long as possible, while seldom study when nodes need to wake up to reduce the transmission delays. In other word, power saving is the main concern instead of transmission delay.

To reduce the broadcasting delay, it is wanted to decrease the waiting time throughout the broadcasting. The most excellent situation is the purpose nodes wake up right away when the source nodes get the distribution packets. Based on this idea, a level-by-level equalize list is proposed. Hence, it is potential to achieve low transmission delay with node-by-node offset plan in multi-hop WSNs. It is still a brave for us to be relevant the level-by-level offset to alarm distribution in the critical event monitoring. First the arrange of nodes wake-up must established by using the traffic direction. If the traffic run is in the conflicting way the holdup in each hop will be as large as the distance end to end of the entire duty cycle. Second the level-by-level make up for working by the packet distribution could cause a serious collision.

Through scheming a particular wake-up pattern the two likely traffic paths could be carried by a node. To get rid of the collision in broadcasting, a colored linked dominant set (CCDS) in the WSN via the IMC algorithm is established.

II. RELATED WORK

A centralized gateway node collects all transmission requirements during a contention period and then schedules the distributions according to the reservation path. An energy-adaptive MAC protocol, Gateway MAC (G-MAC) implements a new cluster-centric paradigm to effectively distribute cluster energy resources and extend network lifetime. Concentrating the transmissions into a less important lively phase reduces idle listening, but it also increases the likelihood of collisions. Receiving and removal mail future for other nodes, or message overhearing, is usually employed in non-energy forced networks to augment throughput and elevated delay [5].

Continuous monitoring applications are an significant class of wireless sensor function. These application need periodic re-energized data in order at the sink nodes. The need of the sensor node was to broadcast continuously in episodic fashion to the sink nodes it leads to extreme energy consumption. [9]

DMAC protocol specially mean for the wireless sensor network, where the message pattern is limited to an recognized unidirectional data meeting tree. Here, all nodes having a episodic receive–transmit sleep cycle by means of level-by-level offset schedule ,which income that all nodes wake up what time the basis node have just gotten a data packets, and go to the sleep as soon as they transmit packets to the purpose nodes. The level-by-level offset list in DMAC can attain much lower show delay in one transfer direction. it is not well-organized in bidirectional delay guarantee [2].

In this query based sensor scheme a node cannot unpaid send data packets that they sensed to the sink node, unless the go under node sends them queries, these queries are very compound. Hence the sink node needs to forecast the data arrival time for every purpose nodes. Collecting in order from the surroundings by maintenance all the nodes active and transmitting to the sink is power expensive. Therefore, the system is not appropriate to alarm broadcasting in the WSN for dangerous event detection [4].

A novel asynchronous wake-up list is proposed to decrease the end-to-end latency with power competent data transmission. Each node has assigned a specific color. The wake-up list of a node is fixed according to the color assigned to that particular node. As neighbors of each nodule are partitioned into several color groups, the standard broadcast delay within every hop can be condensed to a part of the duty cycle. However, the sum delay still increases proportionally with the amount of hops by a grade of duty cycle length. Furthermore, the presentation of the timetable relies on high redundancy of nodes [6].

The authors obtainable more than a few sleep scheduling patterns that adhere to the bidirectional end-to-end delay constraints, such as shifted even and odd pattern, ladder pattern, two ladder pattern and crossed-ladders pattern. However, the patterns are not suitable to alarm broadcasting in the WSN, because the traffic discussed, is just a single flow. If the sink node broadcasts packets according to the patterns, there will be serious collision in the network. However, the patterns are not suitable to alarm broadcasting in the WSN, because the traffic discussed in is just a single flow. If the sink node broadcasts packets according to the packets, there will be serious collision [3].

The delay well-organized broadcasting in WSN, It is based on the synchronous wake .It choose part duration in each job cycle for sensor nodes to keep data transmission. Although crash can be avoided throughout data transmission, sensor nodes still need to compete in the short separate duration. The short length of period limits the number of hops of data transmission in every duty cycle. The demand wakeup procedure is not well-organized for dangerous event monitoring in WSN, because the nodes are awaken on demand it augment the release latency [7].

ADB is based on asynchronous wake-up. It exploits a number of information restricted in data packets and ACK, so to position the transmission in the middle of nodes. When sensor nodes take previous knowledge of all the connection quality, packet distribution in ADB actually follows a strong-minded distribution tree in the network. Furthermore, as sensor nodes with ADB wake up asynchronously, collision can approximately be avoided. In this technique, to evaluate the proposed scheduling system with ADB [8] and DW-MAC.

III. METHODOLOGY

PROPOSED SYSTEM

Overview of the proposed system

Techniques used

i) Breadth First Search Algorithm

The Breadth First Search (BFS) tree is found in uplink transfer to find the straight path from sensor node to the middle node. In graph theory, breadth-first search (BFS) is a graph search algorithm that begins at the origin node and explores it to all the adjacent nodes. Then for each of persons nearest node explores their unfamiliar neighbor nodes and so on awaiting it finds the goal.

The Breadth First Search (BFS) tree is set up in uplink transfer to find the straight path from sensor node to the middle node. Choose sensor nodes as the middle node c.

ii) Colored Connected Dominant Set

A Colored Connected Dominant Set (CCDS) is recognized in downlink traffic for decrease the broadcasting delay. The center node broadcasts the alarm small package to the whole network according to level-by-level equalize schedule; these transfer paths are called as downlink traffic path. Connected dominating set are helpful in the calculation of routing for mobile ad-hoc networks. In this request a small set of linked control is used as a back for communications.
To establish the CCDS in G with three steps:
1) Construct a maximum independent set (MIS) in G.
2) Select connector nodes to form a Connected Dominated Set (CDS), and partition connector nodes and independent nodes in each layer into four disjoint sets with IMC (Iterative Minimal Covering) algorithm proposed. .
3) Color the CDS to be CCDS with no more than 12 channels.

iii) IMC Algorithm

To eliminate the collision in broadcasting, a Colored Connected Dominant Set (CCDS) in the WSN via the IMC algorithm is established. The idea of the IMC algorithm to select the connector nodes, which partitions independent nodes $I \cap H_i$ in each layer into four disjoint subsets $U_{i,j}$ ($0 \le j \le 3$), and selects four disjoint subsets $W_{i-1,j}$ ($0 \le j \le 3$) among $(H_{i-1} \cup H_{i-2}) \cap I$ as connector nodes to cover $I \cap H_i$. When nodes in $W_{i-1,j}$ broadcast simultaneously, they will not cause any collision among nodes in $U_{i,j}$. By this way, the CDS is established. The vertex cover problem in which a solution is a vertex cover of a graph, and the target is to find a solution with a minimal number of nodes.

iv) On Demand Distance Vector Routing Protocol

This protocol is mainly used to route the packet and maintain a routes. Routes are selected dynamically when source node need send alarm packet to all other nodes and a node will be wakeup through this path. If any nodes or link failure during data transmission in downlink path an on demand distance vector routing protocol is established to select a path dynamically and it will transmit the data to all nodes in network.

A distance-vector routing protocol requires that a router informs its neighbors of topology changes periodically.

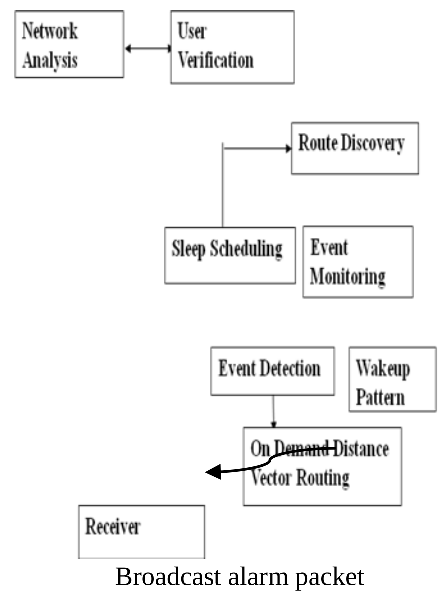

Figure1.Architecture diagram of the proposed system

BACKGROUND PROCESS

To validate the proposed scheduling scheme in real wireless communication environment, we implement it on 64 Micaz nodes.

Deploy sensor nodes

To deploy 64 Micaz sensor nodes on a grid with the grid size $0.8m$. A prior test about the communication range of Micaz nodes has been made. The test results show that the transmission range of Micaz nodes is dynamic and heterogeneous, and transmission between two Micaz nodes will strictly fail at the distance $1.3m$ in any direction when putting them on the ground and setting the transmission power of nodes to be $30\mu W$. It can be seen that each Micaz node in the experiments has no more than 8 neighbors.

Keep time synchronous

After broadcasting the assignment, the center node begins to send beacon in its sending time slot and sleeps according to its sleep scheduling. Each neighbor receiving the beacon actually gets a reference of time, and it relays the beacon in its sending time slot assigned. In this way, all nodes will begin to work in a duty cycle way. Every 10 minutes, the center node transmits a beacon in its sending time slot, and its neighbors receiving the beacon will adjust their timers according to the beacon if there is an error of synchronization due to clock drift in this way, local time synchronization in the network is maintained.

Record the broadcasting delay

To obtain the result of broadcasting delay in the network, a mobile Micaz node carried by a person is used for results collection. Each node records the time when it receives the alarm and sends its record to the mobile node when the mobile node inquires it. The alarm is originated by an arbitrary node selected in the network. It made 10 experiments and recorded the maximum broadcasting delay in the network. The duty cycle is set to be $1s$.

Figure 2 shows the experiment results. The red line stands for results when time slot is $5ms$, and the blue line stands for results when time slot is $10ms$. It can be seen, the proposed scheme achieves very low broad-casting delay ($0.06s$) in most of the experiments when time slot is $5ms$, except for experiment 6 and 7. In experiment 6, the case that packet cannot be successfully transmitted within $5ms$ took place once in the alarm broadcasting, resulting in an extra delay of two duty cycles, i.e., $2s$. In experiment 7, the case took place twice. When we increased the size of time slot to be $10ms$, the performance of the proposed scheme becomes better, as shown in Figure 2.

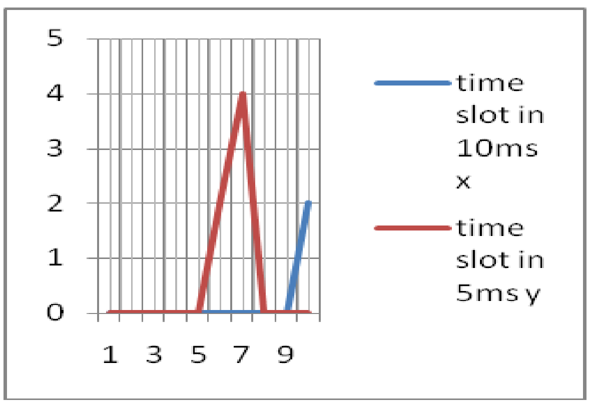

Figure 2 the result of the experiments

IV. CONCLUSION AND FUTURE WORK

The sleep scheduling method is used to detect and check the critical occasion that occurs in wireless sensor network. This can be done by predetermining the route and synchronous wakeup pattern. The upper bound of the delay is 3D + 2L, which is just a linear mixture of hops and duty cycle. Moreover, the alarm distribution delay is sovereign of the mass of nodes in WSN. The broadcasting delay and the energy consumption of the planned organization are much lesser than that of existing methods.

REFERENCES

[1] Peng Guo,Tao Jiang Senior Member, IEEE, Qian Zhang, Fellow, IEEE, and Kui Zhang "Sleep Scheduling for Critical Event Monitoring in Wireless Sensor Networks," IEEE Transactions On Parallel And Distributed Systems, VOL. 23, NO. 2, February 2012.

[2] G. Lu, B. Krishnamachari, and C. Raghavendra, "An Adaptive Energy-Efficient and Low-Latency MAC for Data Gathering in Wireless Sensor Networks," Proc. 18th IEEE Int'l Parallel and Distributed Processing Symp., pp. 224-230, Apr. 2004.

[3] G. Lu, N. Sadagopan, B. Krishnamachari, and A. Goel, "Delay Efficient Sleep Scheduling in Wireless Sensor Networks," Proc.24th IEEE Int'l Conf. Computer Comm., pp. 2470-2481, Mar.2005.

[4] N.A.Vasanthi and S.A., "Energy Efficient Sleep Schedule for Achieving Minimum Latency in Query Based Sensor Networks,"Proc. IEEE Int'l Conf. Sensor Networks, Ubiquitous, and Trustworthy Computing, pp. 214-219, June 2006.

[5] M.I. Brownfield, K. Mehrjoo, A.S. Fayez, and N.J. Davis IV.,"Wireless Sensor Network Energy-Adaptive Mac Protocol," Proc.Third IEEE Consumer Comm. and Networking Conf., pp. 778-782,Jan. 2006.

[6] A. Keshavarzian, H. Lee, and L. Venkatraman, "Wakeup Scheduling in Wireless Sensor Networks," Proc. Seventh ACM Int'l Conf. Mobile Ad Hoc Networking and Computing, pp. 322-333,May 2006.

[7] Y. Sun, S. Du, O. Gurewitz, and D.B. Johnson, "DW-MAC: A Low Latency, Energy Efficient Demand-Wakeup MAC Protocol for Wireless Sensor Networks," Proc. Ninth ACM Int'l Conf. Mobile Ad Hoc Networking and Computing, pp. 53-62, 2008.

[8] Y. Sun, O. Gurewitz, S. Du, L. Tang, and D.B. Johnson, "ADB: An Efficient Multihop Broadcast Protocol Based on Asynchronous Duty-Cycling in Wireless Sensor Networks," Proc. Seventh ACM Conf. Embedded Networked Sensor Systems, pp. 43-56, Nov.2009.

[9] N. Bouabdallah, M.E. Rivero-Angeles, and B. Sericola, "Continuous Monitoring Using Event-Driven Reporting for Cluster-Based Wireless Sensor Networks," IEEE Trans. Vehicular Technology,vol. 58, no. 7, pp. 3460-3479, Sept. 2009.

