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CLUSTERING BASED CRITICAL EVENT MONITORING IN WIRELESS SENSOR NETWORKS

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Abstract

Clustering based critical event monitoring is used to monitor the critical event in WSN (Wireless Sensor Network), where tiny number of packets needs to be transmitted often. Wireless sensor network are deployed in wide range of area, with large number of sensor nodes to monitor and report the information to end-user. Sensor nodes are expected to work for long time without recharging their batteries. LEACH (Low Energy Adaptive Clustering Hierarchy) is the first network protocol that uses hierarchical routing to increase the lifetime of network. LEACH arranges the nodes in the network into small clusters and chooses one of them as the cluster-head. Node senses its target and then sends the relevant information to its cluster-head. Then the cluster head collects and compresses the information received from all the nodes and sends it to the base station. The distributed Load Balancing Protocol (LBP) with fixed sensing range. The main scheme of LBP is that the maximum numbers of sensors are kept alive as long as possible by means of load balancing. Simulation results are demonstrated using NS-2 Simulator. From this result, the proposed algorithm has low delay, avoid collision and increase the network lifetime.

Keywords: ***Load Balancing Protocol (LBP), Low Energy Adaptive Clustering Hierarchy (LEACH);***

1. INTRODUCTION

A wireless sensor network (WSN) consists of spatially distributed autonomous sensors to monitor physical or environmental conditions like temperature, sound, pressure and to cooperatively pass their data through the network to a main location. The development of wireless sensor networks was motivated by military applications like battlefield examination, today such networks are used in many industrial, like industrial process monitoring and control, machine health monitoring. The WSN is built of sensor nodes from a few to several hundreds or even thousands, where each node is connected to several sensors. Sensor nodes in the networks are randomly moves and they are connected to user through gateway sensor node. Each sensor networks of node has radio transceiver with an internal antenna or connection to an external antenna, microcontroller and electronic circuit for interfacing with the sensors and energy source, the cost of sensor nodes is similarly variable, ranging from hundreds of dollars to a few pennies depends on the complexity of the individual sensor nodes. Size and cost constraints on sensor nodes result in corresponding constraints on resources like energy, memory, computational speed and communications bandwidth. The topology of the WSNs may vary from a simple star network to an advanced multi-hop wireless mesh network.

The propagation technique between the hops of the network can be routing or flooding. Sensor nodes can be imagined as tiny computers, extremely basic in terms of their interfaces and their components. It's usually consist of a processing unit with limited computational power and limited memory, sensors including specific conditioning circuitry, a communication device like radio transceivers or alternatively optical and a power source usually in the form of a battery.

1.1 Sleep Scheduling

As sensor nodes for event monitoring are liable to work for a long time without recharging their batteries, sleep scheduling method is implemented during the event monitoring. Clearly, the sleep scheduling could cause transmission delay because source nodes should wait until destination nodes are active and ready to receive the message. The delay could be large as the network scale increases.
Recently, many sleep schedules for event monitoring have been designed [1], [2], [3], [4]. However, most of them focus on reducing the energy consumption. In the critical event monitoring, only a tiny number of packets need to be transmitted during most of the time. When a critical event is detected in monitoring area, the alarm packet should be broadcast to the network as soon as possible.
To reduce the broadcasting delay, it is needed to reduce the time wasted for waiting during the broadcasting. Here, destination nodes wake up immediately when the source nodes obtain the packets. Here, the broadcasting delay is definitely minimized. Based on this idea, a level-by-level schedule was proposed in [5]. The packet can be delivered from node a to node c via node b with minimum latency. Hence, it is possible to achieve low broadcasting delay with the level-by-level offset schedule in multi-hop WSNs [6], [7], [8], [9]. It is still a challenge for us to apply the level-by level offset to alarm broadcasting in the critical event monitoring [10]. First, the order of nodes should wake-up according to the traffic flow. If the traffic flow is in the opposite direction, the delay in each hop will be as large as the length of the whole duty cycle. Second, the level-by-level schedule employed by the packet broadcasting could cause a serious collision [11], [12]. Finally, transmission failure due to some unreliable wireless links may cause the retransmission in the next duty cycle, which also results in maximum delay equaling the whole duty cycle.

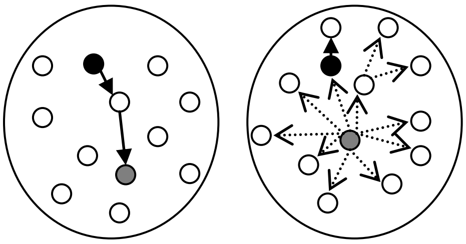

Fig.1.1 Alarm Broadcasting

2. Proposed work

In clustering based critical event monitoring is used to monitor the critical event in WSN (Wireless Sensor Network), where tiny number of packets needs to be transmitted often. Wireless sensor network are deployed in wide range of area, with large number of sensor nodes to monitor and report the information to end-user. Sensor nodes are expected to work for long time without recharging their batteries. LEACH (Low Energy Adaptive Clustering Hierarchy) is the first network protocol that uses hierarchical routing to increase the lifetime of network [14]. LEACH arranges the nodes in the network into small clusters and chooses one of them as the cluster-head. Node senses its target and then sends the relevant information to its cluster-head. Then the cluster head collects and compresses the information received from all the nodes and sends it to the base station. The distributed Load Balancing Protocol (LBP) with fixed sensing range. The main scheme of LBP is that the maximum numbers of sensors are kept alive as long as possible by means of load balancing.

2.1 LEACH Protocol

LEACH (Low Energy Adaptive Clustering Hierarchy) is the first network protocol that uses hierarchical routing to increase the lifetime of network. LEACH arranges the nodes in the network into small clusters and chooses one of them as the cluster-head. Node senses its target and then sends the relevant information to its cluster-head [15]. Then the cluster head collects and compresses the information received from all the nodes and sends it to the base station shown in Fig. 3.

LEACH operations can be Classified into two phases:-

1) Setup phase 2) Steady phase.

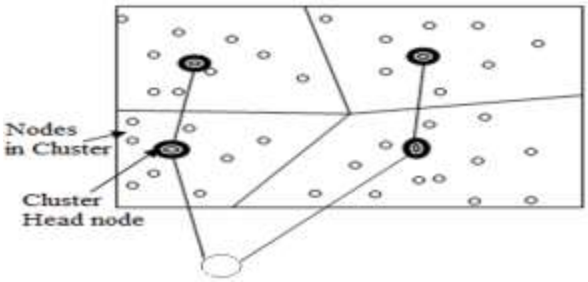

Fig. 2.1 Clustering Based Critical Event Monitoring

In the setup phase, the clusters are created and a cluster-head (CH) is chosen for every cluster. While in the steady phase, data is sensed and sent to the base station. The steady phase is longer than the setup phase. This is done in order to minimize the overhead cost.

2.2 Load Balancing Protocol

The main idea of LBP is that the maximum number of sensors are kept alive as long as possible by means of load balancing (i.e., if a certain sensor is overused compared to its neighbours, then it is allowed to sleep). In this algorithm, sensors can liberally exchange active or idle states. Assumed that there is no equal battery level at each sensor. Each sensor node can be in three states:

1) *Active:* the sensor is active and monitors the targets
2) *Idle*: idle and sleep modes, the sensor stops wasting any energy
3) *Alert*: the sensor monitors targets but will change its state to either active or idle state soon.

When a sensor is in danger state, it should transform its state into either active or idle state.

1) Active state: if a target is solely covered by itself
2) Idle state: if each target covered by a sensor s is also covered either by an active sensor or a vulnerable sensor with a larger battery supply as shown in Fig. 2.2.

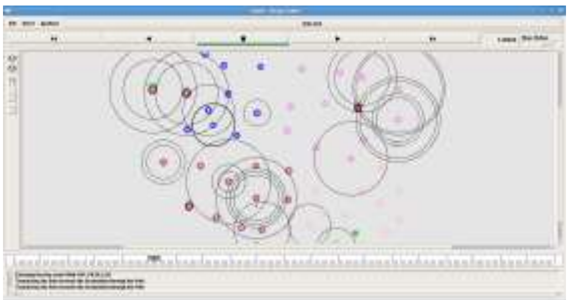

Fig. 2.2 Aggregation of data with LBP

3 Conclusions

In Wireless sensor Network with Enhanced Sleep Scheduling, could cause transmission delay. The proposed method introduced the LEACH and LBP Protocol to improve the network lifetime, energy efficiency and reduce the delay. The proposed algorithm minimizes the delay in the network, increase the network lifetime and avoids the interference in the network. In Load Balancing Protocol, active sensor nearly exhausts its energy, broadcasts that to its neighbors. A minimal subset of neighbors in idle state will change their states into active and effectively replace the exhausted sensor.

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A Brief Author Biography

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