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RESEARCH ARTICLE

Self-Organized Energy Efficient Algorithm for Wireless Sensor Network

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Abstract: Wireless sensor networks consist of micro sensor nodes. These micro-sensor nodes are used to transmit the packet to the BS. The more modern networks are bi-directional, also enabling control of sensor activity. When thousand number of nodes are embedded for transmission battery replacement is not easy so energy-efficient algorithm is used for a better network lifetime. Researches have proposed many protocols like HEED,PEGASIS,LEACH,TCB,APTEEN, etc. In this paper we propose an self-organized algorithm(SEEA) where in for each round the base station assigns the cluster head, and packet is begin collected from the neighboring nodes and transmit it to the BS. Simulation results show that the SEEA has the high performance when compared to other protocol and balance the energy consumption for a better network lifetime.

Keywords- energy-efficient, self-organized, protocols

1. Introduction

A **wireless sensor network (WSN)** sometimes called a **wireless sensor and actor network (WSAN)** are spatially distributed environmental condition that can be used to Senses or monitor with sensor nodes of both physical and environmental condition it relay on the following methods and it has few applications on enhancing for the future use.

2. Self-Organized Energy Efficient Algorithm

The main aim of SEEA is to achieve a longer network lifetime for different applications. In each round, BS assigns a root node and broadcasts its ID and its coordinates to all sensor nodes. Then the network computes the path either by transmitting the path information from BS to sensor nodes or by having the same tree structure being dynamically and individually built by each node. For both cases, SEEA can change the root and reconstruct the routing tree with short delay and low energy consumption.

2.1 Initial Phase

In Initial Phase, the network parameters are initialized. Initial Phase is divided into three steps.

Step 1: When Initial Phase begins, BS broadcasts a packet to all the nodes to inform them of beginning time, the length of time slot and the number of nodes When all the nodes receive the packet, they will compute their own energy-level (EL) ..

Step 2: Each node sends its packet in a circle with a certain radius during its own time slot after *Step 1*. All the other nodes during this time slot will monitor the channel, and if some of them are the neighbors of node i, they can receive this packet and record the information of node i in memory. The nodes which are not in the range of can't monitor the preamble in this time slot, so they can know they are not the neighbors of node i and will turn off their radios, then switch to sleep mode to save energy.

Step 3: Each node sends a packet which contains all its neighbours information during its own time slot when Step 2 is over. Then its neighbours can receive this packet and record the information in memory. Each node works according to them in the following phases.

2.2 Tree Constructing Phase

Within each round, SEEA performs the following steps to build a routing tree. Between there are some differences in the steps of routing tree constructing.

BS assigns a node as root and broadcasts root ID and root coordinates to all sensor nodes. The data fusion technique is implemented, only one node which communicates directly with BS can transmit all the data with the same length as its own, which results in much less energy consumption. In order to balance the network load for each round, a node with the largest residual energy is chosen as root. The root collects the data of all sensors and transmits the fused data to BS over long distance as root can fulfil this work without the control of BS, a large amount of energy is wasted in the next phase.

2.3 Self-Organized Data Collecting and Transmitting Phase

After the routing tree is constructed, each sensor node collects information to generate a DATA_PKT which needs to be transmitted to BS. TDMA and Frequency Hopping Spread Spectrum (FHSS) are both applied. This phase is divided into several TDMA time slots. In a time slot, only the leaf nodes try to send their DATA_PKTs. After a node receives all the data from its child nodes, this node itself serves as a leaf node and tries to send the fused data in the next time slot.

***Segment1*:** The first segment is used to check if there is communication interference for a parent node. In this segment, each leaf node sends a beacon which contains its ID to its parent node at the same time.

Segment 2: During the second segment, the leaf nodes which can transmit their data are confirmed. the parent node sends a control packet to all its child nodes. This control packet chooses one of its child nodes to transmit data in the next segment..

***Segment 3*:** The permitted leaf nodes send their data to their parent nodes, while other leaf nodes turn to sleep mode. If all the leaf nodes try to transmit their data at the same time, the data messages sent to the same parent node may interfere with each other. By applying Frequency Division Multiple Access (FDMA) or Code Division Multiple Access (CDMA), the schedule generated under competition is able to avoid collisions.

it may exhaust its energy and die. The dying of any sensor node can influence the topography. So the nodes that are going to die need to inform others. The process is also divided into time slots. In each time slot, the nodes whose energy is going to be exhausted will compute a random delay which makes only one node broadcast in this time slot.

For Case2, BS can collect the initial EL and coordinates information of all the sensor nodes in Initial Phase. For each round, BS builds the routing tree and the schedule of the network bussing the EL and coordinates information. Once the routing tree is built, the energy consumption of each sensor node in this round can be calculated by BS, thus the information needed for calculating the topology for the next round can be known in advance. However, because WSN may be deployed in an unfriendly environment, the actual EL of each sensor node may be different from the EL calculated by BS. To cope with this problem, each sensor node calculates its EL and detects its actual residual energy in each round.

2.4 Information Exchanging Phase

For Case1, since each node needs to generate and transmit a DATA_PKT in each round,

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3. Comparative Analysis and Simulation Results:

SEEA is compared with PEGASIS and use the same network model as PEGASIS. It generate a randomly distributed 100 to 400 nodes network of square area with BS and use DATA_PKT length of 2000 bits and CTRL_PKT length of 100 bits. The routing tree generated by SEEA and PEGASIS for exactly the same 100 node topology. As seen, the routing tree generated by SEEA is better. To compare SEEA with TBC. BS is located and the length of a DATA_PAK is 4000 bits. We compare the performance of SEEA with the existing simulation results of TBC. Simulation results show that by using the same model as PEGASIS, in each round, the data transmitting in the routing tree generated by the improved. PEDAP is a protocol that requires BS to build the topography. To achieve that, BS should send a broadcast packet which contains all the topology information and the schedule information to all sensor nodes or BS informs the sensor nodes one by one when the topography needs to be rebuilt. If BS sends a packet which contains all the information, each node has to receive the whole packet to get its own information. This will cause a large amount of energy to be wasted.

4. Conclusion

The simulations show that when the data collected by sensors is strongly correlative, SEEA outperforms LEACH, PEGASIS, TREEPSI and TBC. Because it is a self-organized protocol, it only consumes a small amount of energy in each round to change the topography for the purpose of balancing the energy consumption. All the leaf nodes can transmit data in the same TDMA time slot so that the transmitting delay is short. When lifetime is defined as the time from the start of the network operation to the death of the first node in the network, SEEA prolongs the lifetime by 100% to 300% compared with PEGASIS.

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