



Research on analysis routing protocol for wireless sensor networks

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ABSTRACT

This paper discusses the analysis and evaluation of routing protocols in wireless sensor network, routing protocol for wireless sensor network based on the topology structure can be divided into planar and hierarchical. WSN communication protocol stack can be divided into physical layer, data link layer, network layer, transports layer and application layer. Finally this paper introduces the typical algorithm for planar and hierarchical routing protocols and experiment and Simulation of routing protocol for wireless sensor networks.

Keywords: wireless sensor network, routing protocol, Simulation.

INTRODUCTION

Wireless sensor network is used to detect a variety of interest is measured data; its main purpose is to test data to obtain the detection area. In the process of the network design, the main consideration to how efficient processing of sensor data and the data is transmitted to the user node, therefore the characteristics of wireless sensor network is a data centric.

Sensor networks usually consist of sensor nodes, sink nodes and management nodes. Sensor nodes are arbitrarily distributed in a monitored area, nodes in ad hoc form network, by multi hop relay monitoring data will be transmitted to the sink node, finally by Internet or other means of communication network will be monitoring information to the management node [1]. Similarly, users can publish command through the management node; inform the sensor nodes collect monitoring information.

In the hierarchical structure, cluster head is responsible for forwarding data between clusters, and the cluster members is only responsible for data acquisition. This greatly reduces the routing control information, so it has good extensibility. The cluster head can be specified in advance can also be composed of nodes using clustering algorithm automatically elected. Because the cluster head can be elected at any time, so the hierarchical structure has a strong survivability.

Nodes usually consist of power module, perception module, information processing module, storage module, data transmission module and software module of the several parts. Energy modules required for normal work of electric energy for sensor. The sensing module is used to capture the data of interest information; information processing module is responsible for data information and facilitate the transmission nodes for the analog signal from the conversion, and the coordination of other modules, such as data to save the perception module captures the sense of memory modules in the interest of the energy module, energy control and management software; data transmission module responsible for communication with the adjacent node, sending and receiving the captured data of interest information, topological structure but also need to build in the monitoring area network; software module is to provide the necessary system to complete the various tasks for the network, including the routing protocol

implementation, the user order execution.

WSN does not need to be maintained between any two nodes in the network routing, it only needs to maintain between sensor nodes and the Sink routing, routing protocols can be simplified. But usually the resources of sensor nodes are subject to greater restrictions. Sensor nodes with power limited, can not be replaced, computation, communication, storage capacity is very limited, some WSN network node or even no identity.

2. Algorithm analysis Protocol for Wireless Sensor Networks

In the flat routing protocols, all nodes are equal, by local operation and feedback information to generate routing. The advantages of flat routing protocol is simple, by extension, the disadvantage is the lack of standardized management of communication resources, each node needs to know to all other nodes, maintain the dynamic routing needs to control the amount of information. In the hierarchical routing protocol, the network is partitioned into clusters, each cluster consists of a cluster head and a cluster member nodes, cluster member node is responsible for collecting data, and to relay the collected data to the cluster head, cluster head node is responsible for internal cluster data receiving and data fusion, and then the data forwarding to the higher level cluster [2]. Cluster member function is relatively simple; do not need to maintain routing information complex, nodes at different levels of different functions.

Directed diffusion model of DD (Directed Diffusion) is a data centric communication protocol, sensor nodes running the DD use which based on naming attribute to describe the data., directed diffusion algorithm in the operation process includes the following 3 basic processes, namely path establishment stage, stage and enhance the data transmission path stage. Path establishment stage: the convergence point to publish command information of all nodes in the network to broadcast, multi hop mode, command information containing task type, the data transmission rate, time stamp and other parameters of the interest description. Each node to obtain interest by recording the corresponding neighbor nodes and it is data rate and time stamp to establish gradient.

The wireless sensor network MAC protocol to pay more attention to the effective energy utilization, and it is channel design of sleep mechanism. At present for the different sensor network applications, research on MAC protocol of wireless sensor network is like a raging fire, multiple MAC protocol research results already exists, can be classified according to the distributed control and centralized control, using a single shared channel or multiple channels and a fixed distribution channel mode or random access channel [3].

The traditional Internet routing protocol is not concerned about energy issues but focus on the quality of network service, and network equipment are more adequate electricity whenever and wherever possible, and can supplement the relevant, and wireless sensor network is just the opposite, the node energy is limited, therefore, routing protocol design must be effective use of node energy in the first place, and the service quality of network nodes, and the micro components cheaper, and the current technology, energy is very difficult to have the obvious promotion, typical wireless sensor network application to human unexplored places, as is shown by equation1.

$$\delta I_i = \begin{cases} I(P) - I(P_i), & i = 0, 1, 2, 3 \\ I(P_i) - I(P), & i = 4, 5, 6, 7 \end{cases} \quad (1)$$

In the RS model, in addition to the base station (node is connected and fixed network), the network all the sensor nodes can be used as a data source, randomly chosen from the in. The simulation analysis, DD routing protocol has better energy efficiency and scalability characteristics, especially suitable for sensor node receives a data request, in a long time continuous transmission applications to sink data. This is not the way for only a few data in the case of receipt of the request, because of the need to spend big price to establish gradient.

In directed diffusion algorithm is implemented in the correct path, a path when an error, the path or paths will be new beginning [4]. Directed diffusion algorithm considering in this aspect, the data transmission is always can be achieved by fewer hops, while saving time searching for a new path of energy.

$$C(t) = \frac{E[B(t), B(-t)]}{E[B(t)]^2} = 2^{2H-1} \quad (2)$$

Relative positioning is usually to some nodes in the network as a reference, the relative coordinate system to establish the whole network. Absolute positioning can provide a unique namespace for the network, the node mobility effects are smaller, more widespread application domain. But the study found, also can achieve some

routing protocols based on relative positioning, especially geographical location based routing (geo-routing), and relative positioning without beacon node. In the application of certain without a network node absolute position, can be used without beacon node localization algorithm to achieve the relative position of the whole network.

LEACH is the different methods and constructing multiple clustering hierarchical routing algorithms is popular, PEGASIS the node structure into a chain, each node by its neighbor nodes transmit and receive data, and the chain is only one node and sink node or base station to communicate from one node to. Another node continuity of the aggregation, fusion and transmit data to the base station. The chain path is using a greedy algorithm to construct.

SPIN is a data centric routing protocol adaptive communication, its goal is through the use of inter node negotiation mechanism and resource adaptive mechanism, so as to solve the problem of overlapping phenomenon of explosion and flooding protocol data. Sensor nodes in the transmission of data to each other before consultation, consultation system can ensure the transmission of useful data. Nodes by sending the metadata and it are the data rather than the acquisition of the negotiation. The metadata size is less than the collection of data, so the transmission energy consumption is relatively less metadata.

3. Design of Experimental for WSN protocol

CDMA layered PEGASIS protocol uses the hierarchical tree structure based approach, each layer selected node to node transmit data at higher level. Agreement requirements on the data acquisition process of each round, all nodes at a given layer to send the data to the additional neighbors, all data nodes are promoted to a layer of nodes. By analogy, the top layer is only one node is retained and become the first chain node [5]. To illustrate the process of the protocol is for each round path.

Sensor nodes in a variety of unusual or unexpected network environment (such as hardware failures, environmental interference and high load), the routing protocol should be able to help the system to correct the mistakes by automatically adjusting or automatic reconstruction (such as node maintains a plurality of the alternative Sink nodes by), as far as possible to ensure the network normal work, the system has high robustness and stability.

Highlight the characteristics of wireless sensor network itself, such as limited energy, limited energy, network node characteristics and distribution etc.. Characteristic of self organization protocol and based on wireless sensor network, analyzes the characteristics of self-organizing wireless sensor networks, wireless sensor networks, because of limited energy of sensor nodes, energy or energy efficiency is an important issue to consider [6]. So the wireless sensor network self-organization protocol to meet the characteristics of low energy consumption. Because of the actual test platform used in this paper is Imote2, Imote2 is working on 802.15.4, using CC2420 wireless transceiver chip, as is shown by equation (3).

$$P_{FLP}(\theta) = \frac{1}{\left| a^H(\theta) \begin{bmatrix} 1 \\ -W_{FLP} \end{bmatrix} \right|^2} \quad (3)$$

The node number, hence the need for processing multi-level, many aspects of the collected data information, and also filtering, link, evaluation and the reorganization of the information, to improve the correct rate of gathering information, and with higher credibility and ensure the reliability and security of the data, in order to provide useful data for user and, at the same time, wireless sensor network is a data centric network, the ultimate goal is to monitor the user nodes within the area of data collection and processing, from this point of view, the data fusion technology can make the efficiency of this process is superior to the traditional method, so as to improve the usefulness of the information, improve the accuracy of sensing equipment.

SPEED routing protocol is a routing protocol in real time, it realizes the transmission rate of end-to-end guarantee, network congestion control and load balancing mechanism in a certain extent [7]. The SPEED protocol to transmit the first switching node delay and it is in order to get the network load conditions, as is shown by equation4.

$$\begin{aligned} \Delta u^T S \Delta u &\rightarrow u^T P^T S P u \\ \Delta u &= P u \\ \Delta u(i) &= u(i-1) - u(i) \end{aligned} \quad (4)$$

Hierarchical PEGASIS is an extension to PEGASIS; the main work is in the processing delay of data packet transmission, the main aim is to find a balance between energy and delay. In order to reduce the time delay, the

protocol adopts information transmission at the same time. In order to avoid the collision and interference, and it is using the two methods. One is the using different code, for identification of data. Another method is, to transmit data at the same time only some nodes.

NS has the characteristics of good openness, expansibility, suitable for Windows and Linux system platform, is an excellent study of network topology, network analysis and simulation tools. Compared with other NS network simulation tool, the simulation of energy corresponding to the data flow is particularly prominent. There are two kinds of division of different development language NS simulation environment: C++ and Otcl (ObjectTcl, Tcl object oriented extension). C++ describes the details of the network protocols, Otcl provides an object oriented interface, through a variety of parameter configuration simulation activities, framework of simulation, between C++ and OTCL through the TclCL link. C++ run faster, make the simulation with high performance, as shown in figure 1.

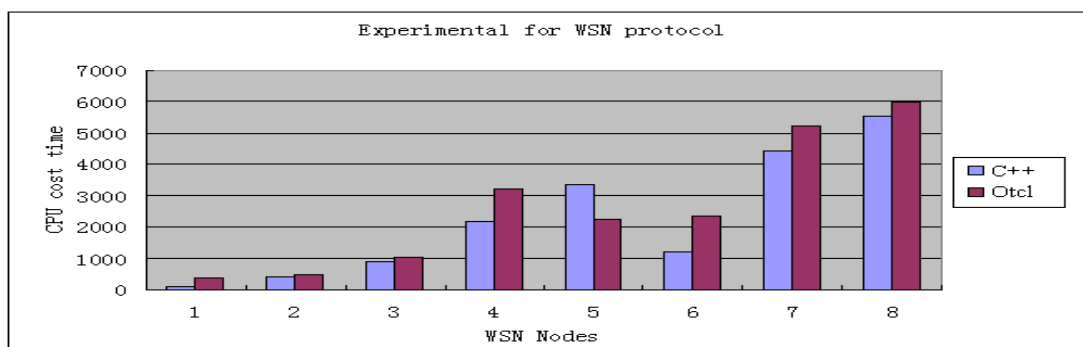


Fig. 1. Compare of experiment routing protocol for wireless sensor networks

In the simulation experiment using NS-2 as the network simulation tool, it provides communication model, random topology and node mobile model generation tool. Used in the simulation scene file using the stochastic model of tool implementation. The simulation scenario is the following settings in the simulation.

The Gossiping protocol is improved and proposed based on flooding protocol. Its dissemination of information through random selection of a neighbor node, and it is transmission of information selection in the same way random neighbor node information of the next node. This approach avoids information dissemination to broadcast the form of energy consumption, but at the expense of prolonging the time of information transmission. Although the Gossiping protocol to solve information implosion, but still overlap information.

CONCLUSION

Finally, using OMNet++ simulation tool on the self organization protocol is simulated, the simulation tool OMNet++, the flooding tree (Flood Tree) protocol, the maximum independent set MIS connected dominating set of CDS protocol, FISCO protocol is simulated based on, put forward different structure may have different maintenance methods and energy consumption, initial structure stage small energy consumption may be in the maintenance phase of high energy consumption. The basic characteristics of WSN with open media, no center certification bodies, distributed collaboration; its security problem is more serious than the wired network. Routing protocol is the main target of attack, but the current routing protocols have been proposed rarely consider the security problem. How to use less cost, obtain routing better safety performance, may be the direction of future efforts.

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