Research on Composition and Topology of Wireless Sensor Network

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Abstract. Wireless sensor network is a kind of computer network which is composed of many automatic devices distributed in space. These devices use sensors to collaboratively monitor physical or environmental conditions (such as temperature, sound, vibration, pressure, motion, or contaminants) at different locations. Based on the composition of sensor nodes, sensor network is composed of intelligent sensors with multiple wireless communication modules. This paper studies the distribution and arrangement of sensor nodes in the sensor network, which is used to sense and monitor the physical information of the environment, so that the sensor network has higher reliability and availability.

1. Composition and function of sensor network nodes

The composition and function of sensor network nodes include the following four basic units

- Sensor unit: composed of sensor and a / D conversion module;
- Processing unit: composed of embedded system, including CPU, memory and embedded operating system;
- Communication unit: composed of wireless communication module;
- The power part.

Figure 1 system composition of sensor node in wireless sensor network

![System Composition of Sensor Node in Wireless Sensor Network](image)

In sensor networks, a large number of nodes are deployed in or near the perceived objects in various ways. These nodes form a wireless network through self-organization, and perceive, collect and process the specific information in the network coverage area in a cooperative way, which can realize the collection, processing and analysis of information in any place at any time. A typical sensor network structure includes distributed sensor nodes, nodes, Internet and user interface.

Sensor nodes can communicate with each other, organize their own network and connect to the
base station node through a variety of ways. After receiving the data, the base station node completes the connection with the public network through the gateway. The whole system manages and controls the system through task manager.

With the development of wireless communication technology and the improvement of data processing ability, the service based on wireless sensor network has become one of the most potential mobile Internet services. In the environment of wireless sensor network, the demand of fast and accurate data transmission service becomes the main research object.

2. Basic principle of wireless sensor

The development of Internet of things has attracted much attention. With the development of wireless communication technology and smart service-oriented society, the development and application of Internet of things technology plays an important role. With the continuous expansion of the application scope of Internet of things, the research of Internet of things technology is gradually deepening. In the architecture of the Internet of things, due to the diversity of sensing devices and objects, the data in the Internet of things presents the characteristics of multi-source heterogeneous, massive, spatiotemporal correlation and high redundancy, which brings some difficulties for data processing. The data management layer provides support for the upper application, so the efficient and accurate data processing becomes the key to ensure the accuracy of IOT application. At present, data fusion technology is used in the data processing of Internet of things.

In addition to one or more sensors, each node of a sensor network is equipped with a radio transceiver, a microcontroller and an energy source, usually a battery. The size of a single sensor node depends on the size and complexity of the sensor network. The size and complexity of sensor nodes limit the energy, storage, computing speed and bandwidth.

Sensor networks mainly include three aspects: sensing, communication and Computing (hardware, software and algorithm). The key technologies include wireless database technology, query in wireless sensor network and network technology for communication with other sensors.

Sensor networks and sensors

The system composition of sensor nodes in sensor networks. The sensor node is divided into five parts: sensor module, minimum system of microprocessor, wireless communication module, power supply module and enhanced function module.

The sensor module and power supply are regarded as traditional sensors, and the minimum system of microprocessor can correspond to the intelligent sensor. The wireless communication module is a new functional module added to the traditional sensor in order to realize the wireless communication function. Enhanced function modules are optional configurations, such as time synchronization system, satellite positioning system, mechanical system for mobile, etc.

Wireless sensor network in the sensor node, with the help of the system sensor unit to transmit the collected information to the collection node, can realize the monitoring of complex and changeable environment. Based on the system, the wireless sensor execution network adds the execution node, which makes decisions and performs related operations according to the collected monitoring information, so as to further control the environment on the basis of environmental monitoring.

Wireless sensor network uses wireless communication technology to realize the communication connection between sensor nodes of the system, which can complete the system sampling. The characteristics of sensor network make it have a very wide range of application prospects, and its ubiquitous characteristics make it an indispensable part of our life in the near future.

3. Architecture of wireless sensor network

Sensor network system usually includes sensor node, sink node and management node. A large number of sensor nodes are randomly deployed in or near the sensor field, which can form a network through self-organization. The data monitored by sensor nodes are transmitted hop by hop along other sensor nodes. In the process of transmission, the monitoring data may be processed by multiple nodes, then routed to the sink node after multi hop, and finally arrived at the management node through the
Internet or satellite. Users configure and manage sensor networks through management nodes, publish monitoring tasks and collect monitoring data.

The topological structure of IOT network refers to the geometric arrangement of communication lines and stations, nodes and convergence points in the network.

A star network: each node is connected with the central station through the point-to-point link. It is easy to add new sites in the network, easy to control the security and priority of data, and easy to realize network monitoring.

![Star network diagram]

**Figure 2 star structure type of sensor network**

The star structure completes the data transmission from node to collection point.

B ring network

Each station is connected into a closed ring through communication medium. Ring network is easy to install and monitor.

![Ring network diagram]

**Figure 3 ring structure type of sensor network**

C point-to-point network

All sites in the network share a data channel.

The installation of point-to-point network is simple and convenient, the cable to be laid is the shortest, the cost is low, and the failure of a site will not affect the whole network.
Each node completes the point-to-point data transmission process.

Classification of wireless sensor network communication
Point to point data is transmitted in computer or communication equipment in a point-to-point manner. Star network and ring network adopt this transmission mode.

Broadcast data is transmitted in a common medium. Wireless network and bus network belong to this type.

4. summary
A analyzes the composition and working principle of WSN sensor nodes, and explains the main functions of sensor nodes;
B discusses the main topology of wireless sensor network. Star type, ring type and point-to-point type are used to describe the structure;
C Analysis of wireless sensor network applications.

To solve the problem of data network congestion when the base station of Internet of things (IOT) network layer uploads burst data, this paper studies the file management technology in the distributed and cloud computing environment. Based on the idea of cloud computing and virtual machine technology, a file intensive upload algorithm is proposed, and the corresponding cloud file system is developed. It supports rapid deployment of upload server, and automatically selects file server for the base station or users. When the network is idle, the files in the file server are automatically synchronized to the central node. The actual operation shows that the technology is very simple to deploy, low cost and fast upload speed.

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