Research on Some Key Techniques of Wireless Sensor Network

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Abstract. This paper focuses on the basic concept and architecture of wireless sensor networks. Some key techniques of wireless sensor networks are deeply discussed, including node-localization, routing technology, topology control, data fusion and energy management. Characteristics and disadvantages of these techniques are analyzed, and suggestions for improvement are given. Finally, the future research and development tendency are prospected.

1 Introduction

Wireless sensor network is composed of a large number of low-cost nodes which scatter in a certain definite area. These nodes have capabilities of data perception, information processing and wireless communication. Nodes are organized without fixed infrastructure, data packets can be transmitted between the nodes in multi-hop mode. Due to limited living cycle of nodes, WSN has dynamic topology. With easy deployment, low consumption and low-cost, wireless sensor network can possess extensive prospect in military, civil and industrial production.

2 Architecture of Wireless Sensor Network

Typical architecture of wireless sensor networks is shown in Figure 1, which consists of sensor node, sink node and management node. Monitoring data is forwarded between sensor nodes in hop-by-hop mode, aggregates at sink nodes

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through multi-hop routing, and finally reaches management nodes via the Internet or satellite. During the transmission, data packet can be handled by multiple nodes.

![Architecture of wireless sensor networks](image.png)

**Fig. 1** Architecture of wireless sensor networks

(1) Sensor node
Sensor node has capabilities of data acquiring, information processing and cooperative work. It always consists of four basic components: sensor module, processor module, wireless communication module and energy supply module.

(2) Sink node
Sink nodes act as receiver and controller in the network, monitor and handle events, messages and datas, and send multiple queries or distribute tasks to the network. Outside the network they act as repeaters and Gateways, link to remote control units and users via Internet or satellite.

(3) Management node
WSN can be configured and managed through management nodes. Monitoring tasks and data collection are distributed.

3 Key Techniques of WSN

3.1 Localization of Nodes

Wireless sensor network’s working area is wide and suitable for bad or special environment that people can not close to. Node’s location information is always random. The datas collected by nodes must be combined with location information which is in it’s measurement coordinate system. Without location information datas will be valueless. For using WSN in special areas, it is most important to achieve node localization with minimal communication overhead and hardware cost.

Accurate localization of nodes is an important requirement for various applications of wireless sensor networks. Wireless sensor networks have characteristics of low energy, large-scale, low mobility, dynamic topology, multisensor data fusion and asymmetric communication. All of these make node localization to face lots of challenges. For example, GPS is the most popular location service.