

Study On Wireless Sensor Networks

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Abstract: As wireless sensor technology improves; an increasing number of organizations are using it for a wide range of purposes. ZigBee technology is a new standard in wireless personal area after Bluetooth. After an introduction to this technology, a new wireless meter-reading system based on ZigBee protocol has evolved. This system, which is comprised of ZigBee network and database management system, has many important advantages such as low cost, low power consumption, and low data rate. Wireless Sensor Network based on ZigBee technology is a wireless network which is composed of many nodes of ZigBee RF chip, sensor and MCU, especially suitable for application of the remote monitoring system in flammable and explosive environment. Fusion of RFID and Zigbee is also possible which turn out to be boon for wireless sensor network technology. A complete overview of wireless sensor network technology is given in this paper. Wireless sensor network technology has become one of technological basic needs of us.

[Gupta, D.K. and Kumar, P. **STUDY ON WIRELESS SENSOR NETWORKS**. *N Y Sci J* 2025;18(1):1-4]. ISSN 1554-0200 (print); ISSN 2375-723X (online). <http://www.sciencepub.net/newyork>. 01. doi:10.7537/marsnys180125.01

Keywords: Wireless Sensor Networks (WSNs); machine learning (ML)

INTRODUCTION

With the development of network and communication technology, the inconvenience of wiring is solved with WSN into people's life; especially it has wide perspective and practicability in the area of remote sensing, industrial automation control, and domestic appliance and so on. WSN has good functions of data collection, transmission, and processing. It has many advantages compared to traditional wired network, for example, convenient organizing network, small influence to environment, low power dissipation, low cost, etc. At present, near field wireless communication technology has been used widely, especially Bluetooth, wireless local area network (WLAN), infrared, etc. But, they have a number of disadvantages, for example, complexity, large power dissipation, short distance, networking in small scale. In order to satisfy the demand of low power dissipation and low speed among wireless communication devices, a new type of wireless network technology-Zigbee emerges as the times require. In this paper, we will introduce the networking technology and application of Zigbee. How Zigbee & RFID combination can be used in applications. In this paper first Zigbee is explained, then its advantages application and finally its fusion with RFID along with applications is discussed.

Through the radio waves, these sensors can transmit the data from one sensor to another with small energy

cost and high efficiency. Compared with various existing wireless communication technology, ZigBee technology has the lowest energy consumption and cost. Because of the slow data rate and the small range of communication, ZigBee technology is extremely suitable for agricultural field which has small amount of data flows. The technical features of this technology also make it the best choice for wireless sensor networks. Therefore, it has the practical significance when applied in the crop environmental monitoring system [1], [2]. ZigBee has the following features. ZigBee uses a variety of power-saving modes to guarantee that it could be used for at least six months to two years powered by two AA batteries. ZigBee uses the avoidance collision mechanism in CSMA/CA and pre-set a prior particular time slot for a fixed bandwidth communications service in order to avoid competition and conflict when sending data. MAC layer adopts a fully confirmed data transport mechanism, and each packet sent by the receiver must wait for confirmation [3]. Zigbee has self-organizing features that one node can sense other ones without any human interventions, and connect with each other automatically to create a completed network. It also obtains self-recovery function that the network can repair itself when a node is added or deleted, the position of a node is changed, or a breakdown occurred. It also can adjust the topology structure to ensure that

the whole system can work normally without any human interventions.

ARCHITECTURE OF WSN

WSN generally consist of three parts: sensor cells, managing nodes and aggregation nodes, the structure is displayed in Figure 1; i) sensor nodes: these are large nodes that can be thrown freely into the air and fall freely to the point of data collection for the entire WSN. These nodes are connected in series to form a whole sensor network; ii) convergence nodes: to provide a summary of all the details, the data acquired by the sensor nodes will be collected in the aggregate node using the routing mechanism; and iii) management node: the information filtered by the pooling node is transmitted via the network and communication equipment to a terminal platform, where the relevant staff can effectively analyze the data recorded.

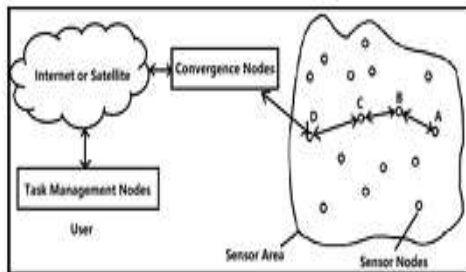


Figure 1. Architecture of WSN schematic

WSN FEATURES

Networks of wireless sensors have the following features i) large scale: compared to other networks, networks of wireless sensors cover greater variety of information and acquire a greater amount of information [1,3,17]. These advantages are based on a profusion of sensor nodes. However, when the number of sensor nodes is high, this can make maintenance difficult [2,4,6,18]. In addition, the particular application area of the sensor nodes can make it challenging to replace them, especially in environments with high temperatures and pressures or high radiation levels [5,7,9,19]; ii) limited battery capacity: the stability of the working state of an infinite sensor network has a huge relationship with the battery capacity [20]. Typically, batteries are not renewable and need to be replaced in a timely manner in the event of damage or low power [21], but the relatively complex geographical location of sensor nodes makes timely replacement difficult and the relatively wide range of sensors used increases the difficulty of replacement [13]. Likewise, in order to ensure the correctness of the data obtained by the

sensors, the battery life needs to be increased [15]; iii) Compensating for weak communication capabilities with the help of multi-hop network technology generally speaking, sensors are poorly equipped in terms of communication and must be routed with the help of multi-hop network technology when communicating with each other and other nodes [21]. Multi-hop network transmission technology can pass information to the aggregation node corresponding to the node and can forward information sent by other sensor nodes. Even if individual sensor nodes fail, they can be interconnected with other nodes [16]; and iv) the sensor node is the location of the free fall point after the sensor has been randomly thrown, and the corresponding network structure has to be built after finding the right fall point. During specific use, they are prone to a variety of faults, such as power failure or damage. Therefore, the entire sensor network needs to have a strong dynamic coordination capability.

APPLICATIONS OF WSN

Zigbee wireless communication technology has wide perspective, Zigbee will be used in a couple of years in the area of industry control, industrial wireless location, home network, building automation, medical equipment control, mine safety, etc, especially home automation and industry control will be the main application fields. Zigbee wireless communication is applied in families. With the development of people's life, the concept of smart home and home automation is well known, but it must relate to the transmission of information and signal if it comes true, so it is troublesome to wire cables. Zigbee is a new short-range technology for wireless communication, it is specially designed for applications of wireless communication of low speed and low power dissipation, and it is ideally suited for establishing family wireless net. It is effortless to realize home temperature regulation, remote control of interior lighting systems, and automatic adjustment of curtain. Zigbee wireless communication technology is applied in meter reading system in the monitoring center just needs to analyze and calculate data acquired from users and obtain electricity consumption of users. After that, electric charge of the month is deducted from electricity account of users, the workers who is obliged to read the meter in user's home, the thing that users are not at home when workers are to read the meter is avoided[8]. Compared to working expediently for workers, it is the most important to be used in safety. introduces an experimental home security monitoring and alarming system based on Zigbee technology, it is capable of monitoring door and window magnetic contact, smoke, gas leak, water flooding, providing simple controls such as turning off

the valves, and sending the alarms to the residential area security network, etc. Zigbee wireless communication technology is applied in factories or enterprises. It is applied in information system of coal preparation enterprises in, all kinds of disadvantages of traditional cable network system are avoided by coal preparation enterprises, it highly improves the level of information automatic, automation, and management[9]. Zigbee wireless communication technology is applied in ARM NC system network in Experimental results showed that the improved method can guarantee the processing efficiency of NC system with satisfied accuracy and data transmission speed. Aiming at substation perimeter safety, a novel laser alarm system based on Zigbee is proposed in. It consists of laser railing security subsystem and data central monitoring subsystem, the communication between the two subsystems is realized by Zigbee wireless technology, a real-time human-machine interface can be provided for worker. Zigbee wireless communication is applied in mine. Aiming at improving safety of production and staff safety, Zigbee technology is applied in the Miner's Lamp Monitoring in. This system can realize underground staff orientation and achieve monitoring and control of the state of charge on the miner's lamp, and the high effective control and management on use of miner's lamp [10]. Utilizing the underground existing net and the extension Zigbee nodes, the system also can be more easily increased the humidity, gas and other sensors, to achieve mine environmental monitoring, ensure safety in production, the improved method has been researched in Zigbee has been widely used in many areas due to the advantage of low power consumption and low cost, it is good for wide-scale application. But there are some problems now, the coordinator carry too much nodes, especially in the large scale wireless sensor network, it is necessary to result in bad real-time, data packet loss, and stability decrease; also, there are some places where it is difficult for humans to change the batteries of nodes, or there is a fairly large number of nodes which is troublesome to change presents an improved design, the coordinator only deal with the task on the Zigbee network, the rest tasks will be processed by another processor. Prolonging the lifetime of the Zigbee network is the important goal of designing the Zigbee routing protocol. An energy-aware routing mechanism EA-AODV is presented in it can save energy and improve the performance of Zigbee network. Zigbee wireless communication technology is applied in container Information system in the paper presents the strategy of networking and routing in order to keep energy load balancing between network nodes, prolonged the lifetime of node and network effectively.

It is highly necessary to research these respects. ZigBee technology is a new standard in wireless personal area after Bluetooth. After an introduction to this technology, a new wireless meter reading system based on ZigBee protocol is possible. This system, which is comprised of ZigBee network and database management system, has many important advantages such as low cost, low power consumption, and low data rate [9], [10].

CONCLUSION

As a new wireless protocol in personal area, ZigBee has its unique characteristics including low cost, low data rate, and low power consumption which corresponds to a large market. This paper provides an application in the field of building automation. The fusion of two emerging technologies -- WSN and RFID that can give full play to the advantages of both technologies complement each other. It provides more reliable technique protection on the coal mine environmental monitoring and has great significance in China Mine safety. In this paper wireless sensor network technology is discussed along with application and it is clear that WSN proves to be emerging technology.

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12/5/2024