Design of Sports Training System Based on Wireless Sensor Network

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Abstract. In order to realize the training needs of athletes, it is necessary to apply the wireless sensor network to the sports training system. Through the system hardware and software design, the connection of base station and sensor nodes, and the management of node control. Create a sports database management system, store the sports data and analyze their sports parameters. Finally, the experiment proves that the sports training system based on wireless sensor network has more stable performance, can meet the needs of sports training to a certain extent, and provide scientific and reasonable training suggestions for athletes.

Keywords: Wireless Sensor Network · Sports Training System · Base Station

1 Introduction

As a self-organized network composed of micro-sensor nodes, the wireless sensor network can effectively accept and send information and data, and further collect and process information and data. And at this stage, information technology completely changed the development direction of sports vision in China, make the sports information process further promoted, real-time sports data network monitoring as the core of sports informatization development, can through collecting data, and to the sports data analysis [15], get more effective and accurate sports decision advice, help athletes to develop more scientific training plan. Wireless sensor network has a wide range of applications and can play an important role in all walks of life. In addition to sports, it also performs well in fields such as environmental monitoring and traffic control. Because it can connect to the digital world and the physical world. The wireless sensor network applied in the sports training system design can effectively optimize the sports training system [14]. Therefore, this paper mainly focuses on the application of wireless sensor network in the design of sports training system [16].

2 Design of the Sports Training System

2.1 The Design of the System Hardware

2.1.1 Sensor Node

Sensor, power supply, processor and radio frequency module are all part of the sensor node hardware structure (as shown in Fig. 1), and as the core processor of the sensor node
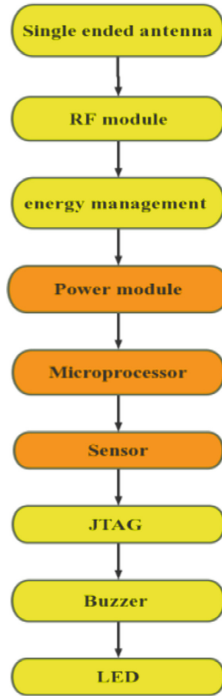
Fig. 1. Structure of the sensor nodes of the sports system.

hardware structure, CM needs to have certain temperature compensation function and signal conditioning function [5]. The core module to ensure work stability and energy stability is the power supply module [1].

2.1.2 Base Station Design

Base station modules are very important because the base station module determines the outcome of network control. The base station module can effectively wake up the network and realize management operations, whose hardware structure is shown in Fig. 2 [13].

The USB host interface and the multiplexing interface are used to connect to the storage equipment. The USB interface can effectively expand the base station capacity [9]. The USB host interface circuit design is shown as in Fig. 3.

The most common communication protocol in modern LAN networks is Ethernet, which can send and receive data frames and check connections. In order to meet the operation needs of users, design the touch screen of the small keyboard in the base station [8], and display the data on the touch screen, so that users can realize interactive operation with the base station [6]. The circuit design of the receiving interface is shown in Fig. 4.
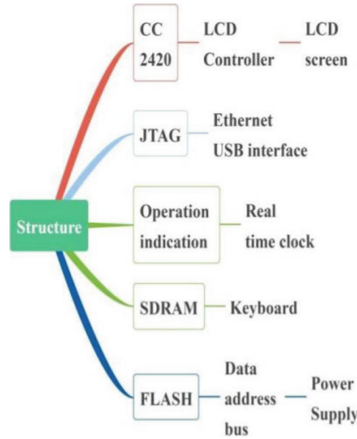
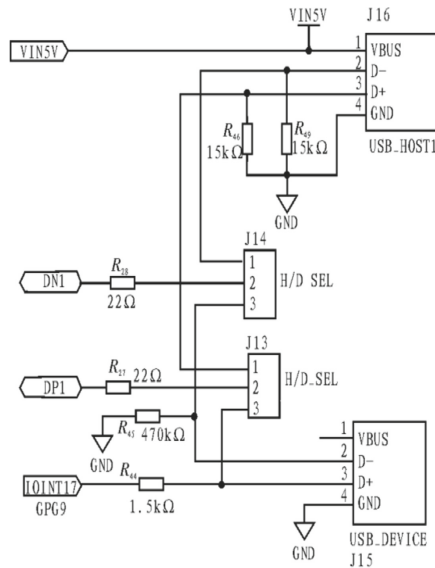**Fig. 2.** Hardware structure of the system base station.

Fig. 3. Circuit Design of the USB host interface.

2.2 The Design of the System Software

2.2.1 Software Design of Nodes and Base Stations

Creating the network through the Network function can effectively ensure that the nodes are integrated into the network [4], because once the nodes are not integrated into the network, the base station will send reports in real time until all the nodes are integrated into the network. The protocol stack then starts running and sends instructions such as collecting data to the node, and when the node feeds back the data, the program stops
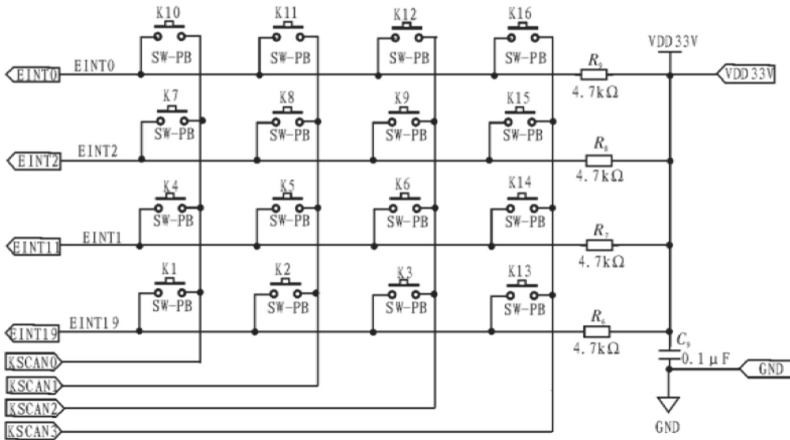
Fig. 4. Circuit design of the keyboard interface.

processing the data. After the node initialization, it is necessary to call the function and apply for the network, and then wait for the base station to issue instructions to collect and transmit relevant data [8].

2.2.2 Database Management System Design

The database system includes the external network interface and USB. By running the database management system, it can analyze and process the motion data [10], and the part responsible for analyzing and processing the motion data is the database management system. Borland C++ can realize the development of database management system and effectively store data [12].

In the database management system, it is divided into four modules, namely, data receiving module, parameter setting module, data analysis module and data storage module. The data receiving module mainly receives the data by connecting the base station and analyzes the data [7]. The parameter setting module is mainly used to meet the training needs of sports athletes, while the data analysis module can read the test data, draw the data change curve, and find the characteristics of the data change. Finally, most of the data stored by the database storage module is the movement change data of the athletes. In order to facilitate that each athlete can quickly find his own data, the athlete's number is also stored in the database storage module [3].

3   System Implementation

In order to meet the design requirements of the sports training system, the reaction time of the laboratory and the outdoor environment as the test platform tests the relationship between the node packet loss rate and the communication distance [2].

As shown in the Fig. 5, at the communication distance of about 20 m, the communication effect is relatively stable, but the farther the distance, the lower the stability of the communication effect, which is also reflected in the node packet loss rate.
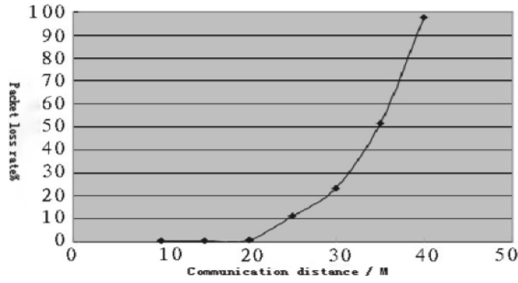
Fig. 5. The relation between packet loss rate and communication distance.
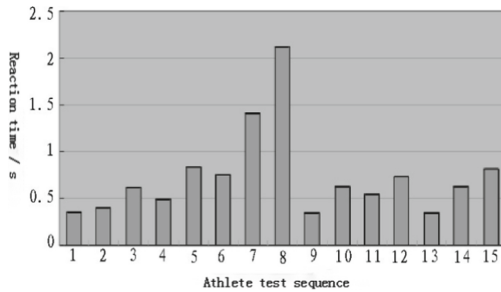

Fig. 6. Response time of the athletes.

As can be seen from the Fig. 6, the sports training system can fully meet the training needs of sports athletes, but to some extent, the signal coverage of the wireless network is strengthened to make the signal more stable [11].

4   Conclusion

Through the system test, it can be seen that the application of wireless sensor network in sports training system has certain real-time, which can make sports training more convenient and effective, and can improve the use efficiency of sports training system to a certain extent, so that the sports training system can be fully utilized. From the perspective of long-term development, the application of wireless sensor network in the sports training system makes the development of sports industry get a different impetus.

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