

Research and Design of Portable Multifunctional Intelligent Sports Scoring System

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ABSTRACT. *The sports competition scoring system has been widely used in various sports events. However, most systems have high requirements for equipment, that is, the use cost is high. The portable multifunctional intelligent sports competition scoring system is a low-cost, high-performance portable multifunctional sports competition scoring system based on MCGS programming. This system is very convenient for referees' refereeing work and athletes' sports data observation. It has been proved in practice that the system can be applied in various sports events and has the value of promotion and application.*

KEYWORDS: *Portable; Intelligent; Sports competition; Scoring system*

1. Overview of portable multifunctional intelligent sports scoring system

Scoring is an important task in sports competitions, and the scoring system is a key factor affecting the efficiency and quality of scoring work. In the process of sports competition, the athlete's basic information, positional relationship, and the number of pauses are very important for the referee's refereeing work, and the score of the sports competition is also very important for the audience. The most basic function of a high-quality sports competition scoring system is to realize real-time transmission and display of game data. However, in air volleyball, badminton, table tennis, and tennis, the positional relationship of athletes often changes, and there are many pauses and substitutions. In these events, the traditional sports competition scoring system costs too much and is not very practical. For this reason, it is very important to design a portable multifunctional intelligent sports competition scoring system that is small in size, convenient to carry, and simple to operate.[1]

2. Design of portable multi-functional intelligent sports competition scoring system

2.1 Overall framework

The portable multi-functional intelligent sports competition scoring system is designed from different angles of referees and athletes, taking the rules of sports events as the basic basis, intelligent programming, intuitive presentation of real-time competition information, easy expansion and multi-use of one machine as the basic goals. In the module design part, it is necessary to do a functional analysis of each module.[2] The overall design of the system includes four parts: the main control module, the transformer power module, the wireless bluetooth module and the LED display module.

TPC7062TD industrial personal computer is used as the main control module of industrial personal computer. The main reason of adopting this type of industrial computer is that it has a high-performance embedded integrated touch screen with advanced cortex-a8 CPU as the core, which has excellent performance in image display and data processing, and can make referees grasp the competition situation intuitively and clearly.

The transformer power module adopts the LM2596 power module, which is specifically composed of two 24V lithium batteries (one for ipc and the other for LED screen). As the voltage required by ipc and LED screen is different (ipc needs 5V voltage, while LED screen needs 3.3v voltage), two 24V lithium batteries need to be converted into the appropriate voltage of the corresponding equipment through LM2596 power module.

The wireless bluetooth module adopts BT816S wireless bluetooth. In many emerging portable devices, the most critical and widely used is wireless bluetooth real-time data communication to data.[3] This type of bluetooth device is adopted mainly because of its low cost and strong practicability. When connecting the wireless bluetooth device with the industrial computer, the serial port to RS232 module is used. The communication of this module is stable and reliable.

The LED display module shall have two data display parts: one is to display real-time game information for the referee (such as score, ownership of the ball, number of game suspensions, etc.); the second is to show the score in real time for the audience.

2.2 Structural design

The following is an analysis of the overall structure of the system design ideas, and introduced the functions of each structure and design points.[4] The overall structure of the system consists of the industrial control screen of the upper computer and the high-brightness LED of the lower computer. The back of the industrial control screen of the upper computer is connected with the wireless

bluetooth device with a switch board to send real-time game data for the high-brightness LED of the lower computer. For portable use, the industrial control screen of the upper computer USES portable lithium battery to power its own wireless bluetooth device and screen. On the back of the highlighted LED of the lower computer, there is also a switch board connected to the wireless bluetooth device to receive the real-time game data sent by the upper industrial computer. Similarly, for portable use, the lower unit's high-brightness LED also uses a portable lithium battery to power its own wireless bluetooth device and screen.

2.3 System structure and data structure

The system structure is shown in figure 1, and the system data structure is shown in figure 2.

Figure 1 structure of portable multi-functional intelligent sports competition scoring system

Figure 2 data structure of portable multi-functional intelligent sports competition scoring system

3. Interface design of industrial computer for portable multi-functional intelligent sports competition scoring system

The interface design of ipc includes three parts: the competition selection interface design, the information input interface design and the competition interface design. There are two contents in the design of the competition selection interface: first, design the bluetooth connection icon, and the user can directly click to connect the wireless bluetooth device on the industrial control screen; second, the design of various sports entry, the referee can simply click the corresponding icon of each sport and directly enter the specific competition interface of the sport. In the information input interface, the referee can directly enter the name of the two teams and the relationship between attack and defense. In the competition interface, the referee can confirm the score changes (plus or minus points), stoppage, substitution and the position rotation of the players. After the above situation occurs, the referee can visually see the result after the change in the game interface (such as the number of substitutions and suspensions).

All in all, the portable multifunctional intelligent sports competition scoring system interface operation process is: enter the system homepage → select the current required sports item → enter the competition interface → enter the information of both parties → whether to start the competition → enter the competition interface → competition interface (end of the competition) → exit the system. The interface of the system is refreshing and concise, and the icons are clear and intuitive. The referees can easily operate and it also meet the requirements

of “humanized” design.

4. Conclusion

The scoring system is an information system that collects, records, and processes information about the process and results of a sports competition. It is an important part of the service system of a sports competition information system. At present, most of the equipment of sports competition scoring system is very expensive, and most of them are used in large-scale sports competitions. At the same time, their application to individual sports is relatively weak.[5] Compared with the previous sports competition scoring system, this system has the following advantages.

The design of the portable multi-functional intelligent scoring system for sports competitions conforms to the operation habits of referees, and real-time transmission, reception and display of competition data can be realized through this system.

The system is designed and developed on the basis of analyzing the rules of air volleyball, badminton, table tennis and tennis. The system realizes the industrial control screen to display the athlete information and competition information directly, which can greatly assist the referee in judging.

The system is very suitable for air volleyball, badminton, table tennis, tennis and other sports started at the same time. Display integrated design reduces the input of human and material resources, strong practicality.

The system adopts modular design, with strong expansibility. Users can update the software system according to the rules of different sports events by adding an “event selection interface” to meet the needs of scoring different sports events.

The application of this system in many college sports competitions in Hunan province shows that the system can effectively reduce the workload of referees and improve the work efficiency and quality of referees, in addition, it can enhance the spectator experience.

It should be noted that this system is based on an industrial control computer-LED screen, and the outstanding advantages are convenience, multi-function and intelligence. However, the content of sports competitions is very extensive, and there are many unexpected situations in actual sports competitions. In view of this, the system needs to continue to enter into in-depth research and design in terms of functional modules, operability, convenience, and so on.

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