

Research of Chinese Rowing Team Information System

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Abstract

Indicate the concept of sport information system and discussed its basic theory. Sport information system based on common computer sciences such as software, database and network, and also has special character about sports. The Chinese rowing team information system designed for Chinese rowing team training for Olympic games. The system contains five function modules: basic information, schedule, test, results and injury, service and technologies.

Keyword: Rowing; Information System; Database.

I. Introduction

Sports information system is a subsystem of information system. According to information system theory and the status of the sports system, we indicate that sports information system is a human-machine system which uses computer and communication technology, to provide sports information service for people. Coaches, athletes and sport scientific researchers faced with mass data, however, they requires not only just a lot of data, but also statistic and analysis of the data. So how to design and develop the sports information system is an important issue for sport scientists.

II. Basic Theory

There are many kinds of sports information systems, according to different standards and needs, the result of the division is different. Divided by the network, sports information system can be divided into local area network information systems, metropolitan area network information systems and wide area network information systems. Divided by the content of sports information, sports information system can be divided into training information systems, competition information systems, physical education information systems and so on [1].

Database is the most basic components of the sports information system, it is composed by hardware, software, data's collection and application, to provide users information services, with the function of data defining, organizing, storage, searching, managing and communicating. Database with advantages of high data independence, few redundancy and unified management and control. Database is very important for sports information systems to storage, manage and integrate information. Sports organizations need to establish appropriate information systems, analysis the system, design the database. Only the database rationally can meet various applications. The designer needs to ensure database integrity, consistency and safety, enhance the efficiency, and make it easy to modify and expand.

The network is the necessary carrier to support sports information system for exchange, transfer and share the data. As the diversity of sports information system, it needs different topology, performance and communication protocols. Construction of network system not only to purchase network equipment, but also is a system engineering problem. How to design and implement the network of sports information system is very important. As mention above, the network can be divided to local area network, metropolitan area network and wide area network by the communicate span. According to the nature of management, the network can be divided into professional networks and public networks. According to the topology structure, the network can be divided into point to point networks and broadcast networks. The topology structure of point to point network include the

star type, the loop type and the mesh type. The topology structure of broadcast network include the bus type, the microwave type and the satellite type. The network also can divided into the circuit switching networks, the message switching networks and the packet switching networks. Requirement analysis: Firstly, make clear the sports organization's distribution, geographic environment, the existing distribution of network resources. Secondly, analysis the service users need. In addition, estimate the data traffic, include the amount, frequency, delay, capacity and life cycle of the network nodes [2]. At last, make clear the requirements of data transmission speed, security, reliability and openness. Feasibility analysis: Description the formation of networks in technological, economic and social conditions. Review various possible technical solutions, and make the final choice.

Compared with the general technical engineering, the difficulties of the sports information system's construction not only about technical, but also about the sports system and external environment. The relational factors mainly about institutions, policies, regulations, concepts, technology and other factors. At first, sports information system is seen as a sports organization with computer technology applications, consider the development as a technical process [3]. Users hold that the development is the work of developer, the developer stated that the user should be aware of their requirement and leave them alone. This manner often misunderstanding on both sides, waste of time and resources, or leaving the system short-lived because of maintenance problems.

In the development process of sports information system, users, administrators, analysts, technical experts, programmers and other participants contact and influence each other. Their complement is very important. However, the knowledge structure and experience of them always different, so the communication usually be affected. More importantly, the sports information system will inevitably change some business processes as well as organizational structure, which will affect personnel work and power relations, causing conflicts between departments and works. Sports information system is not simply a computer system, but the human-machine system

supporting sports management. Human is an advanced and complex factor of information management and make it became a decision-making social system [4].

III. Chinese Rowing Team Information System

In the Rio de Janeiro Olympic Games training period, Chinese Sports General Administration attaches great importance to the information technology of national teams, commissioned Chinese Academy of Sciences, Tsinghua University, Beijing Sport University, Zhejiang University and many other well-known institutes to research for national teams. We are responsible for Chinese rowing team. According to the status of the Chinese rowing program, and the accumulation of intelligence data processing, as well as the requirements of coaching staff, designed the Chinese rowing team information system.

3.1 Introduction of rowing

The Olympic programme has included men's rowing since 1896 but rough seas in the Piraeus harbor forced the events to be cancelled at the first Olympic Games. Women have been rowing in the Olympics since 1976 and lightweights since 1996. The Olympic rowing programme includes 14 events. Boats or shells were traditionally made from wood, but are now mostly fabricated from carbon fibre and plastic (eg. kevlar). They are 59.7 - 62.2cm wide while lengths are shown in the diagrams below. A small fin is fitted at the bottom for stability. A rudder is attached to the fin or the stern (except on sculling boats). A white ball is attached to the bow (safety measure, photo-finish). A washboard prevents waves from splashing water aboard. Seats are fitted with wheels which slide on runners or tracks. There are eight boat classes, of which five are for sweep-oared rowing in which the rower uses one oar with both hands, and three are for sculling in which two oars are used, one in each hand. Some classes carry a cox who either sits in the stern or lies in the bow to steer the boat [5].

The salient features of rowing is the skilled of technology, the stationary of action, the complexity that physical function and psychological quality affect the competed of athletics. The key

of scientific training is construct training whose program is integral, Ideological and theoretical system of competition and technical knowledge innovation platform. Quantify athletes' technology, movement, physical function and psychological state, then research the relationship between the training data and competition results and quantify factors. That is an important method of exploring the objective law of special training. Many factors affect rowing performance, such as tactics, techniques, equipment, psychology, environmental, functional fitness from a macroeconomic viewpoint (biological factors). As a result, we can apply information technology to sports practice, and quantify, integrate, correlate the training practice, while establish data model for database training. It can promote the understanding laws of training. To promote the using of the training aids efficiently, we can classify, screen and process all kinds of training information and then share the information through the network.

A. Analysis & definition

The system is mainly for the management of training schedule, testing, competition results, injury and basic information. Training schedule management include: planning, planning inquiries weekly and daily, load statistics inquiries weekly and daily, output reports. Injury management includes injury records, recuperating and nutrition. Basic information includes coach information, player information, site information and weather information. Users are national rowing team coaches, the interface must designed simply for them to manipulate data [6].

The system based on windows operating system, network environment, uses the cross-platform functionality technology JAVA, easy migrate to other object-oriented operating system. Clients' CPU need to P III 600 or above, memory capacity not less than 128M, hard disk capacity not less than 6G, CD-ROM, printer and USB interfaces are required. The network equipment should be switch and network adaptor.

The Chinese rowing team information system developed with a modular approach. Workflow of the entire system is divided into several modules according to stage. Each module integrated into the

system with interfaces. The system designed in browser and server structure, the operation doesn't need to install the special front application, only through the browser can access the corresponding information, the operation is simple.

Information platform for the national rowing team systems run mainly done through the browser. As long as the user's PC equipped with a browser, and in the same network with server, can access the system. System has a function of refreshing limitedly, if the users online does not operate the system in a certain period, will be automatically off. If an exception occurs in the operation, the system will automatically record the user's operation. The Chinese rowing team information systems logic process described graphically in Figure 1. The system started from input, through the system processing, end at the logout. Focus on system's dynamic characteristics, data entry and data export, interface with other programs, priority, cycle and special treatment.

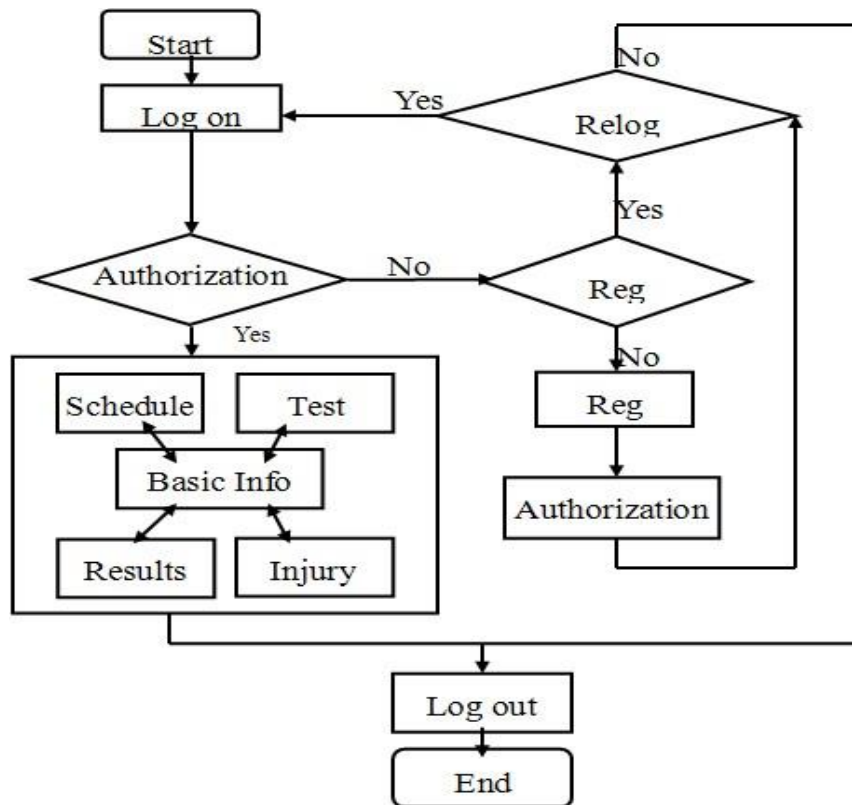


Fig 1 Logic process

B. Function modules

Basic information

Import, search and modify information about athletes, coaches, researchers, venues, training bases (address, average temperature, elevation, average water temperature, average humidity, average wind) and other basic information. The data sheets connected to other functional modules.

Schedule

Import, search and modify information about training plan, daily and weekly.

Test

Import, search and modify information about testing(men's ergometer 500m, men's ergometer 2000m, men's ergometer 6000m, men's step, men's indoor, men's strength, women's ergometer 500m, women's ergometer 2000m, women's ergometer 6000m, women's step, women's indoor, women's strength, heart rate, blood pressure, testosterone, creatine kinase, lactacidemia), every athletes' data of the test will be shown in chart automatically.

Results

Import, search and modify information about game name(three main competitions: Olympics, World Champs and Rowing World Cup), date, location, events(men's single scull, women's single scull, men's double scull, women's double scull, men's pair, women's pair, men's quadruple scull, women's quadruple scull, men's four, women's four, men's eight with cox, women's eight with cox, men's pair with cox, lightweight men's single scull, lightweight women's single scull, lightweight men's double scull, lightweight women's double scull, lightweight men's pair, lightweight men's quadruple scull, lightweight women's quadruple scull, lightweight men's four and lightweight men's eight with cox), boat numbers, results(500m, 1000m, 1500m and 2000m), ranks.

Injury

Import, search and modify information about injury, nutrition and rehabilitation.

C. Database

According to training process and logical structure of the system, the system data can be summarized as: personnel data, training data, competition results and other relevant data. Related to the string, number and image type. The implementation of specific procedure should regulate the

data types reasonably. The process of function realization can be by means of array, assemblage and linked list data structures to represent the data in the process. Define the appropriate length for the field in definition of the database structure, to prevent the condition which the system does not support the data overflow. Make sure different tables in the database are closely linked.

D. Data structure

Logical data structure

The logical structure of the system and the flow chart of the training game process, can send data attribute system: personnel information, training data, training plan, performance data. Personnel data involves the string, digital and image types. In the specific program design, reasonable regulation and database, JSP supports data types. In the process of the realization of functions, can be used to array, set, list data structure to describe data item in the process of use [7].

On the database structure definition, for the length of the field to define an appropriate, to prevent the system does not support data overflow occurs in use. There is a close connection between the different tables in the database at the same time. Compatibility is the national rowing team information system and computer operating system again, so in the development must take into account the support software software environment, now the development of object oriented software development process generally is WINDOWS based on window type.

Physical data structure

Data related to the Chinese rowing team information system is realized by the ORACLE database management system, for each module relates to the data in the database is in the form of management table. If there is a shared or visits requirements between tables, the realization of the data access interface in the table definition. Information platform for the national rowing team in the aspects of data sharing, must have a flexible space greatly, this not only for each function module, this situation also exists for the inter module data. So in the process of specific written before must know the whole operating process flow of all the function modules, the need for sharing module management data access interface suitable definition.

The whole process management of the Chinese rowing team information system involves a large number of different format data, these data not only large, but also the size of spatial units of different types of data has not a. Information platform for national rowing team to achieve graphic model of process in process monitoring, since it involves graphic implementation and updating, computation is very large, this is the PC or server CPU has put forward higher requirements. Only the process management on the computer icon on the high frequency of it is more intuitive.

Another point is the Chinese rowing team information system and computer hardware compatibility issues, so in the development must take into account the support software running on the hardware environment.

E. Error processing

For the problems of the function timely maintenance operation. The system in the maintenance time do it long enough, the use of the system over a period of time after the summary, or do the upgrade and find a better alternative to upgrade module.

At the system design stage, each version of security system, the system is not complete maintenance work, can be the first to use the previous version of temporary work, do the flow of data to grasp, and not because the system could not run and maintenance of data processing [8].

Recovery is to find the fault point, from the point of failure to resume execution. Restart technique is a major problem for the party system measures, find out the software running on the source, from the source point lifting the starting system and maintenance system.

IV. Key Technologies

A. Role-based access control

Role-based Access Control (RBAC) Technology, according to different positions divided into different roles, the permissions of database access to resources encapsulated in the role, users are

given different roles, indirect access to database resources, thus the system designed a user list and a role permissions table.

B. Optimization query

In database development and maintenance process, the design of query optimization can improve system performance, particularly important in database systems with large amount of data. The system is mainly used two methods that establish the proper index and optimize the query sentences.

Establish proper index

In [9], to establish an appropriate index, can avoid scan the table and reduce the I/O cost of query result, can improve the speed of query execution. In general, the greater of data in tables and the less results returned by query, the clearly the effect of index is. To the database as an example, in the WHERE clause of a column (such as ID, Name, etc.), index is often used to speed up the search.

Optimize the query sentences

Optimization of the SQL statement, can reduce computation and memory requirements, improve responsiveness. For example, when multiple selection operation in the same form, stringent conditions could be headed and weaker conditions on the back, this method can reduce the size of the temporary table, improve processing speed. When the Associated selection operation occurs in multiple tables, the SQL statement using nested forms in order to reduce the amount of data.

C. Security

To ensure the safety of the system, choose the relatively highly reliability security hardware, timely update operating system patches and antivirus software's virus database; when implementing close port which is easy to attack, such as Tel-net, FTP, etc. As infrequently as possible to use the pointer, and avoid to manipulation directly to memory programming [10].

D. Database backup and recovery

Database is the core of the system, managed to maintain data integrity in case of hacker attacks, viruses, sudden power outages and other catastrophic accident, needs data backup and recovery. According to different situations, using different backup and recovery strategy.

Backup

In the case database operate uninterrupted, physical hot backup can be used. This method requires that the database processing should operate under the archive mode, then use the appropriate operating system backup command back up the database data files or control files respectively. Hot backup based on archive mode, combined with archive logs, can restore the database to all the state that data had been submitted, without any loss of data.

If we backup the data for system logically, we can take the form that regular database full (Full) backup, export the database fully at a certain time period in the form of full library, then take increments or cumulative export in the other time of this cycle. Based on the above export operation, we can take logic back up completely, also provides corresponding scheduling settings of the data import.

Recovery

Data recovery is based on data backup, Need back up data files recovery. If there is no data backup, data recovery is unfounded. If we failure to read the temporary table space data file, then we should remove it from the database system, create another temporary table space, assign user who use the temporary table space use a new one; If we failure to read data file, then find the previous cold backup data files, and plant. At last, recover it according to archive logs; If the disk media of the database system crash, we can overwrite all of the previous back up data, then go to restore operations according to the control file in other disk and database archive logs.

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