

# Design and Implementation of Management Information System of Field and Track Training

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## Abstract

In terms of features of field and track athletes' training, this paper, integrating techniques of network, database, computers, multi-media, image processing, etc, devises a management information system of field and track training based on B/S model and provides an training information processing system. This paper analyzes the systematic functional structure and the constitution of systematic sub-systems in detail. Meanwhile, it elaborates on the design of systematic functional structure, network structure, link modes and systematic soft wares' functions, and introduces web, database and ASP dynamic homepage technique applied in the interactive Web system design, followed by the cases for illustration of some relevant designs.

**Index Terms:** Field and track; information system; database; Web; B/S model; ASP

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## 1. Preface

In recent years, field and track sports have made tremendous breakthrough worldwide, especially in field and track sprint. When the achievements in sprint continue to challenge the limits of human beings, people realize the increasing importance of modernized and scientific methods in field and track. To further enhance the training level of China's field and track and maintain our advantage in parts of men's events, it is necessary to resort to scientific training management methods.

At present, the major sports powers in the world have invested considerable technical power and capital, using various advanced technology and modes to study the athletic sports, aimed at improving athletes' performance, including the research and improvement on training methods. Practice has proved that the advanced technology training management is of great help to improve the athletes' performance. The sports sector in China has also witnessed this trends and has done some research and trial work. Some research fruits have been made in field and track training, however, there still hasn't been a complete field and track training management system.

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In recent years, with the tremendous development of international internet techniques, web database technology has achieved some new breakthrough and traditional soft wares with C/S structure need to develop different versions of soft wares in light of different operation systems. Because of the rapid upgrading, high cost and low efficiency of products, they no longer meet the operational needs; therefore, network structure with B/S model arises on the basis of C/S model, hence the emergence of information management system based on B/S model. B/S model information management system has advantages of simplified clients, development of system and low cost of maintenance. In B/S model, the clients can be used as long as the operational system, network agreement software and browser are installed and this kind of simplified clients are commonly called "Thin clients"; on the other hand, convenient operations for the users. When applying B/S model, the clients are merely a simple and easy-to-use browser software and the operators can apply it without training. B/S model information management system is more suitable for the construction of training management systems with greater mobility, such as field and track [1].

In terms of current situations of field and track athletes' training and management, this paper, integrating techniques of network, database, computers, multi-media, image processing, etc, devises a management information system of field and track training based on B/S model and provides an training information processing system. The system can be used to manage the training information of the athletes, accumulate training experience, analyze study and summarize the information, and to instruct the athletes' training, enhance their training management level and finally to improve their athletic performance.

## **2. Functions & Characteristics of the System**

### *2.1. Information Processing*

The system can be used to manage the athletes' routine training and competitions, and to collect, classify and organize the relevant training information as the accumulation of training experience.

### *2.2. Relevant Analysis and Prediction of the Data*

The system can set the training information as data samples for the users to make statistical analysis, using modern mathematical methods, statistical methods, simulation methods, etc, of the previous performance arbitrarily in terms of time, project, athlete, coaches, competition level or performance level (in trainings and competitions). In addition, the trend analysis can be carried out with predication model to enlighten and instruct the coaches and athletes for correction on training methods.

### *2.3. Posture Assessment*

The system can also provide the assessment system on the postures of technical movements in field and track, the access and processing system of video information of the postures and other management sub-systems in field and track with data analysis and application platform, which will allow the other sub-systems to be installed in the system leading to the building of the whole system. [1]

Because of greater mobility of trainings and competitions in field and track, the application of network structure by the system can provide many link methods and ensure accuracy. Considering the diversity in training methods, the system has greater potential of extension and functional modules can be defined by users themselves according to their requirements.

### 3. Key Techniques of the System

#### 3.1. Web Database Technique and Browser/Server Model

The system design adopts Web database structure and applies Browser/server model. Based on the implementation of Web information system, Web model of the international internet is made use of to establish the standard platform and server in the inner LAN which is connected to Internet. Its key technique lies in the seamless interface between Web service and application service as well as data service. In other words, the application processing information and data information with HTML formula can be converted into the accepted HTML formula and the link technique between servers and database by the browser. Commonly speaking, the browser sends out the request via HTML form or hyperlink; then the server receives the request, translates the results into HTML and various Script languages, and finally sends them back to the browser [1].

Browser/server model is Web-focused, applying the TCP/IP and HTTP transfer protocols, and the clients, via the browser access the Web server and the backstage database linking to the Web server, with its structure listed in Figure one:

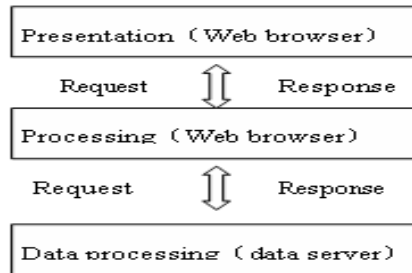


Fig 1. .3 layers of B/S model

In B/S model, the clients can access the application programs only with the installation of a browser, which has not high requirements for the hardware and software. Thus B/S model enjoys the advantages of easy-to-use user interface, easy for maintenance and upgrading, wonderful openness, high degree of information share, good extension, powerful utility of the network and pleasant safety. The low requirements for the networks facilitate the coaches and athletes to use them during their away matches.

#### 3.2. ASP Technology

The system adopts the dynamic interactive Web technique and via IIS and the active server page, it can realize the dynamic interactive Web design.

ASP (Active Server Page), a technique developed by Microsoft, can replace CGI server and it is based on the programming environment of IIS (Internet Information Server). It integrates HTML, script and Active X into a \*.asp file and produces dynamic and interactive Web application programs.

When client browser sends out request for files to the server, the server will respond to the request and explain the ASP interface requested. When confronted with the script instruction, the corresponding script engine will be started to handle it and interpret it in the server, then the HTML document will be produced based on the results of database access and will be issued in the client browser.

Asp enables the connection between Web and database simply and efficiently, integrates HTML, script and other components and build effective interactive dynamic Web application programming environment. Its

interaction can be reflected in that it can receive the users' submitted information and respond to it with no necessity of manual renewal of page files to meet the application needs. The data in database subject to change and the application program carried out in the server is doesn't have to be changed.

**4. Overall Structure of the System**

Considering the greater mobility of training and competitions, the system sets the Internet and Web model as the standard platform and adopts the 3 layers of B/S structure, enabling more extensiveness of data in the system and more convenience in use. The server includes Web server and database server. The application layer lies in the Web server, responsible for the receiving of the requests from remote users and local users (coaches, training center and policy-makers in bureau or sports administration) via browser, then relevant data will be accessed from the database server which will in turn be sent back to the browser. The data layer lies in the database server, responsible for the data store.

**5. Structural Descriptions of the System Functions**

In light of the target the system will attain and the specific analyses of the training information management system in Web setting, the system, according to its whole design, is categorized into 4 subsets, data management system, competition performance analysis system, technical posture management system and training analysis management system[2].

*5.1. Data Management*

Operations of addition, modification, deletion and query are available to the data in the data warehouse.

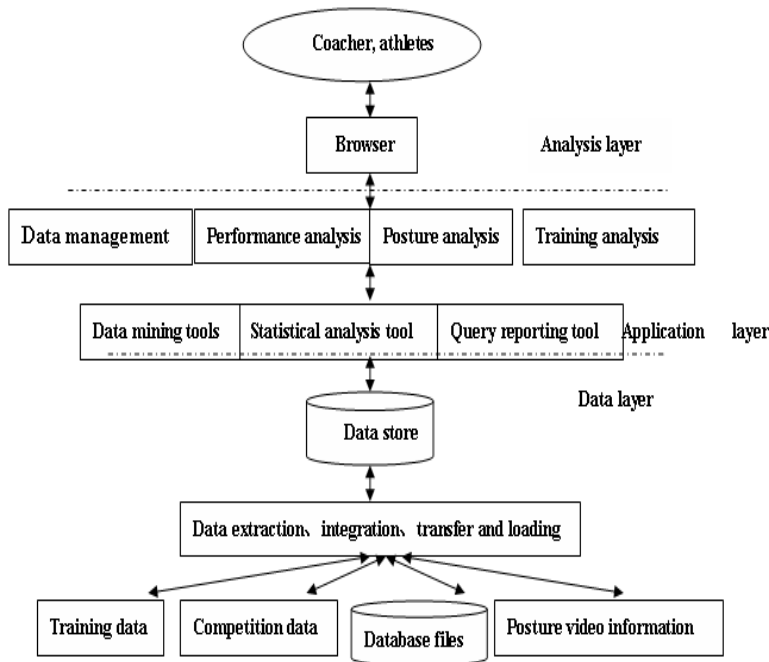


Fig 2. Overall structure of the system

### *5.2. Performance Analysis and Prediction*

The system, via statistical analysis tools, enables to provide the clients with the previous performance arbitrarily in terms of time, project, athlete, coaches, competition level or performance level (in trainings and competitions). In addition, the trend analysis can be carried out with predication model to predict the future performance and the results can be represented with forms and graphics [3].

Headings, or heads, are organizational devices that guide the reader through your paper. There are two types: component heads and text heads.

Component heads identify the different components of your paper and are not topically subordinate to each other. Examples include Acknowledgments and References and, for these, the correct style to use is "Heading 5". Use "figure caption" for your Figure captions, and "table head" for your table title. Run-in heads, such as "Abstract", will require you to apply a style (in this case, italic) in addition to the style provided by the drop down menu to differentiate the head from the text.

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### *5.3. Training Analysis*

Training analysis enables to analyze the completion of every plan in a certain time and technical characteristics of a certain athlete, including amount of exercise, exercise intensity and steadiness of technical movements. Besides, the data representing the outstanding athlete can be used to make comparative analysis, making it possible to grasp the conditions of the strategies and techniques generally.

### *5.4. Posture Analysis of Technical Movements*

The data concerning the completion of the movements in the training system are accessed through retrieval and analysis of movement images of athletes, while the imaging information and relevant data are accessed through availability of the video information of postures and processing system.

## **6. Network of the System and Design of Database**

In light of the special requirements of training, the network design of the system adopts the B/S model. Considering the limitations of conditions for use, the system also designs the single machine which can be operated offline and can well integrate with the networks.

### *6.1. Overall Design of Networks*

#### *1) Design platform:*

The system is based on Web database structure and adopts network structure with B/S model. Windows2000 serves as the system development platform and development tools like Microsoft InterDev are used. Besides, ASP Active X and other relevant languages are used to program the system. After the completion of the system, it will run in the setting of Windows2000 and Windows9x and users can use the system via Internet browser.

The hardware of the system includes Desktop server, PC machine, portable computer, network linking equipment and some relevant imaging collection procession equipment, etc [4].

## 2) *Network structures:*

The system adopts the B/S network structure, including the server end and browser end. The server end lies in the 10/100M LAN and can connect the Internet via LAN and a dial server. The browser end can connect the server via several modes in different locations.

(1) Server end includes Web server and database server. Web server carries out some relevant operations on the submitted request from the users, for example to analyze the training results and present the analysis results, and for another example, when the system receives the request to plan the users' training, it will display the training plan page and finish the record for training plan jointly with the database server. Database server deals directly with the query, storage, deletion and modifications of the data. The data processing instruction launched by the Web server is transferred to the database server. And the database server will finish directly the operations on the data and sends back the operation results back to the Web server for further processing.

(2) Browser end is the internet browser and works based on any operational system supporting script explanation language browser. Users can operate the system via the browser. And the processes are: users send out the operational instruction to the server end via browser end, the server explains and implements the instruction, for example to display the page, to carry out data analysis or to drive the database server to conduct some relevant operations. After the implementation, the server will send back the final results to the browser end, for example, the contents in the training plan and the training analysis results.

## 3) *Connection modes*

The system provides many connection modes, convenient for users' use. There are several connection modes between users and servers end as follows:

(1) LAN (10M/100M LAN). Users connect the server via 10M/100M LAN. This connection mode is always applied in the training base with good LAN environment and training venues.

(2) Offline mode (Single Machine). Besides the network environment, this system can be applied in offline mode, in other words, it can still be used in the locations where networks are unavailable. For example, in away matched or training intervals, the portable computer with the servers and users end of this system can be used and although there are no hardware and network availabilities, the offline mode can be employed to record training, competition data and conduct analyses normally. When the network is available, LAN mode shall be employed to deliver the record and the data analyzed back to the headquarter server for the intactness of the data and further analyses.

## 6.2. *Overall Design of the Database*

Due to the characteristics of such information system, the data stored in the database are mainly in the form of numbers, text and multi-media. In light of analyses of the physical use of the system and data upgrading, the data in the database belong to the medium order of magnitude. Therefore, Microsoft SQL Server is employed as the database. Considering the online and offline modes, 2 kinds of database structures are designed for network and single machine. In order for the data upgrading, maintenance, copy, safety and convenience, the data must be normalized, making the offline database identical with the network database, including the data structure, and setting recorded time as index for offline upgrading of data.

## 7. **Function Desigh of Software Structure**

The software implementations include 4 functional modules: performance analysis and prediction, training analysis, posture analysis and system management, as can be listed in Figure 3[5].

Module of performance analysis and prediction includes performance analysis, training performance analysis, performance prediction model, etc.

Module of training analysis includes the analysis of the amount of training, the intensity of training, the completion state of training, etc.

Module of posture analysis includes the comparative analysis of postures and stability analysis of movements. Through comparisons with the postures and movement structure of the world-class athletes, the athletes can find their shortcoming and gaps, making the coaches and athletes take the opportunity to assess themselves and gain a better understanding of states of movement completion.

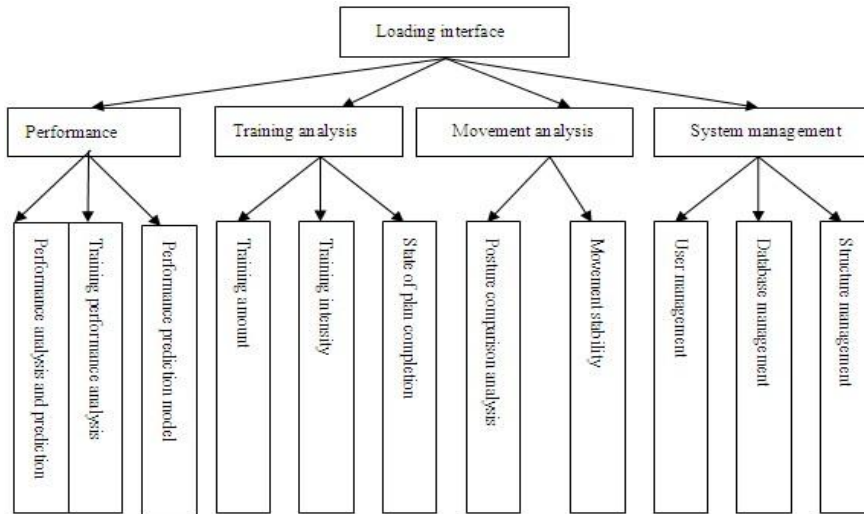


Fig 3. Structures of software functions

System management subsystems are mainly used to manage and maintain the system, including management of the users, data management and management of system structures.

## 8. Conclusion

Making use of advanced information technology to make scientific analysis and guidance to training is serves as an effective means to enhance the athletes' level. In this paper, Web database and ASP are used to design and realize a management information system for training under the network environment, integrating the various necessary analyses in training, prediction models and methods, which provide a convenient and uniform data analysis processing platform for policy-makers of varied levels and meanwhile scientific quantitative basis for the layout of training plans. The system is characterized with convenient use and comprehensive functions. In the future, in terms of the extensions of the system functions, the accessibility of posture video information in field and track and the analysis and assessment of postures in training, further exploration and research shall be conducted.

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