

The Application of Web Technology and Data Mining Theory in Physical Result Management System

Zhou Bo,
Hunan Normal University
Changsha, Hunan China
zhoubo2015007@163.com

Zhou Chao
Hunan University of Arts and Science
Changde, Hunan
China



ABSTRACT: *This study introduced the layout and realization of physical result management system. Firstly, it gave a introduction of the study background, relating to the Web Technology and Data Mining Theory involved in project developing; then it analyzed the requirements of user and gave the analyzation of systematic data flow based on the requirements. Secondly, it elaborated the technical framework of the system and the design proposal of the data base, on this basis came the implementation process of each functional module of physical result management, and then the discussion of the application of data mining in this system; finally, it conducted a corresponding system testing and validated the accuracy of the system function. Based on the above plan, the results of this dissertation are listed as follows: a physical result management system was developed, which included function modules such as the management of test type, test item, sports performance and the convention of point scale. PE teacher is able to complete sports performance management and data gathering, achieving the goal of improving the quality of physical education.*

Keywords: Physical result management; Data mining; Decision tree

Received: 20 July 2016, Revised 19 August 2016, Accepted 26 August 2016

© 2016 DLINE. All Rights Reserved

1. Introduction

Due to the reformation of educational system and the widening of educational mode, people pay more and more attention to physical education; in addition, Ministry of Education has made a series of training and performance standards according to the educational curriculum. Moreover, physical education test has been brought into the academic results of students, as one of their integrated quality standards. However, the results of the tests are usually stored on the school computers which just serve as a resource or file. Although students have attended the physical fitness test, they know nothing about their physical condition. With the development of computer technology and the popularity of all kinds of modern educational equipment, various information management system are widely applied in college. In allusion to problems and situation of physical education in college, by constructing information and taking full advantage of modern data mining techniques, it tries to achieve automatic processing and analyzing of a broad range of sports-related data thus enable the inquiry of students and the statistic analysis of teachers[1]. Many colleges started to conduct some relevant researches on this system, relying on the data mining system; they applied it to instructional management system and made remarkable results, which has improved the level of management in school a lot. Many researchers have found that there is a large amount of data in college that can be used in data mining techniques, they begin taking up researches on the college data mining techniques, therefore, its application fields have been further expended. Zhang Lin has made an intensive study of mining technology, putting forward ID3 algorithm to have a through analysis of some relevant data in college dean's office in order to explore the correlation of different curriculum setting, finally to provide university policy-maker with data reference [2]. Ni Wei came up with the idea of applying SQL Language and VisualBasic Interface in grade management system to realize the management and statistics of physical scores, thus to meet the needs of teaching[3]. He Dong, during his research process, adopted three major techniques; they are ASP, Javascript and Vbscript. While building the systematic database model, he employed the method of Normal Form, by applying methods of Pigeonhole Principle and Dichotomous Search Algorithm in data setting and convention, fulfilled the data processing and analysis through model building [4]. This thesis will make a specific needs analysis and requirements of the target system by detailed conversations with related departments in school and physical education teachers, and it will draw up different physical result management system projects according to the analysis results. With the help of the popular ASP.NET techniques currently, it tries to realize the design and development of physical result management system, solving diverse problems that exist in the grade management system in physical education at present, and hoping to offer corresponding references in application to physical result management system.

2. The Development Technology of Web

ASP.NET, evolving at the basis of ASP technology, is an entire development technology which combines both ASP and NET. It is mainly used for the design of dynamic pages and has the advantage of many other technologies but not limit to those traits. It is the most commonly seen technology in software market, which accounts for a large market share.

The three-tier structure of ASP.NET commonly refers to the three-tier architecture of NET. That is, to divide the whole application

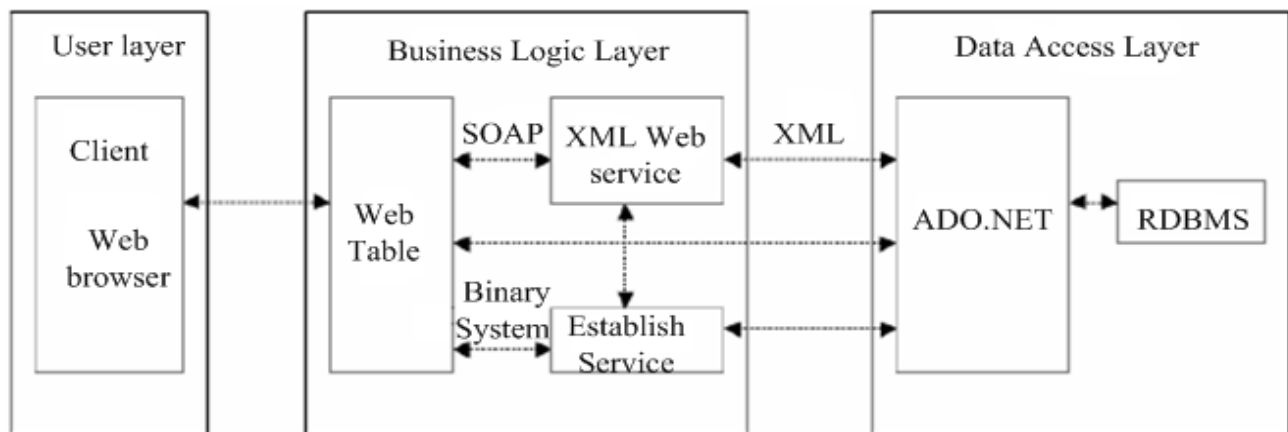


Figure 1. Three-tier structure based on the ASP.NET

tier into client layer, business logic tier and data access layer. In this way, the speed and efficiency of data processing of the system can be increased [5, 6]. The diagrammatic figure of three-tier structure is showed in figure 1:

SQL is a structured query language and SQL Server is a database management system. Database management system is used to store various data that used in the system. Moreover, it can implement various data operation by invoking SQL statement, including inquiry, modification, deletion etc [7]. The physical result management system chooses the data base system of SQL Server 2005, and it selects this version because of its unique strengths as follows: (1) the application of distributed view greatly increases the database access speed and improve the work efficiency as well as the quickly locating of the data. (2) it supports for multiple language development, including the commonly requested XML and some others. (3) it has a better performance and higher reliability. (4) it combines a variety of commonly used techniques to realize the data integration. (5) it provides the clients with virtual network interface system.

3. Data Mining

Data mining refers to the law analyzation of the existing large data volumes so as to find out the hidden data law, and it put emphasis on the prediction of the future data. It possesses the functions as follows: 1) analyze the available data and predict the future trend. 2) achieve the association analysis of multiple data sets. 3) realize the clustering of fragmented data. 4) give concept description and deviation description etc. It features the characteristics of large-scaled data processing, real-time random queries, future trend prediction, decision basis supply, etc.

There are multiple data mining methods, the following three ways are commonly used. 1) data summary: fulfill the data enrichment in a certain way and show it in a specific chart. 2) classification mining: adopt a classifier tool to map the data that needs to be processed. Bayes method and non-parametric method are commonly used to construct classifiers. 3) clustering method: classify the data of same categories so as to achieve the clustering of data, statistical methods and machine learning methods are usually applied in this process.

Decision Tree is a way to classify all data in the form of a tree model, from root node to branch node, and every node will be tested correspondingly. All branch nodes that form the decision tree will be seen as a enormous data set space, and all the non-leaf nodes in the decision tree will be the aggregation of corresponding attribute of the data. The correspondence between natural tree and decision tree is showed in table 1:

| Natural Tree | The corresponding meaning in decision tree | Expression meaning in classification problems |
|--------------|--|--|
| Tree Root | Root node | Training instance of the whole dataset space |
| Fork | Internal(non-leaf)-nodes, decision node | The attribute of sorting objects (assemblage) |
| Branch | Branch | Possible value of attribute |
| Leaf | Leaf node; state node | Data partitioning (classification result) |

Table 1. The correspondence between natural tree and decision tree

This study adopts ASP, NET as its item system software development platform, combining with SQL Server database, develops a physical performance management system based on the three-tier architecture of ASP.NET. As for the analyzation of physical scores, it employs decision tree which based on ID3 algorithm [8, 9].

4. Systematic Design

The design of the target system is based on the data mining technology. By detailed conversation and discussion with professional sports-related teachers from high vocational colleges and in allusion to problems emerging in the process of physical performance management, it puts forward plans for design and development of the physical results management system. By applying the target system, It aims to solve the present problems in physical management and to free PE teachers from their previous busy work and realize the automation and informatization of physical results management eventually.

The major consideration for data analysis content is the direction of data flow and whether it changes or not, and what changes it may occur during the data flowing. Those all needs to be recorded and analyzed accordingly. The figure of zero layer data stream is the description for specific functional modules, as showed in Figure 2. Moreover, it can be seen from the figure that

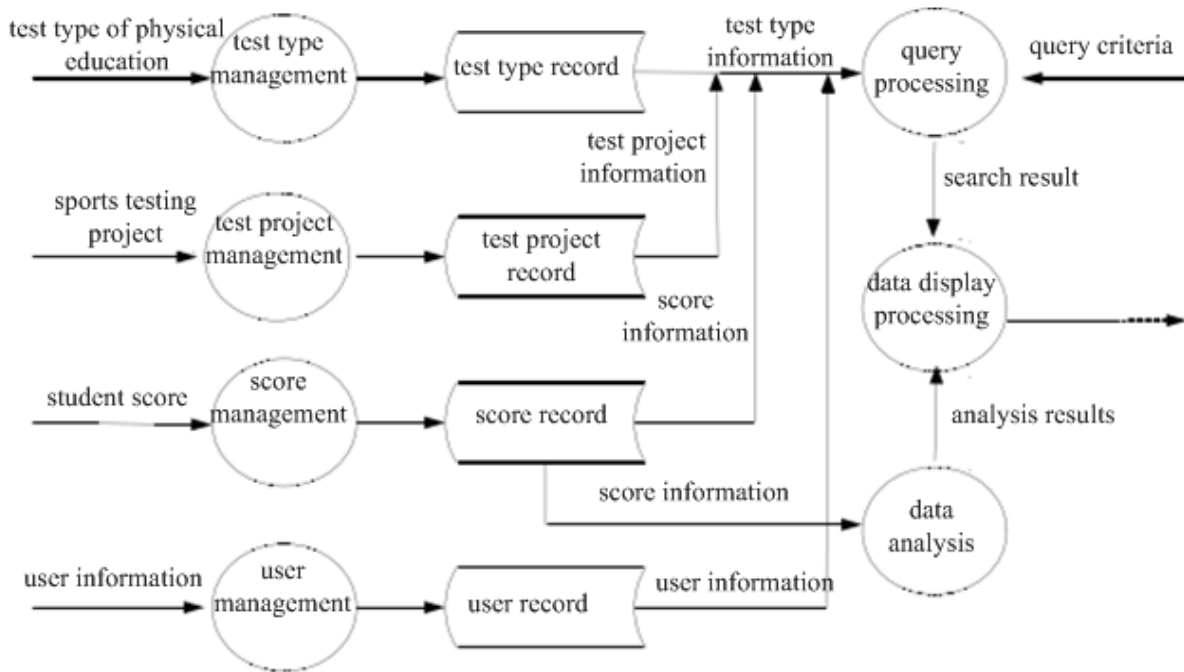


Figure 2. Zero Layer Data Stream of System

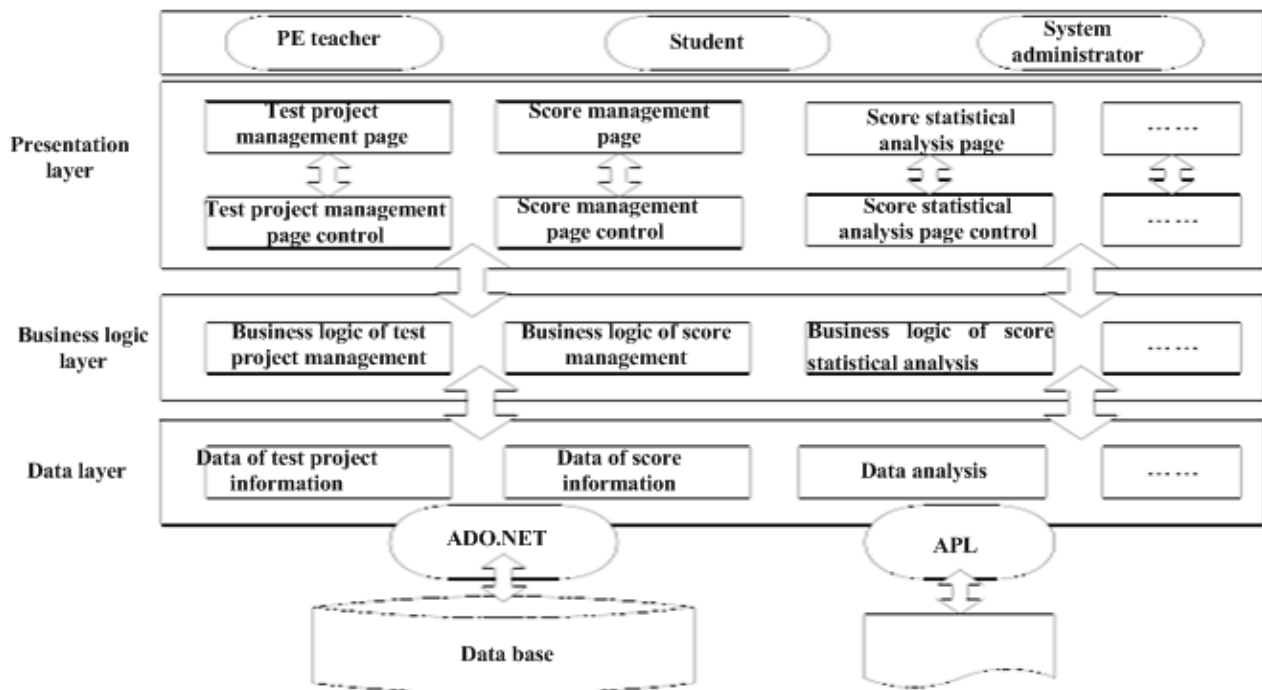


Figure 3. Overall Technical Structure of System

after the user information entering the system, user management module is responsible for the data processing, and then to record the information in the user logbook, meanwhile, this information will be fed back to client-side user eventually after being queried and analyzed.

The development of target system adopts the three-tier architecture of NET, which divided the whole application into three levels, namely, presentation layer, business logic layer, data access layer. Its overall technical structure is showed in figure 3:

In the process of system development, functional module designing is an important work. By a detailed conversation and discussion with target user in the earlier stage, the functional requirements of system work out. Here it transforms the functional requirement into a specific functional module of the system, in order to reach the function required by users through functional module designing.

It is inevitably to involve a large amount of data during the operation of system, because the essence of system is to complete the program execution and data operation. In fact, designing the database is to design the data relations and connections and to set up a data module for them. Database designing usually includes database conceptual design, database logical design, database physical design, etc [10].

5. System Implementation

The key functional modules of target system includes the deletion of physical test type, addition of physical test project, input of test scores, transformation of point scale, generation of the decision tree, etc.

1) physical test type: the management of physical test type includes functional modules as addition of test type, update of test type, deletion of test type, weights setting, etc. The database table mainly involved in the module testing process is type test table, while the corresponding database program statements are insert, update, delete, which corresponds to Insert, Update, Delete.

2) physical test project: it refers to the management of relevant information of physical test project, which mainly includes the addition of physical test project, update and deletion of physical test project, weights setting, etc. The major database table involved in it is the test project table of information. The program flow for adding a test project is showed in figure 4:

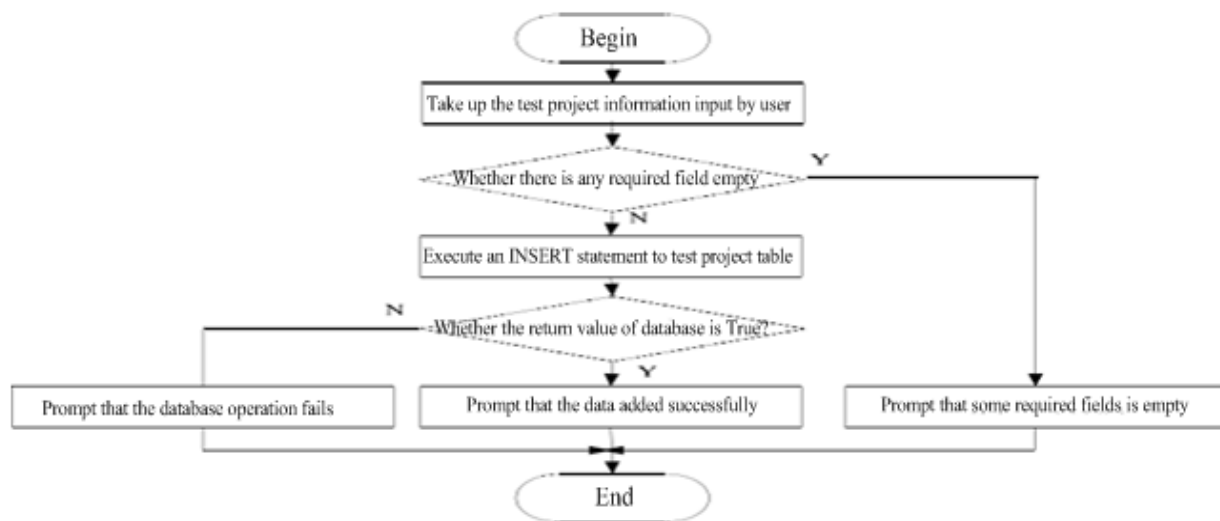


Figure 4. Program flow for adding a test project

3) score management: supervise information related to the physical scores of students, which mainly includes the following functional modules: score input, score update, score deleting, score query, score derivation and point scale transformation[11]. Its flow graph is showed in figure 5:

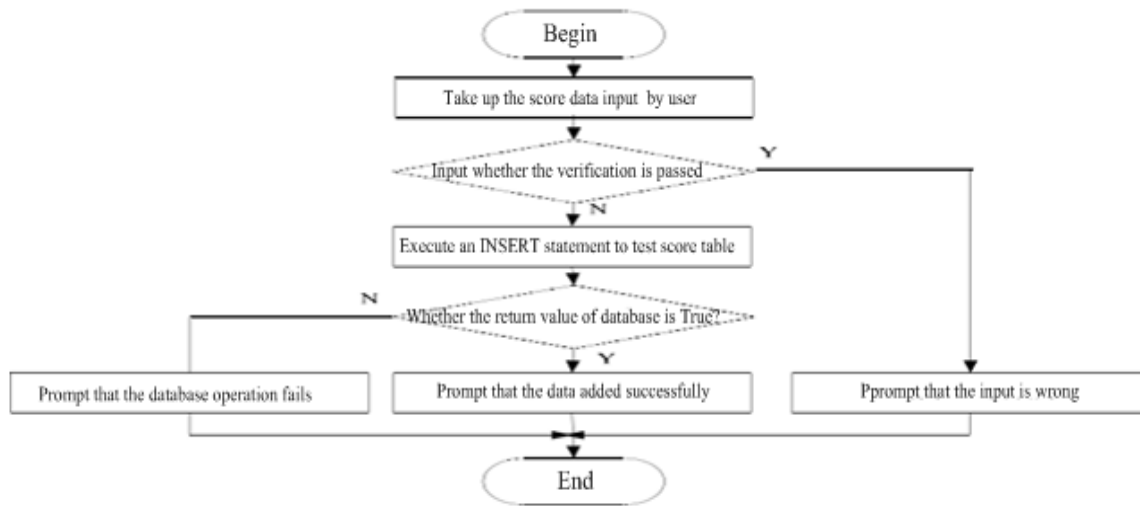


Figure 5. The Flow Graph of Score Input

System testing is the best methods and approaches to ensure a high quality of system, which includes functional test and performance test. The physical result management system employs various methods in testing, includes unit testing, integration testing, etc. In this study, it shows that the target system can achieve all its functions in the process of unit testing, integration testing, stress testing, installation testing and re-testing [12], and its performance proves to be stable to satisfy the common use of users, and it also verifies that the performance index conforms to its previous defined index.

6. Conclusion

The reform of education system along with the requirement of the society to the talents enables physical education to become an important part and an important curriculum in school teaching and examination. The coming information era provides information teaching with technical support. At present, the existence of problems in physical result management are commonly seen, so this study focuses on the design and development of the target system. By applying the target system, it aims to standardize relevant work flow in physical result management and achieve scientific management and informatization management, to free teachers from traditional busy work and improve the work efficiency eventually[13,14]. In the end, it adopts the most popular technology currently, ASP.NET along with the three-tier architecture B/S, realizing the information management of physical result, which includes the functional modules of test type management, test project management, score input, score transformation, etc. It greatly enhances the efficiency of teacher's physical result management by applying the target system. In addition, it adopts the ID3 algorithm in decision tree to give relevant analysis to the score record in system. At the same time, it puts forward valuable teaching comments and suggestions by means of data mining techniques.

References

- [1] He, Li (2013) The Design and Implementation of Network Elective System for Vocational Colleges. *Technology Innovation and Application*, (35) 76.
- [2] Jafar Tarokh, Mohammad., Soroor, Javad (2010). Supply Chain Management Information Systems Critical Failure Factors. *IEEE*, 425-431.
- [3] Li, Na (2011). The Design and Implementation of the Physical Result Management System in Vocational colleges based on data mining. Chengdu: Electronic Technology University.
- [4] He, Dong(2009). The Research and Development of Public Sports Information Processing System. Chongqing University.
- [5] Liu, Ji (2013). The Data Transmission in Three-tier Architecture System of ASP.NET. *PC Fan*, (9) 16.
- [6] Qiao, Bing (2013). The Conception and Relationship Analysis of the Three-tier Architecture of ASP. NET. *Electronics World*, (2) 94-95.

- [7] Gao, Xin(2013) Analysis about how to Optimize SQL Database Performance. *Technology Innovation and Application*, (27) 82.
- [8] Zhao, Yonghui (2014). Improvement Research of Data Mining Algorithm ID3. *Computer Development & Applications*, (4) 61-63.
- [9] Gao, Yang., Liao, Jiaping., Wu, Wei (2011). ID3 Algorithm and C4.5 Algorithm Based on Decision Tree. *Journal of Hubei University of Technology*, (2) 54-56.
- [10] Fu, Lihua(2010). Introduction to Database Design and Construction. *Huo Li*, (14) 133.
- [11] Yahong Xiao, (2014) The Design and Implementation of Student Elective System Based on Web. *Computer CD Software and Applications*, (4) 268-269.
- [12] Chang, Yixue., Xu, Qigang(2014) Summary of Software Testing Theory and Method. *Digital User*, (5) 74.
- [13] Wei, Lihong (2012) Trend of University Informatization. *Digital Technology & Application*, (2) 196.
- [14] Wang, Ronghua (2012). Analysis of the Present Situation and Development of University Teachers' Workload Management System. *Guide To Business* (24) 63-64.