The Design and Implementation of Sports Competition Registration System Based on SSH Framework System

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Abstract

With the development and expansion of the internet, the use of network system to manage sports competition is getting more and more popular. It becomes a dominant trend to realize more comprehensive and effective management of information about sports competition through the design and study of sports competition registration management system. The author applies the theory of SHH framework technology during design of this system; meanwhile, uses UML language to realize overall modeling of the system; completes demand analysis of informationization and overall function design of registration and management informationization of the sports competition through overall analysis and design of the system; and makes the system subject to evaluation achieve desired functions through completing the design and implementation of the sports competition registration management module for further popularization and applications.

Keywords: SSH, UML, Registration management and sports competition.

1. INTRODUCTION

The sports undertakings play a significant role in a country, and the management of sports competitions with network system will be more and more popular, and draws increasingly more attention from different countries (Fujii et al., 2011; Andersen et al., 2013; Emery et al., 1974).

With development and growing of the internet, online management of sports competitions gradually becomes a mainstream trend. However, a sports competition registration management system needs to be developed to realize more comprehensive and effective management of the information about sports competition, so as to make the management of competitive races be more standardized and meticulous, ensure the normal running of sports competitions, and improve the informationization level of the sports competitions (Kumar and Tripathi, 2010; Lim et al., 2006; Percy and Warner, 2009).

2. TECHNOLOGIES RELATED TO THE DESIGN OF THE SYSTEM

2.1 Unified modeling language (UML)

Unified Modeling Language (UML) adopts a graphical mode to express the development style of a software system; and provides the drawing techniques of multiple diagrams (Pauly, 2015; Russell and Urban, 2006; Solberg et al., 2016), including state graph of use case diagram, etc., all of which are common drawing methods. The drawing of these diagrams can simplify design and analysis initiatives. The user can have a more profound understanding of the basic concepts of this method in common use by integrating various UML software models; and combine Java language to use UML in a flexible way from user need to ultimate realization, as well as from various UML diagrams to the final completion of Java code.

The UML often employs the module-division method, while recursive algorithm is often adopted in modularized design, which prefers to use objects to express the generation mode of code (Urban and Russell, 2003; Tajima et al., 2014; Yang et al., 1999). UML graphical tools are helpful for expressing and exchanging design ideas. UML provides a variety of drawing modes, and the most common ones include state graph, module, interface and relation.
2.2 SSH Framework Structure

SSH (Struts + Spring + Hibernate) is an integrated development framework. From the perspective of functions, the system of integrated SSH framework can be divided into four layers: View, Model, Controller and Browser. This layered structure enables programmers to effectively build a website-based specific development mode with clear structure, excellent reusability and easy operation in a short time period (Fu et al., 2005; Bray et al., 2000; Nicolas et al., 2011).

Struts is a critical part in the development of the whole project, which supports the whole frame structure in project development. Spring is a development framework that can be used to implement detailed control programming of completion interface and a key point-type dividing application framework; while Hibernate is the framework for the layer of data persistence.

3. OVERALL DESIGN ANALYSIS OF THE SYSTEM

3.1 Design process of the system

The significance of system design lies in fulfilling the user’s objectives in an innovative way, and carrying out new development and design on the original basis. Such a design is not only meaningful to meet the user’s demand at that time, but also provides innovative ideas and directions for the development of the entire field. The overall design process of the system includes the design methods, objectives and principles, as well as system analysis use case model and system design.

With regard to the design process of the system, the ultimate purpose is to realize normal operation of the system. If the system functions well after test, working devices should be tested, so as to complete the system and put them into operation as a whole.

3.2 Design method overview of the system

Figure 1. Architecture diagram of system network
The user may edit the users and their roles when performing authority management of the system. The system retrieves and displays the information about authority management selected by the user from database; then the user adds, revises and deletes the information about authority management, and input corresponding users and their roles into database. The user, after filling out the user name and password, submits authority management data of the system to receive log-in identification verification, and enters into the user interface after passing the verification.

The network architecture design of the system is an integral part of the system. As shown in Figure 1, the design of network architecture involves client, server cluster, exchanger and L2 server cluster of the system, as well as video equipment including, DVR, DVS, NVR, IPC, etc.

3.3 Design objectives and principles of the system

This paper is aimed to design a software system that can be used to register specific events in sports competitions; and it also requires to liaison with banks since issues about expense are involved. The new system realizes on-line web-enabled operation based on Windows. Take the registration of province leagues for example, these leagues are required to register their detailed information respectively first, and pay corresponding expenses after registration; then the system can provide each province league with registration records on completion at any time after registration.

The principles of uniformity, applicability, usability, reliability, security and robustness should be followed in the design of the system.

4. OVERALL DESIGN OF THE SYSTEM

4.1 Overall design of the system

During management process of the system, different operations may be provided based on different demands of the user. Based on comprehensive analysis of the system, the competing teams, as participants can implement use case behaviors of registration, addition and cancellation of competitions as well as information query. Among them, the registration of competitions covers the management of competition information; while addition/cancellation of competitions covers the management of competition information and calculation of refund; and the judgment period is the extension of the registration, addition/cancellation of competitions and calculation of refund. Information needs to be verified and printed after query; therefore, the use case of information printing needs to be extended based on information query, and another participant- the printer- is required at his moment. However, while printing the information, the accuracy of information needs to be checked, so the participant-administrator- is required to implement the query of management competition information. The competing province leagues need to register with the system and pay corresponding expenses, then the system will return an ID to each competing team, with the precondition that the system is in the open registration period and the post-conditions that the system successfully stores the revised information and is about to return the IDs. With regard to this system, the overall use case diagram of the system is shown in Figure 2:

Figure 2. System use case
Figure 2 exhibits the functions that are realized by the system as a whole, including user registration, log-in system, information query, user inspection and revision, treatment of abandonment, management of administrators, recording of competition information, processing of accounting information and security structure. Only after these function modules are completed, can these functions of the system be truly realized.

4.2 The design of display function of the system

In the design, functions of the system to be realized are modularized and worked out in a reasonable way by combining practical theoretical basis. The user can have a more visual understanding of the design requirements and contents to be achieved from the design to implementation in combination with specific UML diagrams.

4.2.1 The design of registration module of the system

With respect to the overall use case diagram for design of the system, the overall class diagram of the system can be drawing out based on use case diagram and demand analysis as shown in Figure 3:

```
ID information
- ID number
- match groups
  + get match group()
  + add match group()
  + delete match group()

League
- league name
- league ID
- League address
- league member names
  + get information()

Match group
- match groups number
- match group level
- match category
  + show information()

Manager
- time
  + register()
  + login()
  + query()
  + add match group()
  + cancel match group()
  + set time()

Referee
- referee name
- assigned match
- organization
- referee address
```

**Figure 3.** The overall class diagram of system

Fig. 3 illustrates various participants and operation behaviors as defined by the system in a relatively detailed way. It can be seen from Figure 3 that the categories established include competing teams, information about competing teams, information about coaches, and administrators of the system. Figure 3 also defines the specific operations (corresponding functions to be realized) for each object, so as to complete corresponding functions while performing specific operations. Besides, Figure 3 provides four interaction diagrams according to various functions that are required to be realized in this paper successively, representing registration, query, revision and cancellation respectively in detail.

4.2.2 The design of query module of the system

The query function is designed mainly for registered teams to search for relevant information about their teams based on their own demand after they successfully pass verification and log in the system. For competing teams registered, they should log in the system first; then the system will identify their IDs, generate entity objects accordingly, and provides the IDs, upon verification of the IDs, to the categories of coaches, information about province leagues and competitions for information query.

The system can provide revision function as well for both basic information filled-out and competition related information.
Upon completing the abovementioned query function, the last one is the cancellation of information, which is not only about simple deletion of data information, but also involves the contents about corresponding expenses; therefore, charging and refunding activities need to be carried out based on different information of competing teams in a reasonable and correct fashion.

4.3 The design of database

The design of database is critical; and the design of the very database adopted by this system is completed by combining specific requirements of this system upon completion of the design of various functions.

4.3.1 The design of the query module of the system

The database is used to record the occurrence process and results of the user’s operations, describe the basic information about operated objects, as well as the tabular values of attributes.

The database of this system includes detailed data contents about the user recorded by the user in the system and information about part of the major activity arrangements. Among them, the section of address book management mainly stores personal information of the user in detail, including the home address, telephone number, etc. of contacts; the section of short message management mainly involves content relationship of information in two aspects, as well as contents of information, etc.; company notice refers to the work arrangement of each province league within a given time period scheduled by its company, and detailed contents and date of the notice can be checked; work meetings cover detailed information about meetings that the user needs to attend during the given time period, including the start time, end time, venue, agenda, etc. of the meetings; the section of job log includes specific jobs carried out by the user during competition period, including the dates, contents, etc. The abovementioned data is available for the user to call; the only parameter to be used is the user ID, with which personal information of the user can be accurately located or revised. All of these detailed functional operations are realized in the database.

4.3.2 The design of datasheet

In this sports competition registration system, the database of management module is mainly used to realize management of the information about registered personnel. Relatively detailed classification and consolidation is required to be performed for the information about registered personnel firstly, so as to carry out management of the information about registered personnel in other modules. Descriptions of main fields in information table on participants are shown in Table 1:

<table>
<thead>
<tr>
<th>Field meaning</th>
<th>Field name</th>
<th>Data type</th>
<th>Length</th>
<th>Constrain</th>
<th>Null yes or no</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant number</td>
<td>P_id(PK)</td>
<td>INT</td>
<td>8</td>
<td>Major key</td>
<td>No</td>
</tr>
<tr>
<td>Participant name</td>
<td>name</td>
<td>VARCHAR</td>
<td>16</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Participant age</td>
<td>age</td>
<td>INT</td>
<td>8</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

5. THE IMPLEMENTATION AND TEST OF THE SYSTEM

5.1 The management sequence diagram of registration system

In this system, specific classification and consolidation is required to be performed for detailed information herein firstly, so as to achieve the management of specific details in the sports competition registration management system. Fig. 4 exhibits the management sequence diagram of the sports competition registration system in detail:

In the module of management function of the registration system, competing teams to be registered should firstly, operate the login system with username and password; while the system will make judgment after verifying specific information about the user, who requests to log in the system. If the user fails the verification, the system will feedback reasons and prompt the user to re-log in; and if the user passes the verification, he/she can successfully log in the system and perform management operation. Based on the contents in main interface,
the user can log in the interface of enterprise information management, operate available information therein and obtain different results desired by executing corresponding operations.

![Diagram of enterprise information management interface](image)

**Figure 4.** Register system of management sequence diagram

### 5.2 The implementation of information management module of the system

This registration management system provides multiple functions regarding personnel management, allows the user to carry out revision, deletion and other operations of information, and realizes multiple selective operations of the information about registered personnel through the application of various functions. Detailed contents realized include: User Login, Sign In, User Check Quit, Administration and Homepage of the system.

Please refer to Fig. 5 for the homepage interface of the system:

![Homepage interface](image)

**Figure 5.** Sports competition registration management system

The homepage of the system is the interface that displays when the system does not enter into any function. This section displays the information about logged-in user, including the name of the user’s competing team, province the user is representing, name of team members, competition category and level of the competing
teams. Among them, the competition category refers to competition events participated, including football, volleyball, basketball, etc.; moreover, competition level includes preliminary level, intermediate level and high level.

At the homepage, the user may choose to exit the interface directly, that is log out safely; or may continue clicking to browse other functions, including mainly query, inspection, and revision of information, abandonment of competition, management by administrator, recording of completion information, processing of accounting information, security structure, and other contents.

5.3 The design of security structure of the system

It can be seen from Fig. 6 that the overall security and technical factors of the system include multiple service guarantees, and efforts should be made to make sure that these security and technical factors are comprehensive service guarantees. Efforts are required to be made from the following three aspects respectively to realize overall security of the system: security management, security evaluation and security strategy.

![Figure 6. System security framework](image)

5.4 Test of the system

Test of the system includes function test, management test and query test of the system.

The testing function is mainly realized through testing of the contents in the following aspects: file test, function test, interface test and robustness test. The testing results can prove that the part of file can meet corresponding demands in actual test, can definitely be provided to be used by the user and fulfill the requirements on contents of files in specific specifications. Every function realized is in normal operation. The design of interface conforms to the features of friendly design, rational layout and convenient usage. The system can still function well when the external environment is not safe.

<table>
<thead>
<tr>
<th>Test item</th>
<th>System check</th>
</tr>
</thead>
</table>
| Test case | (1) Click the query management system, enter the interface  
(2) Select: Query the information by ID  
Click and input ID for the query, input “6666”  
(3) Click the button |
| Expected test result | Interface display all information of the user whose ID is “6666” |
| Actual test result | Interface display all information of the user whose ID is “6666” |
| Test conclusion | The actual test result are consistent with the expected results |
The management test of the system includes test use case, forecast test results and actual test results. The test conclusion is that the test results are consistent with forecast test results; and the query test conclusion of the system is the same. The test of query function module is shown in Table 2.

6. CONCLUSIONS

The author adopts SSH framework structure in Java for the overall design of this sports competition registration system, combines UML drawing tools to perform design of the system with specific codes after realizing the graphical expression of the system, and finally achieves the purpose to simplify the whole system through improving each management module.

This paper, through overall analysis and design of the system, completes the analysis of sports competition registration management process, as well as the analysis and modeling of all-around demand of sports competition in turn. After completing the detailed design and implementation of this sports competition registration management module, the system subject to evaluation will have desired functions and corresponding completeness, and can be put into service together with its working devices.

REFERENCES