Design and optimization on training management system of professional classroom

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Abstract. In order to further enrich the practical guarantee conditions of training theory teaching simulation in the university and improve the level of digital, scientific and information management of professional classrooms, this paper, through analyzing the ideas of system construction, explaining the system composition, structure and system function, designs a professional classroom training management system which integrates the functions of training design, training implementation, training assessment, etc., focally analyzes the key system technology and gives the technology as can be adopted next to further perfect the system function. The research is of great practical significance to improve the level of training information management system development and training management informatization subsequently.

Keywords: simulation training, system design, key technology.

1. Introduction
For further improving the teaching quality and efficiency in the university, speeding up the process of digitalization and networking management of professional classrooms, realizing that there is basis, goal for training, standard for assessment to play an active role in building a training management system under the condition of informationization, effectively improve the teaching quality and efficiency in the university, speed up the process of realizing digitalization and networking management of professional classrooms, and also for further enriching the better targeted simulation practice guarantee conditions of military training theory teaching in the university, and building a professional classroom which can both guarantee the theoretical teaching environment and provide a special training practice platform, it is necessary to carry out overall design from the aspects of the theoretical basis of military training management, the design and development of the software system, etc. on basis of relevant theoretical research on the information management of naval military training and relevant technical reserve of the training management system software.

2. Construction ideas of professional classroom training management system
The construction of the professional classroom training management system adopts the idea of integration-analysis-integration in system engineering, and the construction process is also one becoming increasingly concrete from abstraction. First of all, the naval military training information management related theoretical research is to be made; on this basis, a military requirement analysis is...
to be made to the surface vessels military training information management system; then a system structure analysis and overall design is to be made; finally, the software system design is to be realized from the outside to the inside through the design of user presentation layer, business logic layer, data access layer, system database, etc.

2.1. System composition
The professional classroom training management system is mainly composed of training management system software and hardware systems, the hardware system mainly includes professional classroom client, professional classroom system server. The software system mainly includes the following specific functions.

![Figure 1. System hardware composition sketch.](image1)

![Figure 2. System software composition sketch.](image2)

2.2. System structure
The physical structure of the professional classroom training management system is divided into three layers, as shown in figure 3. The first layer is presentation layer, mainly consisting of PC, browser, etc. The second layer is application layer, including the Web server. The third layer is database server, including server and database service, etc.

The Web server is requested through the Web browser of the presentation layer, the Web server requests operations toward data through data processing, then returns to the Web browser by which the returned data is displayed.
Figure 3. System physical structure sketch.

The software structure of the professional classroom training management system is shown in figure 5. It mainly includes user interface application technology layer, network service application technology layer, software architecture application technology layer, database layer and running platform, etc.

User interface application technology

Network service application technology

Software architecture application technology

Database

Running platform

JSP+AJAX+HTML+CSS+EasyUI

Apache Tomcat

springMVC+MiniDao

MySql

Windows Server 2008

Figure 4. System software structure sketch.

3. Professional classroom training management system function and implementation program

The system function modules are mainly three major function ones: training design, training implementation and other auxiliary functions.

3.1. Training design function

According to different initial training conditions (such as vessel type, training stage, personal post, etc.) and based on the outline training contents, training system, training requirements, regulation library, etc., the system can provide the training objects with the function of training plan preparation, and can provide individual training design, overall training design and other functions for the training objects in a targeted manner. The illustration for administrator is as follows:
3.2. Training implementation function

The professional classroom training management has both theoretical training and practical training functions. In respect of the theoretical training function, the system can provide the training objects with retrieval and inquiry of various training regulations, plans and preplans, etc. for autonomous theoretical study, and can also provide the training objects with theoretical self-test exercises after assessment scope and difficulty setting; in respect of the practical training function, the training organizer can, according to different initial training conditions (such as vessel type, training stage, personal post, etc.), consider from the whole process of training implementation and set up various situations on each link in the whole process of training organization and implementation by way of problem traction for the training objects to carry out corresponding practical training. Simultaneously, in the training to the training objects, the training organizer can, through designing the training instructions from the superior level, setting up the training goal, providing training simulation details, etc., give spot guidance intervention for the training objects in respect of such training items as training preparation, training plan development, training plan and preplan development, etc. The administrator’s training guidance implementation program is as follows:

![Figure 5. Illustration for training design.](image)

![Figure 6. Illustration for training guidance.](image)
The part played by the current user in the present drill training, in case of playing the part of captain, deputy captain, it is needed to inquire all the departments under the control thereof; in case of playing the part of department head, it is needed to inquire the department thereof; in case of playing a battle station, it is needed to inquire the department and battle station where the part is as the figure 5.

3.3. Other auxiliary functions
In addition to the two main functions of training design and training implementation, the training management system also includes interface display and interaction functions, system management functions and other auxiliary functions. The interface display and interaction functions are realized by the interface subsystem, which mainly includes system management operation interface, data retrieval, autonomous study, examination question library, independent test, background database management operation, etc; the system management function is mainly realized by the system management module, which mainly includes the management of each system function, trainee management, etc.

4. Professional classroom training management system’s key technology

4.1. Software architecture design based on micro service
In comparison with monolithic applications, the architecture based on micro service has the characteristics of simple application development, agile development, continuous delivery, more system stability and reliability, decentralization and lowering your system application maintenance cost[1], etc. It has great advantages in development, maintenance, extension and so on. The training management system adopts RESTful API to integrate different functional groups into XLTP, IMSERVER, CMXX and other modules with different modules using API to communicate to realize high cohesion and low coupling. Each service can be developed by independent groups to improve efficiency.

4.2. Responsive Interface (UI) design based on Vue and message agency design based on WebSocket
The front end of the training management system adopts a single-page program mode and responsive UI design[2] to maintain the zero maintenance of client and make the terminal browser attain automatic matching the best layout to ensure that the user experience is comparable to the desktop program[3]. By using the AJAX technology[4], the front end is completely separated from the rear end with API being the only way of communication between the front and rear ends.

In comparison with the traditional communication mode, WebSocket greatly improves the real-time and high efficiency of Web communication[5]. The real-time communication module of the training management system realizes real instant communication and message release, subscription and storage through WebSocket and message agency in drill training.

4.3. General data list CURD control technology
Data integrity, uniqueness, redundancy and security[6] should be mainly considered in database design. In order to avoid and reduce the problem of low efficiency, repeated development in database implementation in the surface vessel information management system, a user-friendly interface of addition deletion, modification, inquiry can be generated automatically according to the XML configuration file for any data list with the functions of data paging, jumping, etc. to be realized. Various names configured by users can be displayed correctly according to the configuration file with a concise and consistent interface to be provided to external developers and the internal logic to be hidden completely toward the outside. The final compilation result is a program set in the form of dynamic link library. In software design, use DataGridView as a visual interface and bind its data source to Data Set example, and then use DataAdapter to complete the interaction between DataSet and the actual database, this is the basic idea of implementing the general data list CURD control. The database list addition, deletion, modification and inquiry operations almost become a necessary function in program development. If this function is implemented separately in each software system, it will be bound to lead to low efficiency and repeated development[7]. Because of the strong consistency of database processing
logic, a lot of ORM frameworks emerge to map the lists in the database and the objects in the development language. However, this framework is limited to the logical level and does not have the function of generating a visual interface directly. Different databases, lists have different corresponding addition, deletion, modification and inquiry SQL statements, so a SQL statement generation method that can automatically adapt to different libraries and lists is needed. What is adopted here is the CommandBuilder class provided by ADO.net itself, which can automatically generate appropriate SQL commands according to different adapters. Finally, the design can be completed by using DataTableMapping and XML configuration file to realize name mapping[8].

5. Final words
This paper studies the idea, composition and structure of professional classroom training management system construction, which focally explains the software design of the system function and execution scheme, and the key technologies used in the software development. On this basis, a training management system can be developed and completed. However, there is still something for perfection. The first is the WebRTC based audio and video communication. In future, the training management system can use the WebRTC technology to realize real-time communication of audio and video streams, and then add by extension the function of visualized scene simulation; the second is containerized deployment, the training management system, which is based on the micro service design mode, can be containerized naturally. The container technology can have the system application and its related dependencies packaged into a container to ensure the system application running environment keeps consistent, make it lighter, more efficient and safer; the third is high availability cluster (HA cluster), the current training management system has single-point failure defect, once the server line gets disconnected, all users are unable to use the system continually. With the adoption of the containerization technology, the Kubernetes container orchestration technology can be used to realize high availability cluster and ensure that the training management system is available in all weather conditions without interruption.

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