



Virtual Training System for Vocational Skill Appraisal

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Abstract. The purpose of this paper is to provide a virtual assessment and training system for vocational skill identification, which can lay a solid foundation for the theory, basic skill operation and practical assessment of professional skill operation. This paper presents a virtual assessment and training system for vocational skill identification, including: theoretical knowledge training and assessment platform, which is used to provide independent training mode and simulated examination mode for basic theoretical knowledge and professional theoretical knowledge; The virtual training and assessment platform of basic skills is used to provide independent training and simulated examination of basic skills for all types of workers in ordnance specialty. Operators can conduct virtual interactive operations of basic skills experiments in the virtual experimental platform to improve their basic skills; The virtual training and assessment platform of professional skills is used to provide independent training and simulation examination of professional skills for all types of workers in ordnance. Operators can perform virtual interactive operations of professional skills in virtual equipment and components to improve their professional skills; It also includes a question bank management platform. This paper can lay a solid foundation for the theory, basic skills operation and practical assessment of professional skills operation of personnel.

Keywords: identification skills · virtual · training system

1 Introduction

In the 1990s, China began to implement the vocational qualification certificate system, one of the main contents of which is to carry out the skill appraisal of the electric power industry. And the skill appraisal of electric power industry is a part of it. After nearly two decades of development, the scale of vocational skill appraisal has been expanding. The electric power professional qualification certificate system is increasingly recognized by the society, according to the data of the Ministry of Human Resources and Social Security and relevant departments. The number of people who participate in the power vocational skill appraisal shows a rapid growth trend. The large-scale increase in the

number of power identification has put forward higher requirements for the quality and efficiency of power identification work. [1–7] At the same time, with the rapid development of network information and computer intelligence technology, online examination and intelligent information systems are maturing. Therefore, it is one of the effective measures to promote the sustainable development of the identification work of China's power industry to strengthen the information construction of the identification work of the power industry.[8].

Strengthening the information construction of identification work, applying modern technology to completely change the traditional and backward examination management and examination methods, and widely applying advanced examination technology and modern management methods can not only greatly improve the efficiency of identification work to adapt to the exponential growth of the identification scale, but also improve the standardization of identification work and service quality and level, Meet the requirements of “scientific, normative, objective and fair” for vocational skill appraisal.[9].

The traditional manual examination management has become more and more prominent due to the increasing scale of identification.[10–15] Large workload, consuming a lot of manpower and time; There are many factors involved, such as candidate registration, examination room arrangement, evaluator arrangement, test paper scoring, score management, certificate management, etc.; Poor flexibility, it is difficult to adjust after the examination arrangement, and the change of small data often leads to the whole body to increase additional workload; Manual methods often lead to errors in relevant data filling, reporting and summary, and more repetitive work.

2 Virtual Assessment and Training System

Figure 1 is the block diagram of an example of a virtual assessment and training system for vocational skill identification in this paper. The theoretical knowledge training and assessment platform provides two modes: independent training mode and simulated examination mode. Under the independent training mode, all the basic theories, professional basic theories and professional theoretical knowledge points of the selected specialty can be traversed. The operator can choose the equipment or courses to practice, You can also check the answers during the exercise, which is suitable for users to comprehensively review knowledge and focus on targeted review; The system provides the statistics and analysis function of user's wrong questions, which can help users better find their own weak links. The simulated examination mode is completely consistent with the paperless examination mode of the professional skill appraisal theory of the military ordnance equipment support personnel, which enables candidates to conduct simulated training in a real environment, so as to be closer to the actual theoretical examination environment. The theoretical knowledge training and assessment platform can directly read the specialty, grade and assessment mode selected by the user, enter the specified mode, and form the first examination questions according to certain rules of topic selection or extract the examination questions of the relevant grade of the specialty for independent training. Through this system, examinees can train and learn all the contents of the question bank of basic theoretical knowledge and professional theoretical knowledge covered by this type of work without duplication or omission.

Self training part of historical memory: because there are many courses that need to be examined in the professional skill appraisal of a certain specialty, and each course has a large number of questions, the system needs to have the historical memory function in the training process, so that users can continue training and consolidate learning next time; The system records the number of exercises and the last answer result of each set of questions for each course. The system stores the user's answer in a database. After the system is restarted, the last answer and the total answer times can be displayed again. The historical memory function of the assessment part is reflected in the system recording the assessment times, assessment scores and information about each answer result, this information makes it easy for users to master the improvement of their examination results.

3 Construction Process of Software System Platform

In this virtual assessment and training system for vocational skill identification, one of the core contents is to realize the virtualization of basic skill operation and professional skill operation. Whether to provide a virtual environment with good interaction performance equivalent to the operation of the real environment is the key problem to be solved by this system. In this embodiment, the high-quality 3D model of the operation element is integrated into a series of pre-defined action processes, And after the call of the interactive virtual engine, Fig. 2 is the schematic diagram of the construction process of the software system platform that realizes the virtualization of basic skill operation and professional skill operation in this embodiment, as shown in Fig. 2. The specific construction process is as follows: data preparation stage: model data and initial setting, UI design and production, and new model; Framework design stage: according to customer demand analysis and requirements, combined with UI layout design, build a program framework to meet all functional designs and program expansion interfaces; System integration stage: use the integrated development environment to realize the insight, training and assessment of virtual operation.

As shown in Figs. 3 and Figs. 4, the computer vocational skill identification and training system in this paper includes a WEB server, at least one computer terminal or smart phone terminal; The WEB server is a high-performance computer, which is used to install the vocational skill appraisal training system; At least one computer terminal or smart phone terminal can be connected to the WEB server through the Internet for browsing and accessing the vocational skill identification and training system on the WEB server; The WEB server exchanges data with the computer terminal or smart phone terminal installed with the WEB browser through the Internet; The vocational skill appraisal training system includes: appraisal subject management module, appraisal topic management module, automatic generation of test questions module, training and scoring module, training score analysis module, user information management module; The appraisal account management module is used to process and store the number and name information of the vocational skill appraisal account; The appraisal question management module determines the question number, question type, question content, choice branch, answer, and score information for a specific subject and stores them. The question type includes choice questions, fill in the blank questions, yes or no questions,

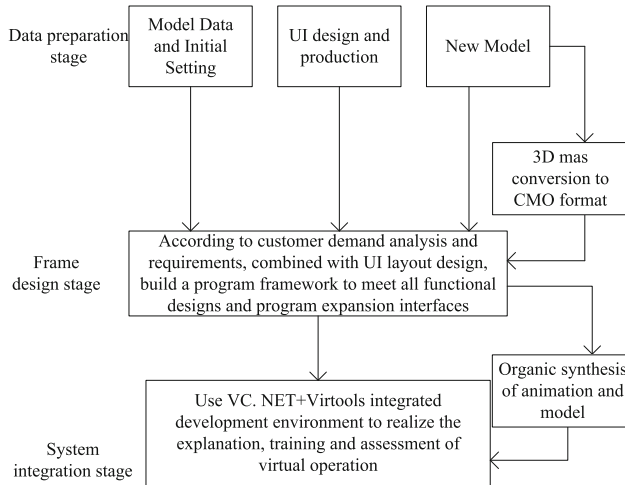


Fig. 2. Schematic diagram of software system platform construction process for realizing virtualization of basic skill operation and professional skill operation

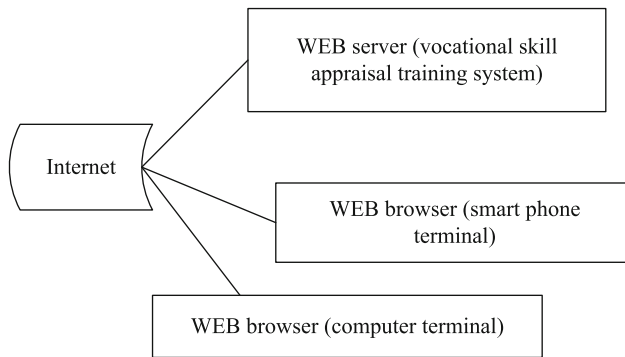


Fig. 3. Network structure of skill identification training system

and operation questions. Only choice questions have choice branches; The automatic generation of test questions module can automatically and quickly select the questions in the identification question management module according to the number or name of the subjects selected from the identification subject management module to form a qualified test paper to meet the identification needs. The requirements of the test paper include the total score of the test paper, training time, type of test questions and the proportion of each type of test questions, as well as the required knowledge coverage and degree of difficulty of the test paper; The training and scoring module can compare the students' training answer results with the corresponding standard answers, and give scores. After students answer the test paper, the total score is their training results; The training and scoring module can save the training results in the database; The training result analysis module can summarize and analyze the students' training results by subject,

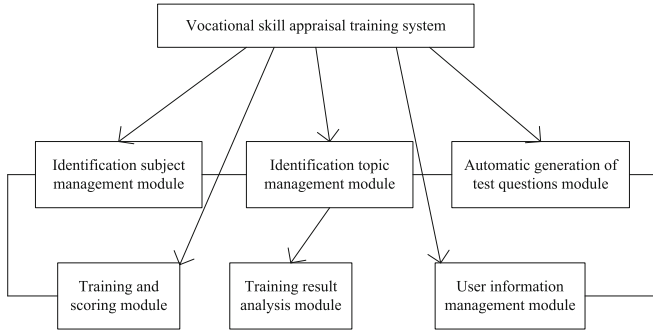


Fig. 4. Working principle diagram of skill identification training system

question type and knowledge points, and give improvement suggestions according to the summarized statistical analysis results; The user information management module includes the administrator information management module, the teacher information management module and the student information management module, which are used to process and store the administrator, teacher and student information, so as to facilitate the administrator, teacher and student to enter the vocational skill identification training system.

The business process of the computer vocational skill identification and training system is as follows: The participants in the system mainly include administrators, teachers and students, who have different user rights. They can only access the system after they have browsed the system on the Web browser and successfully logged in as their own identities. First, the system administrator manages the identification subjects and user information; The identification subject management module is used to process and store the number and name of the computer vocational skill identification subject; The user information management module is used to process and store the administrator, teacher and student information, and then the teacher user manages the identification questions and automatically generates test papers. The identification questions management module is used to process and store the subject questions taught by the teacher himself; The automatic test question generation module is used to extract test questions from the identification question management module to generate test papers.

4 Virtual Operation Interaction Process

In a virtual assessment and training system for vocational skill identification, the interactive operation of virtual operation and simulation assessment is the core of the whole simulation module, and also the key of the system. The virtual interaction operation in this specific embodiment adopts NET + VIRT00L + ACCESS development and implementation. Figure 5 is the schematic diagram of the virtual operation interaction development process in VIRT00L of this embodiment, as shown in Fig. 5. The specific construction process is as follows: use the development module to generate a model. After the model import is completed, use the behavior engine and rendering engine of

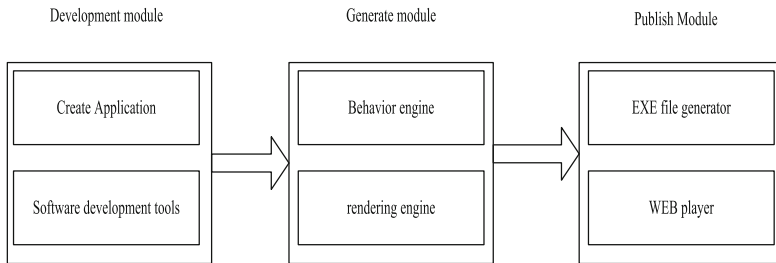


Fig. 5. Schematic diagram of virtual operation interaction development process in VIRT00L

the generation module to complete the definition of the virtual operation interaction process, and use the release module to achieve the release of the interaction model.

The test scoring algorithm is also a key and difficult point in the design of this system. There are two kinds of test scoring in this system, namely, theoretical assessment scoring and skill assessment scoring. For the scoring of theoretical assessment, because all the questions are multiple choice questions, and the scoring design is relatively simple, the system automatically judges the number of correct questions m , and then multiplies the score n of each question to get the final score $m \times n$. However, skill assessment scoring is the difficulty of the scoring algorithm, especially the abstract skill assessment scoring; Abstract skill assessment refers to the subject examination in which dynamic flow charts are used to train users' operation and maintenance thinking, operation identification and judgment results. Due to the drag and drop method of flow charts, scores are given according to steps. First, the system automatically calculates the minimum number of steps m required to complete the flow chart, and reads out the weight value k of each step. The weight sum of each step is set to 100 points. During the examination, The system presets the user's score of this question as 100 points. When the user makes an error, the system will deduct the weight value of this step from the 100 points until the appraisal is completed or the user's final score is 0.

The system can also provide the function of explaining in the form of streaming media, that is to say, it can explain all the subjects of the specialty in the whole process with pictures, texts and sounds, so that users can have an intuitive and comprehensive understanding of the requirements and specific steps of the training subjects, and provide support for users' independent learning and training. The system is also extensible. Users can add professional basic subjects and professional skill subject resources of the required specialty as required, and integrate them into the software platform using the interface provided by the system.

5 Conclusion

The vocational skill identification training system studied in this paper, with computer simulation and virtual reality technology as the core, constructs virtual digital devices for various types of work to replace the real equipment, provides a realistic real equipment training environment for personnel, facilitates independent learning of personnel, and can lay a solid foundation for personnel to carry out the theory of vocational skill

identification, basic skill operation and practical assessment of professional skill operation. It can automatically generate test papers from the test question bank of the subject according to the identification subject selected by the students, so as to provide students with independent training before identification; The training results of students shall be given on the spot, so that students can find their own shortcomings in time, and then indirectly urge students to learn; Through the summary and analysis of students' training results, teachers can help them understand students' learning situation at any time, so that they can have a target in teaching, highlight the key points and difficulties, and greatly improve the passing rate and appraisal results of students' vocational skills.

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