Research on Virtual Reality Training System for Equipment Service

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Abstract. This Apply virtual reality technology to our military equipment. The development of the virtual service training system is of great significance to our military equipment support. It is an important guarantee for cultivating qualified equipment custodians. This paper takes a certain type of equipment as the object, and designs the equipment service training system based on VIRTOOLS. Provide effective solutions for equipment maintenance training. This paper studies and discusses the structural system, key technologies and implementation methods of virtual systems.

Introduction

The maintenance of the equipment is a necessary condition for the integrity of the equipment. The necessary training before the actual equipment is maintained can improve the operation skills of the maintenance personnel. Virtual service training can effectively provide advanced experimental environment and simulation means for equipment maintenance and technical support training, and can train technicians’ equipment support capabilities. Apply virtual reality technology to our military equipment maintenance. The development of virtual training systems is of great significance to our military equipment support. It is an important guarantee for cultivating qualified equipment support personnel. It effectively solves the problems of complicated equipment structure, high price, limitation of site, quantity and model, and low training efficiency in equipment maintenance training. Therefore, this paper designs a simulation system for a certain type of equipment. Provide an effective solution for maintenance training of equipment.

Overall Structural Design of Virtual Reality System

The simulation training system consists of five parts: virtual display, virtual maintenance, virtual assembly, virtual inspection and intelligent evaluation. The software design of the system is as follows: This system uses Visual C and Virtools as its development platform, SolidWorks three-dimensional design software of Dassault Company and 3Ds Max as modeling and animation generation tools, and Access as system database to store fault knowledge base, sample parts base and special tool base. Testing tool library and some service samples. The model construction of the system is shown in Figure 1.

Figure 1. Equipment Model Construction.
Virtual Service Simulation Technology Based on Virtools

The system simulates the real operating environment as much as possible. And can carry out virtual service training for equipment. The service training of equipment is divided into maintenance and maintenance, which are implemented based on the structure principle and disassembly steps of equipment. In order to achieve the combination of virtual and real, while constructing the training system, in order to deepen the impression of operators during training, the actual equipment operation video shooting was made for the difficult operation steps, and the video stream was inserted into the training system. After analyzing the fault, the demonstration video is played to deepen the operator’s impression and improve the training quality. Video stream acquisition, source and scoring criteria.

Virtual Exhibition

The structural principle of equipment is the basis of equipment support. Before the maintenance of complex equipment, maintenance personnel must master the structure principle of equipment skillfully, and equipment is often closed three-dimensional, its internal structure is often difficult to understand in actual equipment, virtual display can solve this contradiction well. It provides a very ideal observation platform for maintenance personnel by changing the observation position, transparency of shell, or component observation. It can effectively help maintenance personnel understand the connection relationship of complex equipment structure. In the process of virtual display, the model is first imported into Virtools, and the basic parameters of lighting and camera are set. Then the BB module of Virtools is programmed to simulate the actual maintenance process according to the maintenance process, which achieves a better design effect. The virtual display module of the system is shown in Figure 2.

![Figure 2. Equipment Virtual Display.](image)

In the design of interactive maintenance, on the one hand, it is necessary to simulate the real maintenance steps and maintenance methods, on the other hand, it is necessary to simplify the process of real maintenance and realize the purpose of familiarizing users with maintenance operations. The realization of interactive maintenance process is mainly realized by calling BB module. First, the script of the specified object is created, and then the program is programmed according to the specified action. For some complex and special operations, it can be programmed by calling Run VSL module using Virtools script language VSL (Virtools Script Language) or through Viaools SDK, as shown in Figure 3.

![Figure 3. Scenario entry editing.](image)
Virtual Assembly

Virtual assembly is to simulate the three-dimensional assembly process of products according to the shape and precision characteristics of product design, and allow users to control the three-dimensional real assembly process of products in an interactive way to verify the assemblability of products. The definition focuses on the simulation process of physical assembly process of products, and embodies the idea. It is an analytical process.

The key technology of virtual assembly is the discrimination of part collision and assembly distance. They can be realized by BB and VSL provided by Virtools. As shown in Figure 4.

![Figure 4. Virtual Assembly of Equipment.](image)

Virtual Duty

Based on the analysis of existing equipment maintenance experience and kinetics decomposition, the maintenance process under some circumstances is established. Activate these processes by using data output from equipment maintenance. Perform different virtual maintenance operations. Virtual maintenance simulation is the reproduction of the actual maintenance process in the virtual environment. It is necessary to have a reasonable description of the maintenance process to guide the simulation. The description of maintenance process should first include the sequence information of maintenance activities. The relationship between maintenance work and activities should be expressed according to the time sequence. Detailed and complete human motion and action information and human-computer interaction information should also be included.

The training system adopts modular driving mode to realize virtual simulation of maintenance system. Maintenance engineering drives virtual maintenance process in turn according to four modules: preparation, equipment testing, equipment maintenance and equipment evaluation. Maintenance personnel must complete a single module before they can proceed to the next step. The error operating system of a single module will be prompted according to the relevant data and pointed out in the key parts of virtual equipment. As shown in Figure 5.

![Figure 5. Virtual Maintenance of Equipment.](image)
Summary
Compared with traditional training, virtual service training has considerable advantages in improving training flexibility, breaking through training conditions and reducing equipment maintenance costs. Virtools software is powerful and easy to operate. It is very suitable for the development of similar systems. Especially in view of the current situation that our army has more new equipment, relatively expensive price and complicated operation procedures, virtual simulation training can be used to improve the quality of training, improve training environment, and further complete the training according to different contents. Good, develop a more realistic and practical virtual maintenance training system.

In view of the extensive application of virtual maintenance training in actual maintenance training, this system mainly considers that the value of analog equipment cannot be too high, and the cost of analog equipment can be reduced as much as possible when meeting the requirements of training effect. At the same time. This system analyses the system requirements from the aspects of function completeness, system availability and system reliability. The system composition and structure framework are given. This method provides a new way to realize virtual maintenance training system, and has important reference value for popularization of virtual maintenance training system of large equipment and modernization of equipment maintenance training in China.

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