

Application of Virtual Training Software in Military Equipment Teaching

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ABSTRACT

In this paper, we analyze the present situation of military equipment teaching in military colleges and universities, combine the characteristics and advantages of virtual simulation technology, and applies the development tools such as Unity 3D virtual reality engine, 3ds Max and Inventor modeling to explore and develop the virtual training software to make up the teaching contradiction caused by the lack of actual installation, and takes the training simulation software of a helicopter flight control system as an example to carry on the practice.

Keywords: Virtual training; Equipment teaching; Military.

1. INTRODUCTION

With the development of society and the improvement of educational standards, more and more experts and teachers realize that there are many disadvantages in traditional teaching. In recent years, virtual simulation technology has become popular all over the world, and its inherent immersion, interactivity, modern quality and entertainment makes people enjoy it. Due to its almost lifelike model construction and convenient programming development, various fields have increased its investment in virtual simulation technology. However, in the field of military equipment teaching, the teaching has a low efficiency because of the shortage of real equipments. It is no doubt that virtual simulation technology can develop military equipment simulation teaching software by building realistic models and writing logical and clear scripts. By creating and imitating the real equipment teaching scene, we can break through the limitation of time and space in real life, stimulate the students' interest in learning in an all-round way, and change the students' boredom and anxiety about learning.

Unity 3D is famous for its powerful cross-platform features and gorgeous 3D rendering effects. Many commercial games and virtual reality products are now developed using Unity 3D engine. Therefore, the application of Unity 3D in the field of military equipment teaching is of milestone significance.

2. PROBLEMS EXISTING IN TEACHING AT THE PRESENT STAGE

The military equipment teaching has its remarkable characteristic, teach the troops what they need to fight, the teaching contents are all for the army real equipments, which has the distinct pertinence. However, in general, the teaching equipment of military academies is not consistent with the training equipment of the troops, and often lags behind the renewal speed of the troops. Therefore, the common problem in the current equipment teaching in military colleges and universities is that the equipment is in shortage and old, the teaching arrangement of practical operation training in the course of equipment teaching is more outstanding than the actual installation, which makes the students lack the practical ability of the equipment, and the teaching effect of the practical operation is not satisfactory in general. The main reason is the lack of some effective teaching resources, the summary of traditional practical teaching found that there are mainly the following problems^[3]:

2.1 It is difficult to update and replenish the teaching equipment

In military equipment teaching, in order to achieve synchronization with the army training, the teaching and training equipment must be the same generation as the army training equipment, such as aircraft, helicopters, tanks, armored vehicles, etc., and all the parts of these equipment require precision processing, cannot make

minor mistakes, and the cost is expensive, the expense is large. Even if do not consider the problem of expenditure, because the actual combat military equipment management is strict, so the military equipment used in teaching and training is generally not active military equipment but the production of teaching-specific military equipment model, which results in a serious low teaching efficiency.

2.2 Insufficient quantity and poor condition of existing teaching equipment

At the present stage of equipment teaching, students can only use some military equipment to carry out practical exercises, and most of these equipment are military obsolete to life equipment, age-old, some of the equipment is the problem of aging parts, traditional structure, loss of function, data has not been updated, and so on. However, there are some differences in structure and parameters between some military equipment models specially used for teaching and training, which makes it impossible for the trainees to enter the actual combat status in the future post. This makes it impossible for the trainees to accurately grasp the parameters and operation methods of the equipment in their future positions.

In addition, in the teaching process, because the equipment operation is frequent or the maintenance is not in place, the equipment has the very large degree of damage.

2.3 The traditional teaching efficiency is low and the process is complex

In the traditional military equipment teaching, subject to the particularity of military equipment and the finiteness of quantity, the teaching process mostly adopts the way of demonstration operation of teachers, group practice of students, or apprentice of teachers, the teaching method can't arouse students' interest in learning, which makes the teaching effect not satisfactory; the organization process of military equipment teaching is relatively complex, not only need to change teaching site frequently, but also need multi-unit coordination support to carry out^[4].

3. CHARACTERISTICS OF VIRTUAL SIMULATION TECHNOLOGY

As the key technology of supporting equipment teaching, virtual simulation technology has the following application characteristics:

3.1 Friendly Interactivity

Virtual reality technology allows the operator to truly enter a computer-generated interactive three-dimensional virtual reality environment, with which to interact and

communicate. Through the interaction between the participants and the virtual simulation environment, with the help of people's own perception and cognition of the things they touch, the participants' thinking can be helped and inspired, and all kinds of spatial information and logical information contained in the virtual environment can be obtained.

3.2 Unique Immersion

Because of the immersive and real-time characteristic of virtual simulation technology, it has been applied in military simulation, advanced manufacturing, urban planning, geographic information system, medicine, astronomy and so on, such as the experiment of some highly toxic substances, the exploration of outer space in unknown field, etc. Virtual simulation technology can greatly promote education and teaching activities in these fields, thus breaking the limitation of space-time and realizing the combination of virtual education and reality education.

3.3 Modern Quality

Under the background of 5G era, the educational subject can appear in the form of virtual equipment. Virtual equipment is the product of the fusion of model simulation and functional logic. It is the result of multi-level virtual simulation of equipment appearance and function by using modeling and logical script development.

3.4 Recreation

Virtual simulation education is characterized by the interaction between human and computer. Individuals can participate fully in education and teaching. It not only includes teaching and entertainment, but also transcends the single entertainment attribute. At the same time, it saves interest and effectively transmits knowledge, so that educators can better understand and accept knowledge, thus making virtual simulation education an effective educational tool.

4. THE DEVELOPMENT OF VIRTUAL TRAINING SOFTWARE FOR EQUIPMENT TEACHING

4.1 Overall Design

The virtual training software of a helicopter flight control system based on Unity 3D virtual reality engine adopts the top-down design pattern, and the overall structure design is shown in the figure. The top-level UI displays the names of each training module for trainees to choose, which mainly includes system learning module, circuit principle simulation and training evaluation module. In addition, the background connects

Mysql database to store the evaluation score, operation record and user information. After completing all the sections, you can return to the top-level UI interface and re-select the training target^[2]. The development process and overall design are as follows:

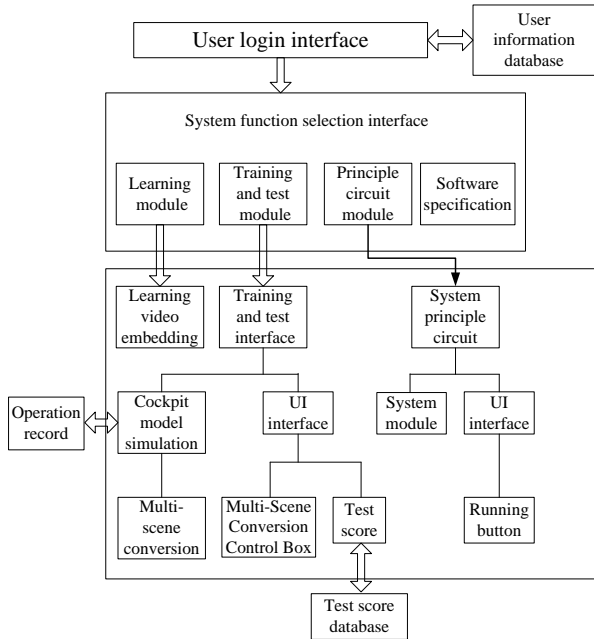


Figure 1 Software General Framework

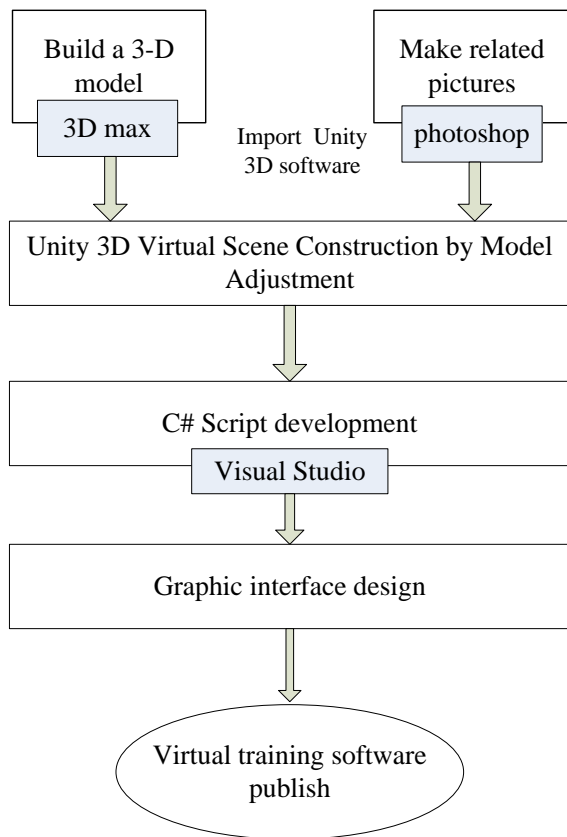


Figure 2 Software Design Process

4.2 Establishment and Optimization of Equipment Model

The development of virtual training software needs to build three-dimensional model of military equipment, so that students can experience immersive learning in the course of learning and achieve the same effect as real-life teaching^[5].

Using 3ds Max to model, animate, and render applications, the modeling process is as follows:

(1) Spline Line Template for Constructing Helicopter Model

A spline line consisting of the helicopter's most basic rotor, tail rotor, frame, cockpit, and seat models. These splines together make up the basic appearance style of the helicopter and refine it.

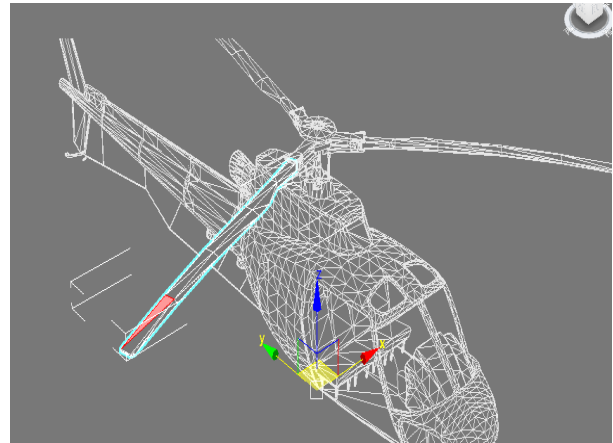


Figure 3 Helicopter Spline Refinement

(2) Three-dimensional processing of spline lines by using 3dmax

Firstly, color the refined spline line and color the plane formed between the line and the line. From a two-dimensional line model to a three-dimensional plane model. Secondly, the plane model is refined, and the edge of the figure is drawn, which makes the model more clear and three-dimensional. After that, the image is converted to editable polygon, and the UVW map is added to the modifier page. The prepared map is attached to the helicopter plane model to realize the simulation effect.

(3) fine optimization of model

The helicopter model is turbine smooth, default light and dark processing, so that the model is more detailed and exquisite.

4.3 Module Design and Function Realization

Learning how to conduct the system electrification check is the important teaching content in the whole system. After completing the system study, it will enter the study of this part. [1] This module fully considers the different possibilities of human-computer interaction in

the training process, and simulates the actual working process to the maximum extent. The trainee controls the cockpit panel by clicking on the switch knob and so on. If the switch is clicked, the switch performs the on-off action and transmits the signal to other model parts. This section is edited under the Update method to improve the user's immersion.

When the training evaluation is over, the system will give the evaluation score after clicking "Finish the training".

After the completion of the examination into the system line learning, this part of the learning is the operator to carry out in-depth study of the core link. After the trainee clicks the UI button according to the need, the system automatically carries on the line connection of the part involved in the button so that the trainee can clearly learn the system line.

4.4 Release of virtual training software

After each function module of virtual training software is constructed, the whole debugging of the software should be done in the Unity 3D platform, so as to find the loopholes in the software and optimize the software locally and globally, so as to lay the foundation for the final software release. Software debugging mainly includes the following aspects:

- (1) Whether the GUI graphical interface jumps correctly.
- (2) Whether the part assembly animation is smooth and correct.
- (3) whether the background data record is normal.
- (4) Whether each function operation is smooth and correct.

After the software is optimized and debugged, the final release is carried out according to the steps. In the open menu bar, select the "generate" option, add the scene to be released, set the release parameters such as running path, rendering mode and resolution in the inspection view, select the release platform to install the software, and generate the final virtual training software^[2].



Figure 4 Program Operation Interface

5. CONCLUSIONS

In this paper, we discuss a way to introduce virtual simulation technology into military equipment teaching from the deficiency of traditional military equipment teaching, and develop virtual training software by taking the teaching of a helicopter flight control system as an example. After the trial of different levels of students, the participants generally reflect that effect of the virtual training software is obvious, after a few virtual training, then the trainees can do the actual installation of basic self-operation training.

Practice has proved that virtual training software can be a good complement to military equipment teaching and training, and it has a good prospect in military equipment teaching and training.

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