

# Application of Virtual Reality Technology on Teaching of Basic Computer

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**Abstract**—Virtual reality technology is a multidisciplinary, multidirectional technology with the core of computer science. Using virtual reality on basic computer teaching can provide the vivid, realistic learning environment; the students can acquire knowledge more vividly and stimulate thinking, and change from the passive recipients of knowledge to a participant in the virtual environment. In this paper, we discussed the virtual reality technology and VRML language, focusing on application of virtual reality technology on teaching of basic computer course and computer experiment.

**Keywords**-Virtual Reality Technology; VRML Virtual Laboratory; Basic Computer

## 1. Introduction

With the accelerated pace of national information and further development of higher education reform, the traditional instructional model has been unable to meet the innovative learning needs of students [1]. Therefore, to enhance basic computer education, reform the teaching mode and improve computer application abilities of students are the important task of basic computer teaching. That is, we should create new instructional models and methods in the new teaching environment in order to improve the personality, ability and comprehensive quality of students.

Application of virtual reality technology in education is a giant leap in the development of educational technology, we can demonstrate the teaching contents more vividly with virtual reality technology, In the use of virtual reality technology to create a "autonomic learning" environment, students can get the knowledge and skills through its own interaction with the information environment. It can improve the efficiency and enthusiasm of acquiring knowledge and skills of students, in order to optimize the teaching process and improve the teaching quality so as to solve the traditional instructional methods can not solve the problem.

## 2. Virtual reality technology

### 2.1. Definition

Virtual Reality, is a comprehensive integration technology, it involved in computer graphics, Human-Computer interaction techniques, sensor technology, artificial intelligence. You can create and experience a virtual world, it uses computer technology to generate a virtual environment, which is realistic, visual, audible, tangible and other perception, users can interact with entity through using a variety of interactive devices, and it is an advanced digital Human-Computer interaction technology.

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Compared with traditional analog technology, the main features of virtual reality technology are: the operator enter a truly interactive three-dimensional virtual environment then interact and communicate with them [2]. Through the interaction between participants and simulation environment, and with the help of human perception and cognitive capacity, to inspire the participants thinking, in order to access a variety of spatial information and logical information. Immersion and real-time interactive are the substantive features of the virtual reality technology, Idea of the reality of time and space (that is inspired thinking, the process of access information) is the ultimate goal of virtual reality.

## 2.2. Composition of virtual reality system

A complete virtual reality system consist of virtual environment, virtual environment processor which high-performance computer as the core; the visual system which the HMD as the core [3]; the auditory system which speech recognition, voice synthesis and sound localization as the core; the body posture tracking equipment which orientation tracker, data gloves and data clothing as the core; and the feedback system of gestation, olfaction, and touch.

### 1) *Virtual environment generation equipment*

Virtual environment generation equipment, it is a high-performance image generation and processing system, usually, it is a high-performance graphics computer or virtual reality workstation. It is the core of the virtual reality system, it responsible for the developments, operations, generation of the virtual reality scene. Furthermore, it connects and coordinates the various subsystems of the system work and operation, and they form a complete virtual reality system. Therefore, the virtual environment generation equipment is indispensable in any virtual reality system.

### 2) *Virtual reality display device*

There are a variety of display systems or equipments, such as the large-screen monitor, HMD, stereoscopic display, and virtual three-dimensional projection display system. In all of these display systems or devices, the virtual three-dimensional projection display system is commonly used in virtual reality as visual simulation tools and methods. It enables participants to realize the exchange of information with the virtual space and real ideas.

### 3) *Virtual reality interactive system*

Real-time interaction is the essential feature of virtual reality technology, leaving the real-time interaction, virtual reality applications will lose value and significance of its existence [4], this is the most fundamental difference between virtual reality and three-dimensional animation, Typically, it needs special virtual peripheral equipment, such as feedback systems of force or tactile, data gloves, position tracker or freedom space mouse, joystick and so on.

### 4) *Integrated control of virtual reality*

A large-scale virtual reality system includes many components, such as multiple projectors, sound system and multiple video inputs and switching, and even assisted the lighting and curtains, which are needed to control and management conveniently, each part including many products and equipments, these products required connected to each other and work together. However, the system is very complex, it needed to be management, the integrated control system can undertake this work, so the series of work can be done by a simple remote control.

## 2.3. VRML

VRML is the virtual reality modeling language. It is a modeling language which used to create real-world scene model or three-dimensional model, its main purpose is to achieve three-dimensional animation in a Web page and users interaction based on three-dimensional objects, it is independent of platform.

VRML objects called nodes, child nodes can constitute a complex features. Node can be reused by an example, it is named and defined, and you can create a dynamic virtual world. VRML file extension is .Wrl or .Wrz, it is the ASCII text file, which used to describe the simple geometry, VRML editing tool can be any text editor. VRML files do not need any compile, directly interpreted by the browser, you can easily achieve the desktop virtual reality. VRML browser is as a plug-ins of Web browser, thus also known as browser plug-ins. When the learner open a VRML file through the web browser, the server receives the request, and transfer VRML file code to the client, the client browser interpret the information through the VRML plug-in, it interpret the information to the space geometry description, such as rectangular, spherical, irregular and the other three-dimensional objects, while it will provide real-time display, a second show many times, so that the learner will have the feeling of the activity scene. The learners use simple 2D mouse can travel in the virtual world by switching different views.

VRML file can organize the different files through the inclusion relations to achieve and manage large-scale scenes. In addition, VRML file has the hyperlink function; it can be achieved hyperlinks between VRML and HTML file.

VRML is a creation of access, can participate in the world. Users can use the virtual object to express their point of view, interact with virtual objects. Virtual reality effects of VRML can provide a new feeling for users.

### **3. Application of virtual reality technology on teaching of basic computer**

#### **3.1. Application of virtual reality technology on classroom teaching of basic computer**

Improvement of teaching effectiveness depends largely on the improvement of the teaching philosophy and teaching methods [5] [6]. The main purpose of basic computer course is to improve the student's ability of computer application and the awareness of using computer to solve the professional problem, and develop students self-learning ability and accept new technologies quickly. Through the use of modern teaching methods to enhance students understanding of basic computer knowledge, increase the volume of information and improve classroom efficiency. It is very significant in today's computer teaching.

Virtual reality technology using in the process of basic computer teaching can show some knowledge of three-dimensional space, such as introducing the basic composition of micro-computer systems, the process of computer assembly, or to explain the process of network construction, we can organically integrate the word, sound, pictures, animations and other forms of several media, and to produce some three-dimensional, cross-style contents, to meet the learners to observe and learn from all angles, as if immersed. The form of three-dimensional display makes the learning process more vivid, more acceptable and students can understand, accept and master new knowledge more easily. Courseware design through the use of VRML can provide perceptual learning materials, it can help students learn the key points and difficult points and raise the enthusiasm of the students.

#### **3.2. Application of virtual reality technology on experiment teaching of basic computer**

Basic computer is a practical course, and meanwhile hardware resources are limited. At present, the opening of many kinds of hardware experiment teaching system courses, especially experimental center, which makes the number of students increase, hardware device can not meet the students need, at the same time, as a long time operation of equipment, but also potentially increasing the frequency of equipment and maintenance, these are the burden of overall teaching resources. In such a strong demand, the use of virtual reality technology to construct virtual experiment teaching centers can reduce the capital investment; it can largely reduce the experiment hardware loss by using simulation software and improve the utilization of laboratory.

Compared with the traditional experimental teaching, a powerful virtual experiment operations, security, and strong use of virtual reality technology, which contribute to improve the design capabilities and experimental ability of students. In the virtual environment, students are able to operate independently, actively explore thinking, have more experimental techniques, can be easily complete the experiment which we can not complete in real life. For example, it can be virtual computer hardware, students can partition, format and other operations, and all of these operations can not affect the real hard data. Virtual experiments can be simulated training some of the more dangerous events, because the virtual training system is security, students can practice skills repeatedly until learn how to operate.

Using virtual reality technology can also be set up virtual training base, the "equipment" and "parts" are mostly virtual, can generate new equipment at any time. Teaching content can be updated continually, so that practical training can keep up with technology. Meanwhile, the immersion and interactivity of virtual reality, so that students can play a role in a virtual environment, and threw themselves into learning environments, this is good for training skills of the students. For example, teaching skills, electrical maintenance skills and other vocational skills training.

Figure 1 shows a real basic power driver board in a circuit teaching course, figure 2 shows measured mechanical size drawing of the board. Figure 3 shows PCB drawing of a power drive circuit board, figure 4 shows 3D PCB virtual wire frame displaying of the power drive circuit board,



Fig.1. Real power driver board in a circuit teaching course

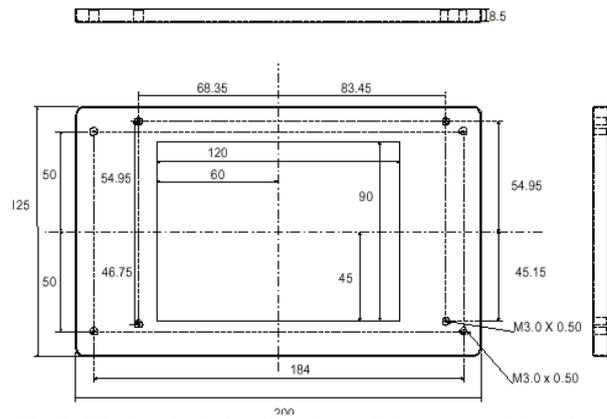


Fig.2. Mechanical size drawing of the power drive circuit board

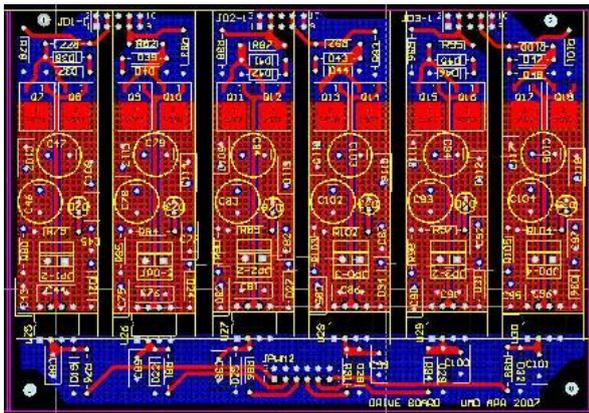


Fig.3. PCB drawing of a power drive circuit board

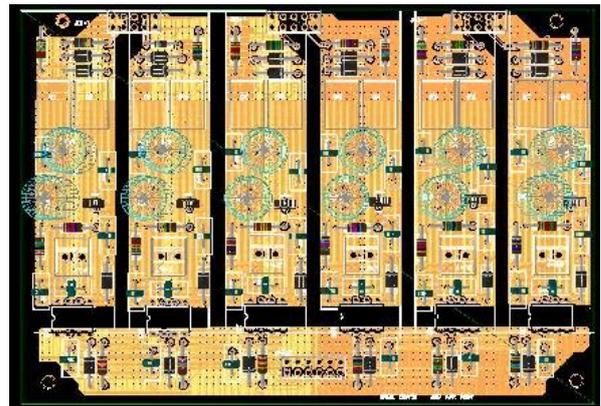


Fig.4. 3D PCB virtual wire frame displaying of the power drive circuit board

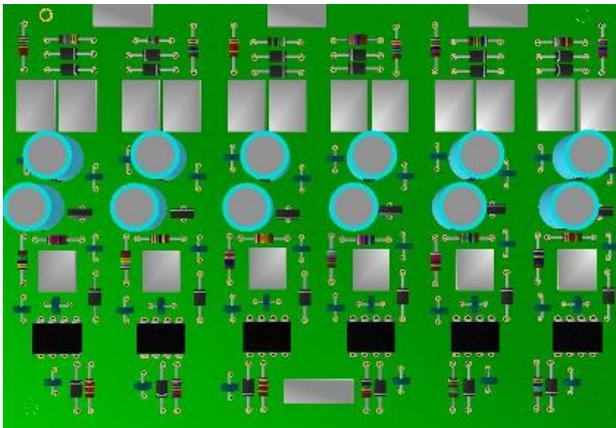


Fig.5. 3D PCB virtual displaying of the power drive circuit board with only component

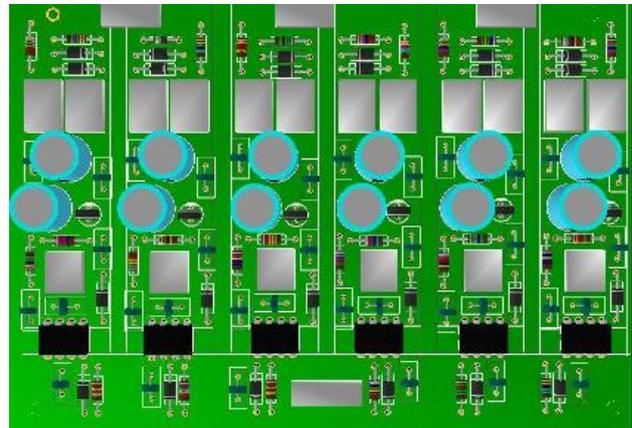


Fig.6. 3D PCB virtual displaying of circuit board circuit board with component and silkscreen

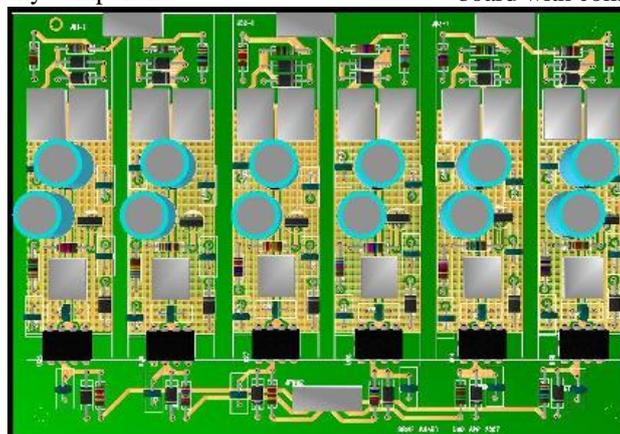


Fig.7. 3D PCB virtual displaying of the power drive circuit board with component, silkscreen, copper and text

figure 5 shows 3D PCB virtual displaying of the power drive circuit board with only component, figure 6 shows 3D PCB virtual displaying of circuit board circuit board with component and silkscreen, figure 7 shows 3D PCB virtual displaying of the power drive circuit board with component, silkscreen, copper and text. The virtual results match the real board very well.

#### **4. Conclusion**

A Virtual reality technology can provide a vivid virtual learning environment and unlimited virtual experience in a wide range of subject areas for students; it can accelerate and consolidate the learning process of students. With virtual reality technology continues to develop and improve, as well as hardware prices continue to decrease, we believe that virtual reality technology with its own advantages and strong potential for teaching, educators will pay more attention to the technology, ultimately, it can play a very important role in the field of basic computer education.

#### **5. References**

- [1] Andies van Dam, And rew S. forsberg et.al. "Immersive VR for Scientific Visualization: A Progress Peport," In IEEE Computer Graphics and Applications. Nov/Dec 2000, pp..26–52.
- [2] National Instrument Corporation, "Virtual Instrument Based on PC", Electronic Engineering & Product Wor1d,2003,(1).
- [3] Lu Tain-chi,Chiang Chuan-wen, "A collaborative scene editor for VRML worlds". EUROGRAPHICS'98 ,1998 ,17 (3).
- [4] Chen Hao-ran, Zhao Jing-bo, "application of net virtual reality technology to remote education based on VRML", Journal of Qingdao University,2003,(3),pp.88-91.
- [5] Duan Xin-yu, "Basic virtual reality and VRML programming," Beijing: Higher Education Press, 2004
- [6] Shi Jiao-ying, "Basic virtual reality and algorithm," Beijing: Science Press, 2002.