Research on EVC-based simulation platform for practical training in TVET

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Abstract: The Virtual Reality Technology has been applied in all aspects of work in China, such as in real estate, education, and so on. This article discusses the design of the school-oriented secondary development of the Visual Teaching for the three-dimensional virtual campus platform (EVC) in the School of Teaching and Training applications to the merits. The article is about the distinctive characteristics of using EVC on language teaching, art exhibitions, workplace simulation, computing programming, logistics and automotive maintenance process demonstrated by the conventional teaching, combined with entertainment platform with the nature of some of the modules which reflects the entertaining process of teaching. Finally, discussing about EVC in teaching which needs to improve and add the number of functional modules.

Keywords: EVC practical training TVET

I. Introduction

Recently, the Virtual Reality Technology has developed very fast internationally, among which the most power of influence is Second life. It is a virtual world based on internet. Linden Lab invented this world in 2003. In 2006 and 2007 it get widespread attention due to the report of some main news medium. By downloading a client which was developed by Linden Lab, consumers can communicate with each other through a avatar in the virtual world.

Since the Second Life appeared, a new product—Three-dimensional virtual world get on the bright stage of the Internet. Many copies of this kind of Three-dimensional virtual world appeared around the world since the appearance of Second Life. Of course, China would not fall back. HIPIHI, UWorld, etc came out and impacted our society in some field such as property, education and entertainment. This development gave a cardiac stimulant to 3D virtual world domestically. But the usage of 3D virtual technique in education is still in the bud. For those which are already in use are lack of characteristic for higher vocational education.

II. Background

Zhe Jiang Technology Institute of Economy has a powerful background and strong support from the leading group. The college also cooperates with the industry leading group such as Zhe Jiang Materials Industry Group to build a training base and actively build a “production Training—Internship” base mode. We paid special attention to build a series of base of integration of in
and out of school, including industrial logistics base, industrial auto and service after logistics machinery base, industrial logistics informationize base and gradually build a practical training platform which is composed of universality, production simulation and training bases. At present, there are two Vocational Education Training Bases which are supported by central finance, one Country Vocational Student training base (logistics) and one Ministry of Education LUPA Training Base.

Our college fully considered the situation on basis of the current model of practice teaching by using exploratory, developmental and enlightened thoughts with the purpose of building a strong interactive and active learning platform. For the specialty of the subjects in our college and the students’ high requests, with limited practicality teaching resource, we cannot satisfy the students’ training demand. In order to fulfill the students’ practical training request, reduce the distance between teachers and students and expand the college practical space and teaching training time and to improve the size and function of integration training base and also to inspire the students creative ability, the college constructed an EVC that mix training teaching and management integration independently by learning the experience of Second Life and on the basis of school teaching mode.

The main functions of EVC are improved based on Second Life. Now Second Life has already been the most popular virtual class in many universities, including Harvard, Pepperdine, Elon University, Ohio University, Ball State, New York University, Stanford University, Delft University of Technology and AFEKA Tel-Aviv Academic College of Engineering. According to an article in Times, they have sold 100 blocks for education. Rebecca Nesson, a teacher in Harvard, brought her “legal research” course into SL. The article quoted her words that no matter how good a long-distance education system is, there is some inner estrangement between you and your students. She said that SL shortened the distance and she could connect with her students in more spare time besides the fixed classes. As to the usage of server in education, Joe Sanchez, a researcher from Autin branch school of Texas University evaluated a qualitative analysis of the interactive process and discovered that once the students overcame the difficulties in technique and usage of the client server, they would express their favoritism on socialized study activities and get many pleasure from the study process and communication with the other people.

III. Construction of EVC

At present, our college made an introduction research of EVC platform with the fund offered by the Finance in our province. We want to construct a 3D virtual world which include practical training, teaching and creativity platform and use 3D online virtual technology in our daily teaching, study and training process. These can make the students have more interests to master the skill in real work and do it better and also use the learned skills to carve out their
own business. Meanwhile our college can reduce some bankrolls on real equipments in school.

3.1 Construction of technology

We use C language, C++ language and C# language in the exploitation of EVC platform. The system is running under SUSE10.0 operating system and the databank uses MySQL. Six kinds of server are configured to the main server according to the functions and students’ number, including Login server, User server, Space server, Data server, Simulator (always called SIM) and other servers (including several servers with different functions).

1) Login server, just like what his name means, is used to validate the user name and password. After validating it should decide which part the user login in: the homepage, the district where the user left last time or some place that appointed by the user. Then the server will find the simulator that run for the place and validate if the user can be connected with that district. At last, the simulator sends the connection request and tells the client end where it should connect with.

2) User server is in charge with the instant message communication, especially the inner group message.

3) Space server deals with how to choose the different routes in X and Y coordinates. The message between Simulator and the server will be recorded and you can find who your neighbor is. This function is similar with the router in internet.

4) Data server treats with central data bank, log server, storage data bank and the search for data banks and running the query processing that represent simulator. (In the reseau of server there is only one central server and log server, but there are several storage server and search server or they are in some certain area. The relationship of these two pairs is the previous two and the latter two are one-several.)

5) Simulator is the main server. Each simulator control an area of $4\times256\times256$ sq.m. When the user strolls around the virtual world, it is actually changed hand between different simulators. There are many tasks for simulator, such as state of storage, land and map of landform and altitude. The simulator is also in charge with calculating items and ground visibility and then sends the data to the user. It uses PRI alignment to send image datum. A kind of physics simulator masters the physical data specially. The simulator also deals with the public communication and instant message. When it runs in full speed, the simulator can reach 45 frames per second. If it cannot keep full speed, it will try to expand the time in the situation that not reduce the frame. If the server cannot keep full speed, then it delays the display of the items but there is no effect on the quality of the item.

Simulator is responsible for running the physical engine, checking collisions, tailing after the location of each item and user, sending the item position to the client end and sending update data to the client end if necessary (only when there is a collision or change in direction and speed this
kind of updating). While the client end is in charge of dealing with the location of LAN items, getting physical information about the speed, doing simple physical calculation, tailing after where the items move to and not checking the collisions.

6) Other servers includes several lesser size servers.
   Central hinge: with responsibility for entirely communication, attemper and distributed calculation.
   Deputy data bank: in charge of mapping between metadata and items. One object may be make of several metadata, so it is necessary to record the relationship between metadata and object which is called item here.
   Central databank: this server stores who own something and record the bills.
   Search databank: a copy of central databank which is used to searching. In order to raise the efficiency, there are large amount of search in databank. While the central databank should assure the efficiency of read-in and amend, the usage of reach is much less.
   Map server: OpenGL drawing the entirely map and the client end.
   Server for long-distance transfer: It can operate the API in server and communicate with the space databank and central databank by not using the browser at client end.

Besides these servers, we also need to install client end which is similar to SecondLife if we want to use EVC platform. The client end mainly focus on the connection with servers, read the content and location of object and then display an romance the scene according to those datum. As there are many disadvantages in the client end, we will abandon the client end mood in the future edition and use WEB interface to login.

3.2 Construction of Space

1) Public space

It is an important mental request that random design of space in EVC platform and nice consumer experience. In the non-functional space, the meaning over passes the usage requests. It has an important function that can connect and divide the functional spaces which decide that it is sensible comparatively. The design of EVC public space emphasize on the mapping relations between the virtual world and the real world. The public space takes both teachers and students' emotional request into consideration and emphasize on natural and beautifying. So it makes great use of materials and structure that relate to the real world in order to build a circumstance that is easy for people to immerse.

EVC public space is not only including the road, Green Belt and other public establishment, but also include the landmarks architecture in the school from the real world. This can enhance the teachers and students’ cognize of space.

2) Functional Space

Combining with the building distribution of our school and the request for
functions, EVC can be divided according to different departments and functions. It can imitate the real architectures and mix with excellent architecture distribution. The basic rule for programming the space is ensuring the usability of functional space, using public space to correspond and making allowance for continuous development.

The functional space cannot be too compressive and collective, it should be divided according to the real demand in order to ensure the speed and stability of development.

IV. Features of EVC

Since 2007, 3D virtual platform has almost matured and the popularization has rapidly upgraded. It became the hotspot and develop trend of Internet. It is very popular to use 3D platform in teaching and training around the world. There are also more and more natural user friendly and interesting methods.

4.1 Entire features

There are most functions in EVC platform as the other 3D virtual platforms. Its features include natural alternation; relax immersion environment and low cost mutually real time study, etc. These features provide the possibility and basis for multi education platforms and have an innovated significance of optimizing the efficiency of teaching and the effectiveness.

Meanwhile, one feature of EVC platform is real time alternation of several people which solve the restriction of section, time and number of people. It makes people from different parts of the world study together and also the number is not restricted by the classroom. It is more convenient to communicate between students and teachers by using the platforms. During the process of inter activity a district with dense study atmosphere and makes the teaching behavior more suitable, deeper and more natural.

Features of EVC virtual teaching platform:

First, simulation. All the scenes and human in the virtual world are not real, they just simulate the real object in the world. But it can give us the real feeling as it is true or even.

Second, alternation. The virtual world is an open system in which the items and human are interplay and intercommunion. For example, when we watch TV, we accept the information passively, but in virtual world we can have a man-machine conversation. This is a man-machine coupling resonate environment.

Third, immersion. As EVC has a more advantage 3D man-machine interface, it allows inaccurate man-machine conversation and make the alternation change from accurate to inaccurate, from one channel to multi channels and from 2D to 3D. What's more, the static UI becomes media UI. So the user’s feeling of immersion is stronger.

This teaching platform not only provides PPT, videos and some other traditional teaching methods, but also provides the students a dynamic study and living space on the net in which they can do creations, share something,
do sociality and communicate with the others. Using the new teaching mode, through a 3D alternate platform, the one-many broadcasting teaching mode is changed into a community teaching and a one-one teaching mode, and the passive teaching is changed into a initiative learning mode. We integrate the current teaching resources such as videos, audios, PPTs and documents and make use of them in the virtual classes.

This training platform provides all kinds of different practical scene for different majors, especially suit for the altitude profession training. One person and single subject training: using the 3D simulations, you can combine and take down the assemblies or do some other comportments training in the practical room. And you can look over and comprehend the details of the objects by zoom in or zoom out or circumvolve it in all directions. Several people and colligate training: this can satisfy several students to cooperate with each other to fulfill the task. It trains the cooperation of the students to finish one training task.

It is just like real operation when you do the above training. This will be the ideal way to substitute the practicality training. It can reduce the influence of insufficient of practicalities and also update the teaching practicalities according to the social development and update of real items, which may save the cost for buying those teaching equipments. Secondly, it is not limited by time and space. So this platform can satisfy the students’ requirements of enhancing and practicing a lot. This is of high value for the students to master the learned knowledge and skills.

4.2 Module Features
1) Language teaching and practice

Foreign language teaching is one of the basics in high education. The gift of tongues is a basic skill of the modernists. With the development of globalization, many teaching organization set the goal for a more perfect language teaching mode. Among the numerous education thoughts, “immersion” education outshines others and becomes the most efficient way of teaching language.

EVC platform is a new pattern and a powerful immersion environment. Many of its features make it an excellent language teaching platform. On this platform, the learners go into a imitate scene, eg. Banquet, interview, shopping or something else and they receive some tasks and get the marks according to what they do. In this kind of environment the students would use foreign language naturally because they can only use foreign language to do what they want to. As it is a virtual world, the students won’t feel shy about making mistakes. We can encourage them to use foreign language. This is obviously the best way to learn a foreign language.

2) Occupation scene simulation

The practical locale for students to practice should be the same as much as possible the actual production and service sites. But due to the lace of
qualifications in school, we should pay more attention to the construction of practical base out of the school. The vocational college is always pay attention to train the students’ operating ability which is one feature of the vocational education. And the out school practice is an efficient way to upgrade this ability. But at the same time we should consider the efficiency and economy of this kind of practice. Now the EVC platform takes this point into consideration. It provide the students a simulate production and service sites in the classroom to practice the skills before they go to the real work in order to make the non-distance between students and the jobs possible.

3) Logistics Management Course

Logistics is a highly integrated application of discipline, logistics process involves the transport, storage, distribution, packaging, distribution processing, handling loading and unloading, information processing and many other links, and it contains a large number of operational activities in each links. We build a 3D logistics training rooms on the EVC platform is to build a bridge between theory and practice. Then we can provide students with practical training platform to enhance their understanding of the theory of modern logistics and to enhance the students operational capability. The students get practical training in the 3D logistics classroom and enhance their practical ability and employability and competitiveness by simulation training.

3D logistics training rooms can be divided into independent curriculum practical training and professional comprehensive simulation training. The independent practical training courses are mainly part of the basic functions of logistics, including transport Training, training warehousing, distribution and practical training, etc. While the professional training is mainly reflected logistics management and logistics processes which integrate on the independent training courses. 3D simulation software is more visualize than the ordinary software. It can achieve the constant interaction with other software through the use of HTTPS protocol, such as to increase the ERP Training which is simulation a multi-disciplinary training courses.

The faculty adviser offers the operation for one day or more, then the students process it according to the business processes and achieve the procession of raw materials, finish goods warehousing, transportation and distribution. Each student works together at different posts. This interactive features that offered by the 3Dvirtual world can not be achieved by the other softwares.

4) Vehicle inspection and maintenance

The usage of intuitive of 3D and all-round vision enables the students to feel that there is no difference to the live teaching. Each student can have a 360-degree viewing of the device which makes up the disadvantages of shortage of equipments and too many students.

a) EVC platform comes with the use of modeling tools to build a virtual 3D object, with the help of professional 3DMAX, PHOTOSHOP, MAYA software such as dealing with fine virtual objects.
b) Teachers can “Click” the auto parts in a specific area, showing the amplification of this part with a 3D image. Objects can use the simple "IlSetText()" to enable the students to obtain the relevant instructions and tips.

c) Students can connect the parts in accordance and form a complete model at last by using the server’s “LINK” technology.

This teaching model mainly trains the students’ ability and let them install an auto so that everyone gets more chance to participate. Its cost to the real parts is very low. When the new product appears, you just need to upgrade the models without washing out the original equipments.

V. EVC’s insufficiencies and expectations

5.1 Technology support

Above all there are some insufficiencies in the virtual world itself as a new internet technology.

First, the hardware configuration is high. At the moment, most of the personal computer cannot support the virtual world as it demands a large process running.

Second, the demanding of speed transmission is high. 3D environment has a large amount of data and it requires transmission bandwidth and speed of the Internet connection which is not yet perfect.

Thirdly, the connection of EVC platform with other virtual platform is limited. Now the background of a lot of virtual goods are relatively closed systems which requires the users to download a special client program which is not connected with each other and which doesn’t allow the users to convert freely in different virtual system.

5.2 Server support

On this issue, we can find that from the Second Life platform, though more than a few million users registered and the number growing rapidly, the follow-up support and service still doesn’t meet the users’ requirements. In the Second Life, what the learners desire most is to get the tutorials of the usage of Second Life. In the virtual world, lacking of skills blocks the exertion of creativity. In addition, according to NMC statistics of a survey on the main activities in the virtual world, there are 91% (187 people) of the learners in the virtual world is just wondering around, that means most of the learners in the virtual world are in a “discrete” state.

Combining the Second Life combine with the status quo, it is a worth consideration and exploration issue that how to guide the learners to engage in the effective learning process.

5.3 Expanding the spatial of educational practice

For now, the main form of educational practice which have been carried out on EVC platform include the following: in the virtual world there are teaching and learning activities in the form of classes, which support the traditional face to face teaching; practice under the guidance of teachers; informal discussions in theme type and a number of cultural and artistic shows
and so on. These educational practices are still in the “analog” stage of the real world. The learners can adapt to the new virtual environment rapidly and to achieve the scene “shifted” and activities “migration”. However, the educational function of the virtual world will never stop here, there is more space for us to develop. How to maintain the ongoing motivation of learners, but not make the learners “flee” in the virtual world? Can we open up new forms of education? More importantly, the boundaries between the virtual world and the real world become more difficult for the learners to distinguish at an unexpected speed. How to experience and create a new culture and education in the virtual world? And to make the practical education unite the virtual world and the real world and to transform in these double-space freely. All of the above are what we need to think about.

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