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An Educational AR/VR System for Predicting Right Career Using Data Mining

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Abstract: *Virtual reality is an emerging technology which could potentially shape the future of education. According to actual demand for system analysis, this paper designs and develops data mining analysis system of college students' data that can help them to predict right career on the basis of their ability test data. Data mining technologies are well grown and able to analyze any data. Proposed system will take students' test data from the virtual reality devices and analyses their activities in real time. However, prediction is performed later when data is collected in the system for the processing with different data mining algorithms. Finally, through example test and analysis, the system is verified to be accuracy in related functions and it has practical application value to use data mining-based method to solve these problems.*

Keywords: Virtual Reality, Education, Data Mining, Prediction Models, Unreal Engine.

Introduction

Virtual reality is a high technology in 21st century in value of synthesis computer graphics, human-machine interaction, artificial intelligence to produce really visual, listen, smell sense and let human and virtual world experience and interaction by value of exterior equipment [1]. Virtual reality gives us new education thought and deal with difficult problem. So Virtual reality is used widely step by step. The research tries to make use of virtual reality in virtual education to meet the need of digital education in right career mining for any student. The VR software Multi gen creator was developed as platform to design three-dimension model, Vega was designed on scene drive tool and visual cpp was developed as platform mining virtual reality system was developed in values of texture mapping, LOD, instance, crash detect technology and so on. The system is applied for mining miner safety education and technology train, safety succor, accident simulation and investigation analyze and so on. In values of VR all kinds of complex work environment are emulated, the mining production system based on VR or parts of production status three-dimension chart is built, the mining production system arranged status and production techniques flow is shown, the trainer is personally experienced the environment and learnt how to make effect. measure on deal with all kinds of danger and exclude hidden trouble and in the same time compeer may make rescue measure and realize rapid rescue according to build virtual environment [2].

II. AR/VR Technologies

AR and VR technologies are related but they are different things we can understand by defining both as follows:-

- **AR**

AR can be defined as an interactive experience in the real-world environment where the computer-generated information and elements are linked to the

real world. The computer-generated information is virtual content that is synthesized with the help of multiple sensors (i.e., camera, microphone, GPS) and haptic devices. The AR productions can take place in three steps: first, all real-world data is collected by various sensors. Second, this information is then analyzed and additional information from different information sources. Finally, the gained information is displayed as digital elements [3].

- **VR**

In contrast to AR, VR takes place within an artificial environment and a participant becomes a part of this artificial world as an immersive or a non-immersive member. The people can interact and manipulate computer-generated objects in a virtual environment with the help of some gadgets like haptic devices. In addition, VR gadgets have influenced VR content and enhances VR capabilities for better experiences. For instance, smell, wind, sounds, heat, body movement detection are elements that potentially create VR experiences more real and interesting [4].

- **AR/VR Hardware**

VR and AR technologies need to mix real environment information and computer-generated objects properly to create desirable experiences but participants never are able to have a perfect feeling of VR/AR content without tools and gadgets. The AR/VR tools work based on human perceptions and can engage the several human senses. The tools can be visual, auditory, haptic, olfactory devices and the external devices like position system can incorporate in these tools[5]. The visual perception in VR can be done either by a head-mounted display (HMD), in a space with back-projected stereo projection screens around (e.g., CAVE1), or a desktop display. An HMD is a box worn on the head and consists of a one or two small displays in front of one or each eye. The Google Cardboard is a low-cost HMD developed by Google [6]. A smartphone is placed into the back of lenses to present content to viewers. This cardboard is also linked to a software development kit (SDK) that provide a designing platform to simply produce VR content for the Android and iOS operating systems. The HTC Vive, Sony PlayStation VR, and Samsung Gear VR are other HMD products that are mostly targeted for games and entertainment purposes. In education, price, quality, and user-friendly are important factors for student use. The Google Cardboard seems to be a good choice for education but the quality of a display is also can be taken into account [7]. Because, side effects of VR such as dizziness and eye fatigue may encourage students to use better ones, therefore the expensive HMD may be considered for education. The HMD is also developed for AR applications. AR HMDs looks like eyeglass with components such as camera, IMU, microphone. Users see a real environment optically and computer-generated elements appear on the glass simultaneously. Although AR HMDs is relatively costly for education but it can revolutionize classrooms by presenting 3D models and other interesting demonstrations [8].

III. Technology Progress Of Mining Virtual Reality System

Many three-dimension entity and scene model need be built to realize mining virtual reality, but a three-dimension object or scene need be divided into several absolute module and combine. The detail of whole progress is very complicated. The progress of design and realization of system is depending on some key points used in 3d world.

- **LOD**

Levels of detail (for short LOD) are a type of multilayer model technology. Multi-similar model is built and different model describe differently the detail. The more the detail is exactly described, the more the model is complex and amount of polygon is more. Accorder to the area is owned by object and user viewpoint the different LOD model is selected in order to reduce the amount of polygon. When LOD is used visible effect is sufficiently considered. When the distance of object and viewpoint gruffer LOD is used, whereas more precisely LOD is used [9]. Figure 1 (a) and (b) are on behalf of two different LOD.

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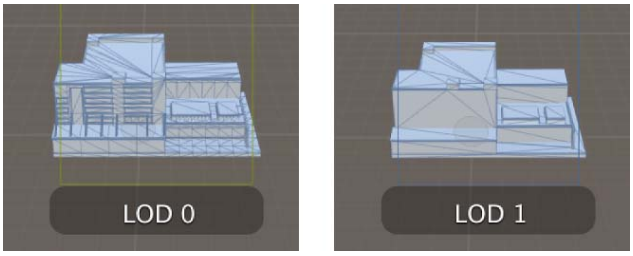

Figure 1: View of different LOD levels.

- **Texture mapping**

So called "texture" refer to two-dimension images which is mapped into three-dimension model. In different 3d tools and game engines texture is loaded by texture toolbox and can have many features to load it correctly Figure 2 is shows unreal engine texture mapping details which give as a realistic view for the model [10]. To create different texture mapping or final render object we can perform following steps (1) Prepare your texture (2) UV coordinate is mapped screen space coordinate (3) Texture color, polygon and material is fused (4) Proper texture is filter and texture mapping effect is optimized.

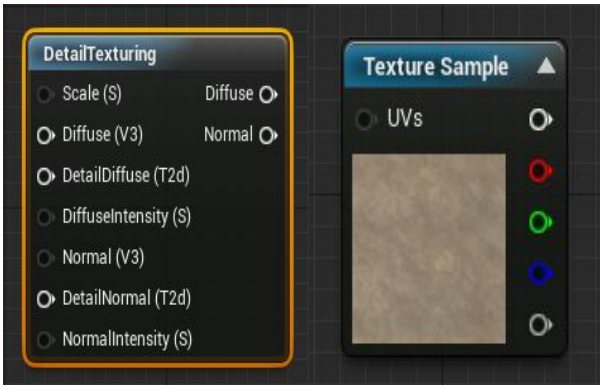

Figure 2: Texture Mapping On 3D Object.

In order to effectively use texture memory and correctly texture mapping the size of image is 2 power, for example 16x16, 32 x32, 128x256 and so on. The type of texture recognized by Unreal engine supports multiple assets type and can use any type of images as texture base. When creator is used at first image is fold into texture template, appointed currently texture, selected object face and currently texture is mapped into object.

- **Virtual scene**

Virtual scene is the core of the whole virtual reality simulation system and collection of all visual objects in system. Under the support of virtual reality technology, scene visualization and interaction are used to build the virtual mine scene which has deep immersion and high interaction, Virtual mine is a complex system definitely, so the virtual reality simulation system is developed by object-oriented programming method-based OSG and VS 2005 platform[11][12].Visualization is responsible for building a virtual mine environment of deep immersion. It is used to realize the functions, such as light, materials, geometry changes, transparent display and viewpoint attachment. Virtual scene should be set light and materials correctly. Geometry change includes translation, rotation, scaling and other geometric operations. Transparent display can offer a way to users to observe a number of objects at the same time[13].

IV. Research On VR Technology In Education

The application of VR technology in education will transform the traditional single teaching into a diversified comprehensive professional teaching, and make all kinds of education more profound, which is

a reform of traditional education. VR technology is a research project that extends from the field of artificial intelligence networks. The application of VR technology in the field of education and training has opened a new exploration of the education model which can be converted into the career prediction model. It greatly changes the traditional face-to-face teaching method, improves the learning initiative of students, uses VR equipment to guide students into the built interesting training environment, enhances the students' fun, and is conducive to the smooth progress of training [14]. The application of VR equipment will prolong the time of different exercise, which can not only achieve a face-to-face teaching effect, but also enhance students' knowledge reserves, can promote education to a certain extent, and spend on teaching equipment and education funds Investment can be reduced accordingly. In sports training, there are a large number of competitive sports. These competitive sports often have accidents in actual training, which are gradually eliminated. The development and utilization of VR technology can eliminate the hidden danger of accidents, and allow the wearer to carry out sports training under comfortable conditions. In addition, VR technology can also better simulate sports events that require high teaching equipment and sports venues, reflecting the humanized creation of the teaching environment. The application of VR technology in education can make up high-end equipment and venues, so that students can truly experience joyful operation and exercise, so as to achieve the goals of education and sports training reform [15].

V. Proposed System

The proposed solution would bring digital connectivity in education by digitizing the education through AR/VR. It is geared towards embodied learning, meaning our games teach abstract concepts by connecting the kids to objects and actions in the physical world. Proposed system fulfils the objective, the algorithm and system design described below.

- **Algorithm**

1. input from AR/VR devices as play data.
2. use play data to generate data concepts.
3. build concept tree based on detail node of the student.
4. merge common concept node with corresponding play info.
5. analyze the concept tree with play data and previous results.
6. create concept profile for students.
7. apply clustering algorithm.
8. merge the clusters of the similar scores of the student.
9. extract the relevant domain from the clusters.
10. output specified career category according to relevant data.

- **System Overview**

Proposed system is a unique educational system that opens up your mobile to the infinite possibilities of physical play. It merges tactile exploration with augmented reality technology which encourages a student to learn and choose right career with fun. It comprises of a set of cards which put 3D virtual objects into a real scene showing a live image via a tablet computer mobile or other device so as to achieve direct interaction between users and the environment. It has different domains like engineering, doctor, auto mobile, etc. based tasks to complete.

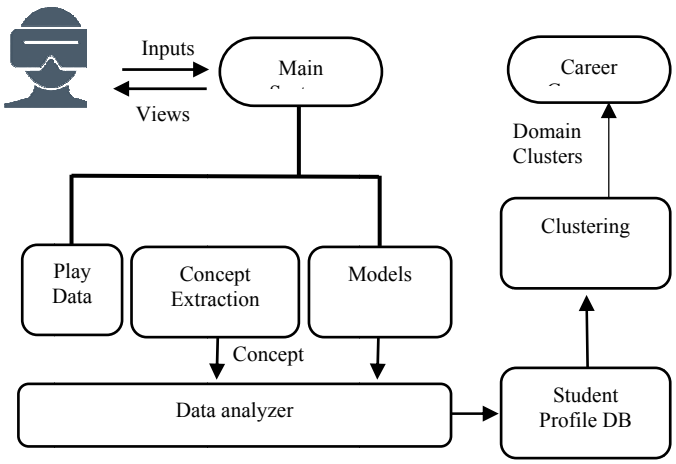

Figure 3: Overall Process of Proposed System.

With our innovative technology, students will be able to learn and visualize efficiently for a better and quick understanding. The system includes different models, procedural levels and blueprint which are related to the specific domain. Furthermore, some components are described below.

- **Concept Extraction**

The concept extraction method composed of two basic steps. First, to extract the concepts making use of the play data returned from AR/VR device. Second, to obtain the relation between the extracted concepts. When a student plays a task in AR device, it returns a set of play data back to the system to identify the items that are relevant to the specific domain of the career. If the returned data, for a particular student contain repeated or high score results that represents his/her interest in it, then those data will be considered as an important concept.

- **Clustering on Concept**

We now describe our concept-based algorithm for clustering similar play data scores for every student. Similar to Cobweb algorithm, our technique is composed of two steps: 1) Concept tree construction using the extracted data and 2) Student profile creation using the constructed tree. Using the extracted concepts and play data, the first step of our method is to construct a play score-based concept tree, in which one side of the vertices correspond to unique results, and the other corresponds to unique concepts. If a student scores greater in the similar domain it will increase the order of the concept in the tree and when specified iterations are completed highest order concept will be considered as the specific domain for the career.

Furthermore, there are some other components that are models, student profile DB, data analyzer and play data. These are the supporting components which are required for the processing for example play data is the collection of activities done by the user throw out the test, models are the pre-build object shown in the virtual space, data analyzer is used to analyze the current and previous data to create student profile, and student profile DB is the concept tree for a particular student which is used to extract the specific domain for the student.

VI. Survey Results And Analysis

In order to analyze and observe the application effect of VR equipment in education, proposed work tests the students of each class after two weeks of education in the experimental and control classes of the college, and calculates the original score. Investigate their interest in different training concentration, and preference for VR devices, and then analyze the application effects of VR devices in education in detail for choosing the right career for them. The questionnaire survey is used to analyze students' interest and preferences of VR technology the system and a data mining approach is applied to that analyzed data for further information. The statistical scores of the experimental of the random students are shown in Table 1 below:-

Number of Students	Interest found in category	Probability of choosing area
15	Computer	Software Engineer
10	Computer	Game Developer
7	Energy	Electric Engineer
12	Physics	Scientist
6	Computer	Data Analyst

Table 1: gives the insights of the 50 random students who experimented on our system. On the basis of their actions and
results in the VR environment the category and area are found with the help of classification algorithms and techniques.

VII. Comparative Analysis of Interest

In order to do a comparative analysis of learning interests, students' interest is decided by the time spend on a particular game of specified category and task solution time duration and number or attempts to solve the problem. Compare the experimental class

with the different results and mining that with classification technique. As can be seen from Figure 3, with the help of VR equipment. People who are interested a specific category which can be used to specify a specific domain of interest which give student specified area of interest. This part of the students may be caused by dizziness when wearing VR devices due to physical reasons. Compared with the experimental class, the control class is based on the traditional way of training the education curriculum. The data of the control class is a good indication of the tedious single disadvantage of traditional education. It can be seen from the bar chart that the number of people who hold a general attitude towards the training course accounts for the largest proportion of the total. It can be seen that VR technology applied to education has been warmly expected by students.

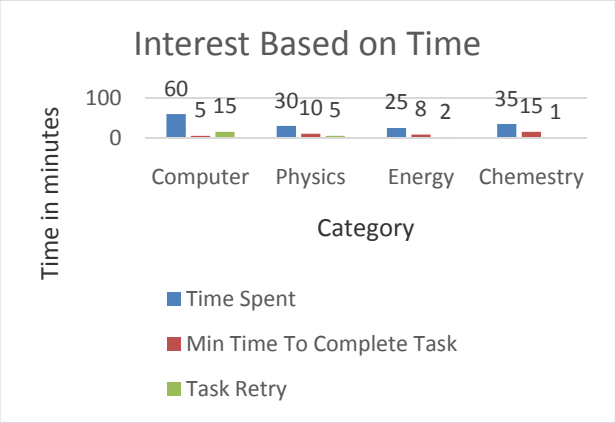

Figure 4: Interest Detection by Time Spend on Game.

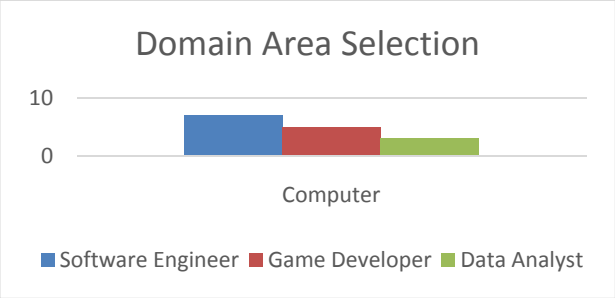

Figure 5: Domain and Category Choosing by Time Spend on Game.

In the experiment, proposed work divides the concentration time into different levels 3–5 minutes, 5–10 minutes, 10–20 minutes, and 20 minutes or more. The experiment and the control class are used for comparative experiments. The experimental results are shown in Figure 4 and Figure 5.

VIII. System Screenshots

Figure 5 shows the level map of the VR setup for the logical ability test that configuration is used in most of the test maps.

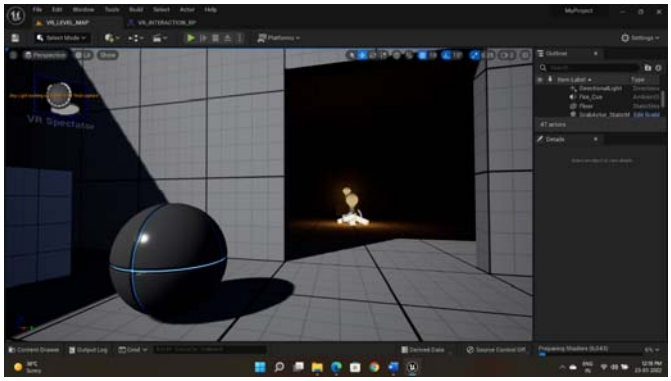

Figure 5: Level Map of AR/VR Configuration for Logical Ability Test.

Figure 6 shows the configuration blueprint for the virtual reality device interaction with the users.

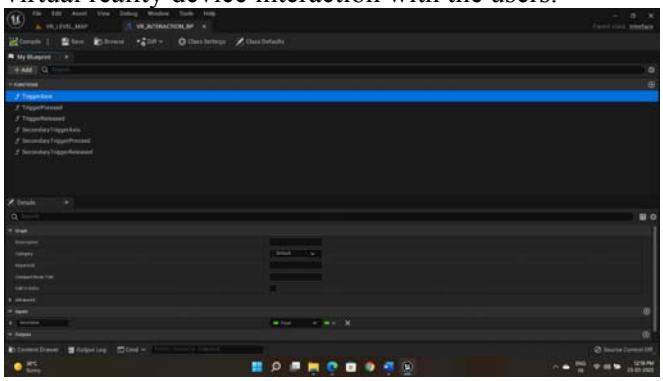

Figure 6: Configuration Blueprint for AR/VR Device Interaction.

Figure 7 shows the menu blueprint for the users when virtual reality device starts to give response.

Figure 7: Menu Blueprint for User Interaction When Devices Responding

Figure 8 shows the analyzer blueprint that uses play data and previous extracted data and analyses the results and generate output with the probability of the relative domain for the user.

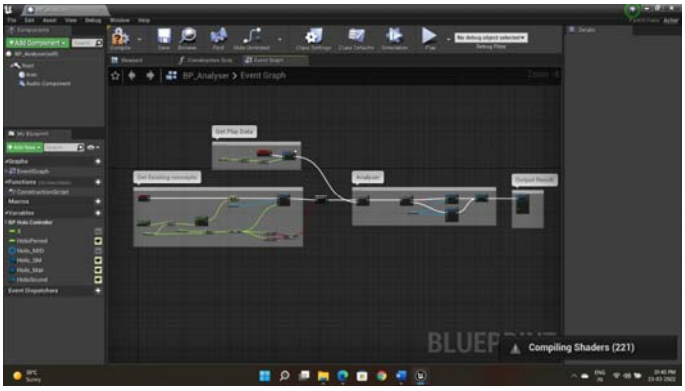

Figure 8: Analyzer Blueprint for Generating Appropriate Results.

IX. Conclusion

Reforming teaching methods through VR reality technology is one of the main ways of modern education. Job satisfaction and choosing right domain for career is an important part of our country's education. Making online VR panoramas and VR videos through VR technology can greatly enhance students' enthusiasm for learning. VR technology can simulate complex environments, breaking through the limitations of traditional sports courses on sports venues, equipment, safety, etc., and can provide complex and abstract sports theoretical knowledge through VR visualization to provide students with scientific and accurate guidance to Get more skills and knowledge. Compared with traditional sports teaching activities, virtual reality technology can not only simulate the motion scene by generating VR panoramas, but also bring learners into the immersive and interactive virtual reality world through VR video. Experience". Proposed work uses VR technology in education and analyses multiple factors and predict the future of the student. A classification technique is used to categorize the data from VR game and provide specific interest domain of area which can help students in job satisfaction. However, VR technology needs to overcome the current technical bottlenecks so that users will not feel uncomfortable during wearing. In addition, to apply VR technology to teaching, it is necessary to follow Guidelines for Graphics Preparation.

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