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ИНФОРМАЦИОННЫЕ СИСТЕМЫ И ТЕХНОЛОГИИ

ON THE DESIGN OF VIRTUAL REALITY ENVIRONMENTS IN EDUCATION

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Tashkent University of information technologies named after Muhammad al-Khwarizmi

This text deals with the design of virtual reality systems. It is also said here that the results reached with the use of the developed software show the attributes that make the ideal virtual reality for situations of research and learning taking the discipline as a reference of the classroom to the computer labs and making more interesting to the student, making the learning easy. Also of note is the fear that is characteristic only for VR in the field of education.

virtual reality for education, visualization of knowledge; design of virtual reality systems, Smart classes, E-learning, sensors and interactive communication technology, 3D, Blender, VRML. virtual laboratory.

1 Introduction

We are aiming at building student vision and focusing on important key trends like mobile learning, online learning and e-textbooks. Each of these trends comprises of the essential components of the student vision in terms of socially-based and digitally rich learning. Providing students increased access to educational resources and experts to identify their caliber and extend learning beyond the capacities or limitations of their school or community.

Exposing students to rich, compelling learning experiences that help develop deeper knowledge and skill especially the problem-solving, creativity and critical thinking which are so highly desired for our world today. Empowering students to take responsibility for their own educational destinies and to explore and innovate thus creating an independent new generation of life long learners. The Augmented reality exercise, wherein models designed to teach concepts like rotation/revolution, solstice/equinox, and seasonal variation of light and temperature,

resulted in an overall significant improvement in student understanding as well as a noticeable reduction in student misunderstandings. Other important conclusions about this system were that AR interfaces not only change the delivery mechanism of instructional content but They fundamentally change the way that content is imparted and conceived, through a unique combination of visual and sensory information that results in a powerful cognitive and learning experience. 21st century learning highlights digital-age literacy, effective communication and high productivity where students have access to rich information and global communication. Teachers support, facilitate, encourage, and collaborate with their students. Pre-requisites for the skill set are basic language literacy, decision making, costs and benefits, pros and cons, rewards and consequences, embrace modern media to think, decide, and communicate thoughts and ideas [2].

2 The solution of the problem

During the last 5 years, technology of virtual reality (VR) evolved from doubtful looking to widely used and implemented. And there was a priori to accept the fact their usefulness. Perhaps for this reason, there were born a lot of misconceptions about VR in general and, in particular, in the field of education. The general misconceptions include the following:

1. «VR was created for entertainment only». This is not true. At the moment, VR has covered many areas: marketing, tourism, real estate, art, education.

2. «VR has a motion sickness problem». This defect was a problem for the first models of helmets. Modern models have no such problem.

3. «VR-helmets cause great harm to human vision». VR-helmets use monitors those don't radiate any particles (except photons of light), so they don't cause harm.

4. «VR leads users away from the present reality, causing disorder and creating dependency». Scientific evidence shows that VR, opposed to the altered states of consciousness (caused by hypnosis, chemical drugs, etc.), does not cause the inadequacy of mind, does not reduce the degree of reflection, not characterized by a feeling of ambivalence, alienation of the own «I», etc.

5. «VR kills the live relations and separates people from each other». But the same was talked about mobile phones, SMS-messages, social networks. However, those who consider the use of new technologies escape from reality, forget about their benefits: mobile telephony gives opportunity to connect with the person on the other side of the planet, and social networks allow to enrich remote communication by various types of content and activities.

3 The calculation of generalized evaluations

The main disadvantage of the virtual caves is the high cost, which makes the use of this type of immersive VR limited. On the other hand, the use of an HMD can often cause some level of cyber sickness.
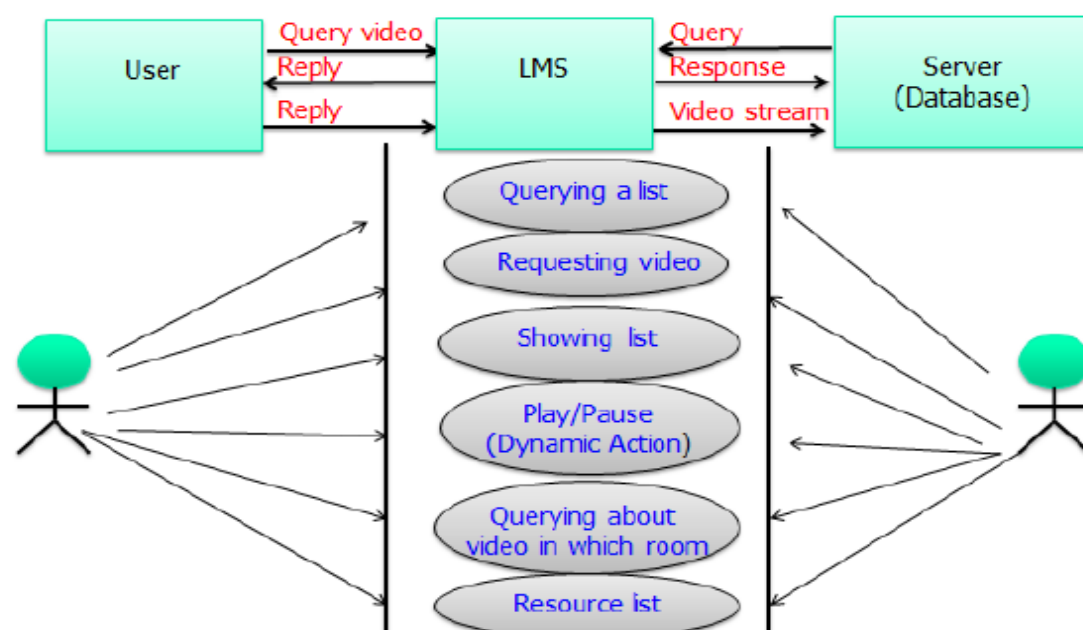

Fig. 1. Viewing of Rough Use Case diagram of the virtual reality in the educational systems

Nevertheless, the use of VR in engineering education spreads further than the use of 3D-VLs.On one hand, VR applications focus on the design and simulation of an engineering project, which are based not only on the use of techniques but also on the interactive verification of the obtained results [13, 15, 16]. On the

other hand, other VR applications aim to improve the comprehension of different concepts: the spatial comprehension of abstract concepts, complex three-dimensional graphics, production processes, manufacturing, operation processes, assembly, etc. [14, 17, 18]. Finally, VR learning environments have also been related to serious games since approximately 20 years ago and, in this way, such environments enhance student motivation through a game fiction procedure of the teaching-learning process [19]. Furthermore, kinaesthetic learning and all the embodied elements in learning are supported by VR [4].

To the design of the automatons, the software uses tolls in 3D, as the Blender and the VRML (Virtual Reality Modeling Language) and to the publishing of a page on the internet it is integrated the Program Language PHP (Hypertext Pre Processor). The results reached with the use of the developed software show the

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attributes that make the ideal Virtual Reality for situations of research and learning taking the discipline as a reference of the classroom to the computer labs and making more interesting to the student, making the learning easy.

Virtual reality, augmented reality and their variations represent computer interface techniques that take into account the tridimensional space. In this space, the user acts in a multi sensorial way, exploring aspects of this space through the viewing, hearing and tact. According to the available technology it's also possible to explore the smell and the taste. Body perceptions, like cold, heat and pressure, are included in the tact, through the skin (Kimer, 2011).

Virtual reality is characterized by three basic ideas: (Pinho, 2004)

• Immersion: the user has the real sensation of being inside the virtual world of the computer. Devices that make this sensation: digital helmets and digital cave.

• Interaction: the user manipulates virtual objects. Devices that make this sensation: digital gloves.

• Involvement: exploring of a virtual environment, it's as if the user took part of the virtual world and he can interfere directly in result of the application, the user can navigate on the virtual environment in a passive or active way.

3.1 Virtual Reality in the Education

The technological revolution has been permitting the use of new approaches in the teaching-learning process. One of the conductive technologies to the building of innovative tools for the education is the Virtual reality, which offers tridimensional computer environments with advanced forms of interaction that can provide more motivation to the learning process.

A very short time ago, we could consider that the great potential of VR use was in small groups placed in large urban centers and in teaching and researching institutions. However, the integration VR-VRML democratized its access, expanding more and more its potential and using fields (BARILLI et al, 2012). With the help of resources of some modeling and animation programs as the Blender 3D, for example, the VR use can help students in the comprehension and assimilation of concepts, coming up as a valid alternative to get good results. Other benefits are observed with the use of Virtual Reality in the education. According to Clark (2006) the Virtual Reality can be used to make the learning more interesting and fun with the purpose of improving the motivation and attention, decreasing costs when using the objective and the real environment no matter how expensive the simulation is. It also makes possible that situations that were impossible to explored in the real world can be done, for example: exploring a planet like Mars, traveling inside the human body, doing submarines explorations or inside caves, visiting very small places to be seen (molecules) or very expensive or very far away, or yet because this place is in the past (historical places) world [3].

4 Necessity of Virtual Reality in education

The following reasons support virtual reality in education:

•It provides new forms and methods of visualization, drawing on the strengths of visual representations and it provides an alternate method for presentation of material. VR can also more accurately illustrate some features, processes than by other means, allowing extreme close-up examination of an object, observation from a great distance, and observation and examination of areas and events which are unavailable by other means.

•Motivate and encourage active participation and interaction from students rather than passivity. Some types of virtual reality, for example, collaborative virtual reality using text input with virtual worlds, encourage or require collaboration and provide a social atmosphere.

•Virtual reality allows the learner to proceed through an experience during a broad time period. It allows the disabled to participate in an experiment or learning environment & transcends all language barriers. With text access it provides equal opportunity for communication with students in other cultures allowing student to take on the role of a person in different cultures. The potential benefits of the use of VR in education and training: visualization and reification, an alternate method for presentation of material; learning in contexts impossible or difficult to experience in real life; motivation enhancement; collaboration fostering; adaptability, offering the possibility for learning to be tailored to learner's characteristics and needs; and evaluation and assessment, offering great potential as a tool for evaluation because of easy monitoring and recording of sessions in a virtual environment [1].

Based on the experience of implemented development VR content in education can be noted that the technology brings positive results when it is using by short sessions or as simulators and trainers. It is inappropriate to use VR for lectures and seminars. In the development of software solutions should focus on the newest models of VR equipment, the most eco-friendly and ergonomic for user. Hardware and software interface must be as simple as possible for users, especially for teachers.
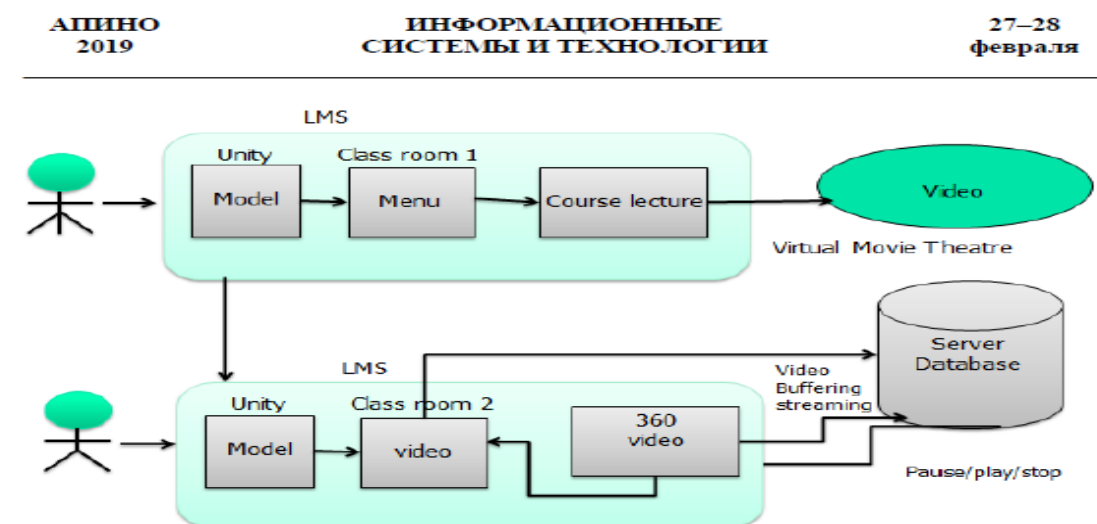
Fig. 2. Viewing of Rough idea integration of applications VR with most common LMS in authorization part and transfer of user activity data from VR to LMS

To reveal the usefulness of VR resources in engineering studies, diverse surveys were carried out during the last seven academic courses to recover the opinion of students enrolled in diverse engineering degrees at different universities. On the basis of the analysis of the database of 200 surveys, students considered that the most important features in VR applications [3, 5] are interactivity, realism (including immersion), motivation, ease of use, and educational usefulness. From these results, several conclusions can be drawn:

• Interactivity and realism are the most important features for motivating students to use a didactic VR application. Taking into account that students are

used to handling videogames designed with the latest VR technologies, outdated didactic VR applications do not awake the interest of students. Consequently, a constant effort to update VR application is necessary.

- The students highly rated the realism of the VR applications developed by the authors. Even so, students demand the use of VR resources as much as possible in order to improve their learning experience, according to survey results. Thus, collaboration between experts in a specific subject and VR technicians is necessary for designing a useful and attractive VR environment for students.

- In general terms, all the students consider these didactic VR resources easy to use (as it would be expected, considering the students' familiarity with the latest generation of videogames, which are designed with the same type of VR software).

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- VR is not by itself educationally useful and, consequently, an ad hoc methodological approach must be developed using the VR as a didactic tool.
- According to students' opinion, the most important aspects in a didactic VR tool to reach a good level of educational usefulness are: (i) a collection of interactive exercises or problems and (ii) the interactivity, which must be designed for didactic purposes and, hence, the allowed movements should enhance the expected learning.

(a)

(b)

(c)

(d)

Fig. 3. Testing models created with virtual reality applications.
(a), the main view of the educational building, (b) laboratory room's project,
(c) main entrance, (d) schedule table

Viewing of walk inside the main hall while run this application script

```
using UnityEngine;
using System.Collections;

public class walk : MonoBehaviour {
public static int pointlar = 20;
public GameObject[] points = new GameObject[15];
Transform[] all_Point=new Transform[100];
private Vector3 target_Pos;
```

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```
private int i = 0;
public float speed_move = 5f;

// Use this for initialization
            string intToStr(int a)
            {
            string s="";
            if(a==0)
            return "0";
            while(a!=0)
                    {
                    s = (char)((a%10)+'0') + s;
                    a = a / 10;
                    }
            return s;
            }
            void Start () {
            // tag point assignment
            string k;
            for (int j = 0; j < points.Length; j++) {
                    k = intToStr (j);
                    //k = (string)(j);
                    Debug.Log (k);
                    k = "point" + k;

            points [j] = GameObject.FindWithTag (k);
            all_Point [j] = points [j].transform;
                    } }
void Update () {
// object target
target_Pos = all_Point[i].transform.position;
// object movement
transform.Translate(Vector3.Normalize(target_Pos     -     transform.position)*Time.del-
taTime*speed_move);
// distance to the target
            float distans = Vector3.Distance(target_Pos, transform.position);
                    if (distans < 0.5f){
                    if (i < points.Length - 1){
                            i++;    }
                        else    {
                            i = 0;  } } } }
```

Conclusion

The educational software helped to take the Formal Language subject from classrooms to the computer labs, making the teaching/learning process more interesting and pleasant to the students, facilitating the teacher's work during the

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evaluation performance too. The advent of affordable and widespread virtual reality technology and the proliferation of smart phones capable of supporting augmented reality has opened incredible opportunities for improving the way that we learn. Students can now experience the topics they are learning about. Use of virtual reality technology has been shown to increase student engagement and focus, while the immersive and interactive environment encourages the students to become active learners.

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