# Enhancing Teaching Approach with 3D Primitives in Virtual and Augmented Reality

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**Abstract.** Today, virtual reality (VR) and augmented reality (AR) are widely used in various fields, especially in computer systems, engineering and medicine. However, it remains one of the main barriers to education due to the high cost of conducting experimental research. This interactive virtual learning is very convenient and effective. Nowadays, it offers great opportunities to improve the quality of education by creating new methods and techniques. Traditionalist methods of substance introduction (fixed video, sound, contents) need personalization and communication. In addition to create a private virtual education environment which allows the students and researchers to get enough learning that is interactive and more visual, where students can learn through experimentation and interactions in the virtual world. There is a requirement for MOOC to grasp propelled learning strategies to give all the more captivating experience to its students. Finally, we create internal avatar model while using in virtual reality (VR) and augmented reality (AR) interfaces.

**Keywords:** Virtual reality for education · Virtual reality (VR) · Augmented reality (AR) · Passive and active learning activity · 3D primitives · 3D avatars

## 1 Introduction

The establishment of virtual universities abroad is recognized as a modern innovative pedagogical technology. The number of supporters of virtual education is growing. In countries where the system is in place, such as the United States, the United Kingdom, Germany, Korea, and Japan, there are several million higher education institutions a year. This is because distance learning is both more convenient and cheaper for users than traditional methods of learning in educational institutions, and most importantly, it allows users to learn at a time that suits them.

General methodological principles for the development of software systems for creating models of the organization of the virtual 3D university educational process. Today is the beginning of the application of virtual reality technologies and principles for the


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development of virtual reality applications. This methodological principle approaches the software in three areas: passive virtual being monitored by a non-human autonomous graphic image with sound, scripted virtual being presented to the user in a limited number of scenarios, image, sound selection, interactive virtual being tracking is that the user can control the virtual environment on the basis of the laws of the world, created using a special device that can perform its function. In many IT organizations, the development of virtual reality applications is a collaborative effort involving project engineers, managers, and other stakeholders [3].

Today, a number of systems for evaluating virtual education in foreign countries (Codeingame.com, vAcademia.com, fun-mooc.fr, rwaq.com, VirBela.org etc.) [1, 2].

With regards to AR and VR, late innovative advances have permitted augmented and virtual encounters to be conceivable on handheld cell phones or minimal effort head-mount-shows (HMD). This implies it is feasible for additional individuals to encounter fundamental AR and VR content utilizing their own gadgets. Be that as it may, figuring execution and capacities of clients' gadgets change dependent upon a few conjectured taking care of variables including multifaceted nature of computerized content and concentrated sensors.

The paper is organized out as follows. Section 2 talks about Augmented and Virtual reality (AR/VR) in e-learning, Sect. 3 How to implement graphics field, Sect. 4 Implication of 3D modeling by software.

## 2 Augmented and Virtual Reality (AR/VR) in E-Learning

Augmented Reality alludes to an idea where genuine world is upgraded by mixing it with virtual world [10]. This present reality static items are powerfully transformed with setting delicate virtual data like video, sound, or a realistic overlay to improve client's experience [4, 10].

### 2.1 Using AR in Education

These days, a typical case of AR is seen by method of applications like Nokia City Lens (Windows App) or Across Air (iOS application) or Google Goggles (android application) which use GPS and compass of cell phone to help client in route around a region. When the client holds the cell phone upstanding with camera in an area, it begins to show insights regarding eateries, inns, milestones and other geo-labeled sections. Coasting picture inflatables or symbols are shown on the versatile screen which on clicking show increasingly nitty gritty data about the picked object. AR applications take into account more up to date approaches to investigate an item and its related space by empowering better commitment and client cooperation.

Augmented Reality is additionally changing the learning condition by upgrading student's genuine condition with virtual data, in different interactive media positions like designs, video and sound and so on [4]. The overlaid data is covered up under the prompts which when examined with AR empowered gadgets breath life into static condition and gives better learning experience to understudies.

Three systems have accepted a key activity in e-learning. To consider the need of an individual understudy and reinforce individualization another learning methodology rose, titled Adaptive Learning or Intelligent Tutoring. Furthermore, if understudies are getting some answers concerning un-recognizable structures like close planetary framework, photosynthesis process, nuclear reactions or bona fide goals; it is obvious that understanding these thoughts without having the choice to see them really is an anticipation in method of expansive learning. Augmented reality makes virtual things which when blended in with real world, give a striking learning experience to learners. (It is described and shown Fig. 1).

Augmented Reality insinuates a thought wherein veritable world is redesigned by blending it in with virtual world. This current reality static articles are effectively changed with setting fragile virtual information like video, sound, or a sensible overlay to improve customer's experience.

Augmented reality is a system that:

- Combines virtual and real
- Interacts in real time
- Works in three-dimensional space

Virtual reality - a completely digital alternative to reality is possible to plunge into digital space with the full illusion of presence, but it is divorced from the real world, in contract to augmented reality.

## 2.2 Virtual Reality (VR) for Education

Augmented reality innovation (VR) and communication by 3D geometric model could stop the uninvolved realizing which is followed in the conventional technique of training. They additionally lead to advantageous correspondence between different members in training process [11].

Virtual reality frameworks included time and area and great nature of comprise of PCs, clients, equipment and programming. They isolated into two primary classes: Immersive Virtual and Non immersive. In addition to, evaluation of e-learning increased year by year. (It is described and shown Fig. 2).

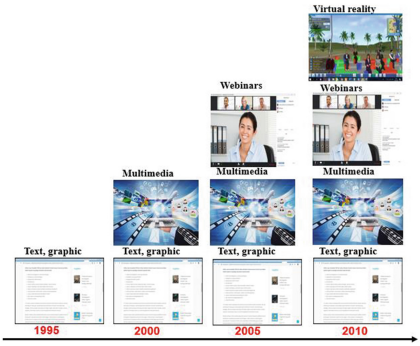


**Fig. 1.** E-learning development tools.

### 2.3 The Need for Virtual Reality in Education

*The following reasons support virtual reality in education:*

Gives new structures and techniques for perception, drawing on the qualities of visual portrayals, and gives an elective strategy for speaking to the material. VR can likewise more precisely show certain highlights, forms than different strategies, taking into consideration extraordinary intensive investigation of an item, perception from a significant distance, just as perception and research of territories and occasions that are not accessible by different methods.

Propel and support dynamic investment and communication with respect to understudies, instead of lack of involvement. A few kinds of virtual reality, for example, community computer virtual reality utilizing content contribution with virtual universes, support or require cooperation and make a social climate.

Virtual reality permits the understudy to experience understanding over a wide timeframe. This permits individuals with inabilities to take an interest in an analysis or learning condition and conquers all language boundaries. On account of content access, it gives equivalent chances to correspondence with understudies in different societies, permitting the understudy to assume the job of man in various societies. Potential favorable circumstances of utilizing VR in instruction and preparing: representation and renewal, an elective strategy for introducing material; learning in conditions that are inconceivable or hard to involvement with reality; expanded inspiration; advancement of collaboration; flexibility, giving the chance to figuring out how to adjust to the qualities and requirements of the understudy; and appraisal and assessment, offering extraordinary potential as a device for assessment because of the simple checking and recording of meetings in a virtual situation [1].

## 3 How to Implement Graphics Field

Forcing classes on any field is perilous, however most illustrations experts would concede to the accompanying significant zones of PC designs:

- Modeling manages the numerical determination of shape and appearance properties in a manner that can be put away on the PC. For instance, an espresso cup may be depicted as a lot of requested 3D focuses alongside some addition rule to interface the focuses and a reflection model that portrays how light collaborates with the cup.
- Rendering is a term acquired from craftsmanship and manages the formation of concealed pictures from 3D PC models.
- Animation is a method to make a deception of movement through successions of pictures. Activity utilizes demonstrating and rendering however includes the key issue of development after some time, which isn't normally managed in fundamental displaying also, rendering. There are numerous different zones that include PC designs, and whether they are center illustrations regions involves supposition. These will all be at any rate addressed in the content. Such related regions incorporate the accompanying:
- User collaboration manages the interface between input gadgets, for example, mice and tablets, the application, criticism to the client in symbolism, and other tactile criticism. Truly, this zone is related with illustrations to a great extent since designs

scientists had probably the most punctual access to the info/yield gadgets that are presently omnipresent.

- Virtual reality attempts to drench the client into a 3D virtual world. This regularly requires at any rate sound system illustrations and reaction to head movement. For genuine computer-generated simulation, sound and power input ought to be given too. Since this zone requires propelled 3D designs and propelled show innovation, it is regularly firmly connected with illustrations.
- Visualization attempts to give clients knowledge into complex data through visual showcase. Regularly there are realistic issues to be tended to in a perception issue.
- Image handling manages the control of 2D pictures and is utilized in both the fields of illustrations and vision.
- 3D examining utilizes extend discovering innovation to make estimated 3D models. Such models are valuable for making rich visual symbolism, and the preparing of such models regularly requires designs algorithms.

*Virtual objects (artifacts):*

- What is possible only in Virtually
- You can simulate the environment
- You can simulate events
- You can simulate joint actions

Further training or retraining of teachers involved in virtual learning can be achieved by increasing the level of their training. To solve these problems, it is necessary, first of all, to revise the existing regulatory legal acts on virtual education and develop standards and rules necessary for the implementation of virtual education. Also, it is necessary to analyze the current technical condition of existing computer networks, increase their speed and take measures to strengthen their material and technical base.

3D Auditorium-Trainers who address in the 3D Auditorium will have the option to stack explicit introductions from VLE and even transfer slides. Homeroom/Meeting Room-These rooms can be utilized as a gathering territory for venture accomplices, or as a study hall for a little gathering of understudies. We will survey the model of the college, a few understudies pick their subject over the span of the learning plan. Presently understudies can encounter the themes they are learning. The utilization of augmented reality innovation has been appeared to build understudy cooperation and consideration, while vivid and intelligent situations urge understudies to become dynamic students.

## 4 Implication of 3D Modeling by Software

We The user operates the application with the Body-Hand user interface, using head movement, thumb tracking, pinch gloves, and a menu system to perform the following object manipulation tasks: Constructive Solid Geometry allows the construction of complex 3D graphical shapes using: Object selection – the user can point at objects and select them, placing them into one of several clipboards. Object transform–perform translate, rotate, and scale operations, in a variety of different ways. Create primitives – 3D primitives can be created in the virtual world, from infinite planes as the simplest,

to complex graphical models such as a water heater. Combine primitives – previously constructed and manipulated primitives may be combined together using Constructive Solid Geometry (CSG) operations to produce higher level graphical objects. only a small number of primitives. Solid shapes contain an inside and outside, and using set operations, it is possible to perform 3D union, intersection and difference operations (see Fig. 2, Fig. 3, Fig. 4). By combining these operations, it is possible to produce any kind of object required. We create internal avatar model while using in virtual reality (VR) and augmented reality (AR) interfaces.

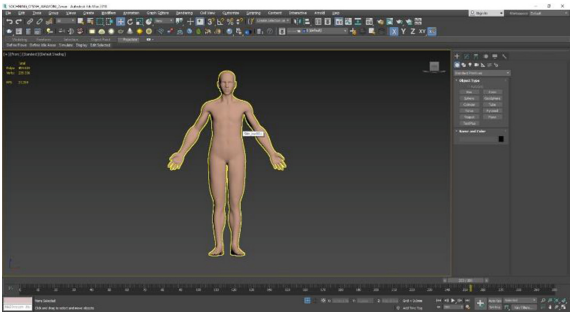

**Fig. 2.** Modeling using the Body Cylinder.

Body avatar is a Kinect-based interactive system that allows users without professional skills to create freeform 3D avatars using body gestures. Unlike existing gestures-based 3D modeling tools, Body avatar centers around a is first person "you the avatar" metaphor, where the user treats their own body as a physical proxy of the virtual avatar. Based on an intuitive body-centric mapping, the user performs gestures to their own body as if wanting to modify it, which in turn results in corresponding modifications to the avatar. Body avatar provides an intuitive, immersive and playful creation experience for the user.

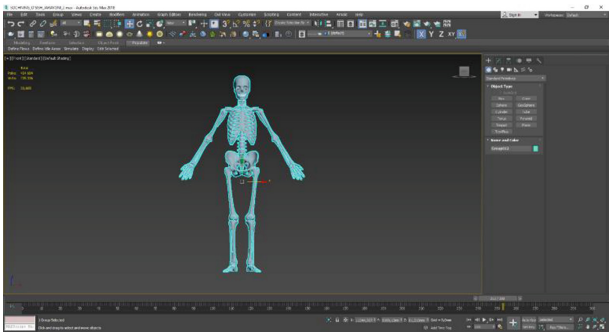

**Fig. 3.** Human skeleton - human skeleton drawn through the 3D Max program.

To do this we model the 3D Max program by using the Box element in the Geometry section. The most VR/AR applications in Education are useful as training systems for medical/dental students. So, we use teaching and learning approach that subjects of English, Russian and Korean classroom with 3D primitives with VR/AR are useful for. In addition to, educators can experiences hairdresser laboratory room's project, cooking room's, mechanical experience laboratory room's. (It is described and shown Fig. 5).

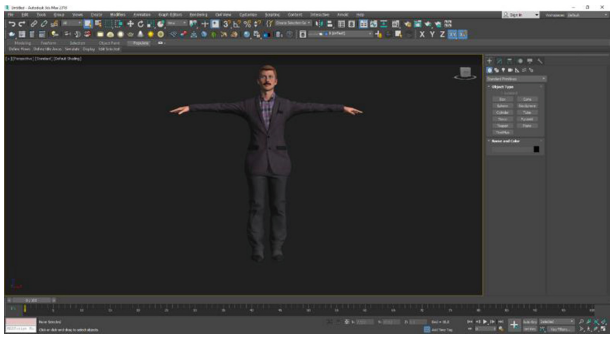

**Fig. 4.** This is the case with the Elements of Editing Poly by using the Elements of the Geometry section of the male teacher's clothing.

Now we will see some experimental result of enhanced teaching and learning Central Asian one of best University Tashkent University of Information Technology named after Muhammad Al-Khwarizmi.

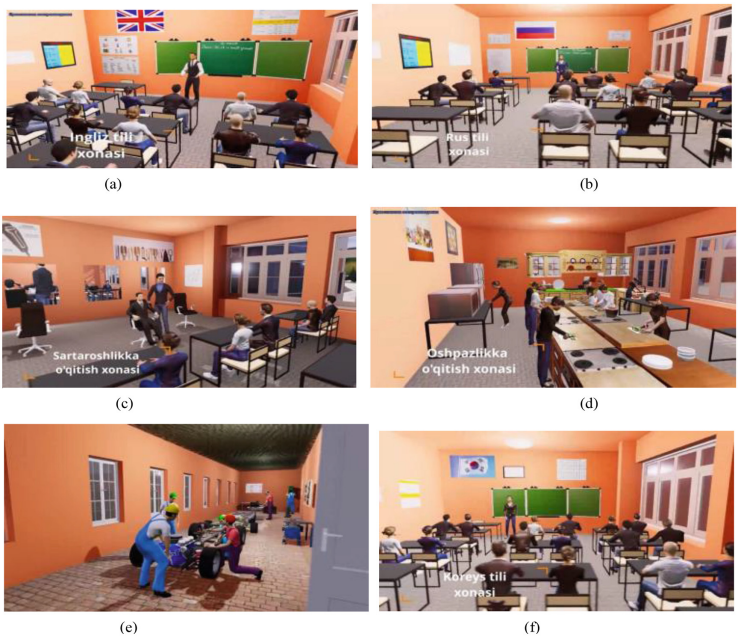


**Fig. 5.** Some of the steps of the construction works process that presented at the BC/VR Software.

Testing models created with virtual reality applications by using 3D primitives. (a) the main view of the educational process in English classroom, (b) the main view of the educational process in Russian classroom, (c) view of hairdresser laboratory room's project, (d) view of cooking room's, (e) view of mechanical experience laboratory room's, (f) the main view of the educational process in Korean room [8, 9].

## 5 Conclusion

This paper presents new way of review in this example model of University and there are students choose their subjects where they learning his timetable. 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. The educational software helped to take the Formal Language subject from classrooms to the computer labs, making the teaching or learning process more interesting and pleasant to the students, facilitating the teachers work during the evaluation performance too.

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