

# Augmented Reality and the Prospects for Applying Its in the Training of Future Engineers

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**Abstract.** The education system of Ukraine is closely linked with the world education trends, therefore it requires constant renewal and expansion. One of the progressive areas of organizing studying process is creating the studying environment which will allow students to reveal their intellectual potential while searching for the necessary knowledge. That's why the *purpose of the article* is analysis of the concept of augmented reality and prospects of its application in the process of training future engineers. The *object of study* is the system of training future engineers and the subject is using of augmented reality technologies in the process of training future engineers. The *research method* is *analyzing the impact* of the augmented reality technologies on the training future engineers. During the research, we have identified positive aspects of the augmented reality technologies in the process of training future engineers. We have defined the stages of creating some methodical system components of teaching fundamental disciplines in the higher technical school through interdisciplinary integration and technologies of augmented reality.

**Keywords:** technology of augmented reality; process of training future engineers.

## 1 Introduction

The key to human success is our education, which takes on a new feature in the 21st Century – learning throughout our life, and the ability to apply this knowledge in practice.

The rapid change of technology, the development of information and communication technologies, the change in the paradigm of educating has led to the fact that the amount of knowledge necessary for a person to succeed is constantly changing and increasing, and therefore there is a need to acquire new knowledge quickly and qualitatively, and be able to apply our knowledge in everyday life and educating.

Formal educating in a higher technical educational institution under the traditional system in the 20th century has been replaced by new forms of educating — distance, electronic and mobile [21]. Each of these forms has its own positive and negative features, but none of them was able to replace the traditional educating process — “live” communication between a teacher and a student. One of the models of educating that was able to combine the traits of traditional educating with innovation was the model of mixed educating (blended learning), which enabled the student to become an active seeker of their own knowledge [18, 19].

For more immersion of the student into the educating process, in order to better visualize the knowledge gained, technologies of the complementary (mixed, augmented, virtual etc.) reality, which make it possible to change the approach to the organization of the process of educating in higher education are more relevant in recent times [16].

## **2 Related work**

The analysis of scientific sources provided an opportunity to argue that the use of technologies of augmented reality in the educating process:

- increases motivation for educating [9] and self-motivation [13];
- increases the quality of education [5, 8, 12];
- creates conditions for obtaining more thorough knowledge [17];
- creates conditions for improving the quality of inclusive education [14];
- provides the opportunity to build an educating process based on the model of mixed educating [4, 23] with the involvement of mobile information and communication technologies [10].

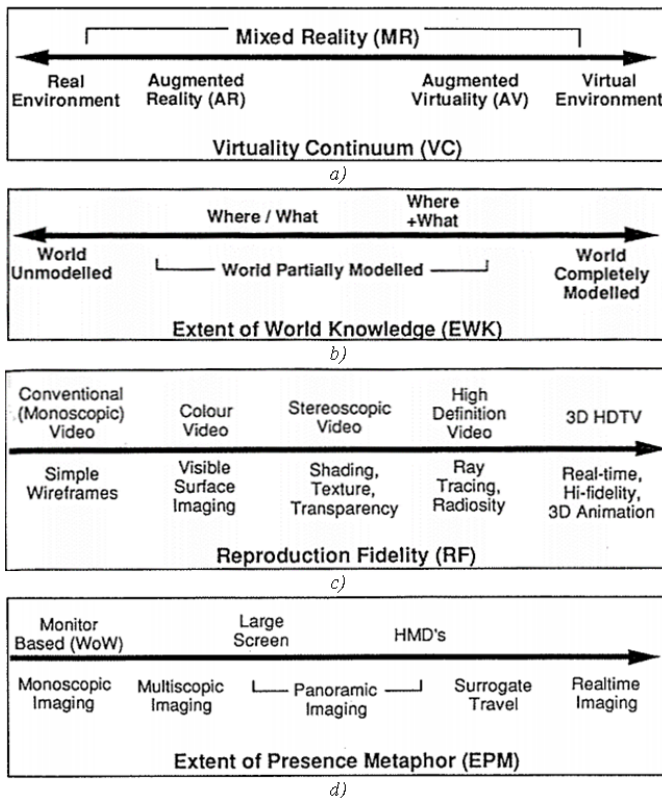
## **3 The Aim of the Study**

Thomas Preston Caudell, the author of the term “augmented reality”, in 1990 was the engineer of research laboratory at Boeing [6], and later, with the development of information and communication technologies, the term gained widespread consumption not only as a technology expansion of reality, but and as technologies that can be used in the learning process.

That is why, the purpose of the article is to analyze the concept of augmented reality and the prospects for its application in the process of preparing future engineers.

## 4 Discussion and Results

Let us analyze the notion of “augmented reality” in the historical context [20]. Four years later, from the first mention of the concept of “augmented reality” by Caudell in 1994, the article “Taxonomy of mixed reality” was published, in which the authors consider such concepts as virtual reality, mixed reality and augmented reality [15]. In opinion Paul Milgram and Fumio Kishino, augmented reality is a technology by which the user’s capabilities are expanded by introducing into the user’s perception field various virtual objects in real time mode (Fig. 1).



**Fig. 1.** Milgram-Kishino taxonomy of mixed reality visual displays: a) simplified representation of a “virtuality continuum”; b) extent of World Knowledge dimension; c) Reproduction Fidelity dimension; d) extent of Presence Metaphor dimension

In 1997, Ronald T. Azuma first formulated the basic principles that characterize systems using augmented reality:

1. the combination of real and virtual world;
2. interaction in real time;
3. work with three-dimensional space, and also provides an interpretation of the concept of augmented reality.

In his view, augmented reality is the technology of integrating real and computer-generated virtual objects in the real world [2].

Later, in 2001, scientist added to this list the application of augmented reality applications by incorporating virtual and computer content into it, allowing a wider application of mixed reality through a simulation that takes place in a virtual rather than a real world [1].

A wide application of the term “augmented reality” began to acquire with the development of software and hardware for its creation and support.

According to Evgeniia A. Daineko [7], there are several reasons for the growth in the popularity of technologies of augmented reality: 1) interactivity, 2) accessibility, 3) realism, 4) innovativeness.

So, *augmented reality* is technology that allows you to combine computer-aided 3D graphics, animation, video and textual information with real-time objects [3]; it is a mixed reality that can be perceived by a person, and supplemented with the help of a computer with elements of some reality [22]; it is a technology that combines the physical environment of a person with a layer of virtual reality in real time. It is used to visually supplement printed material with various virtual objects: text, sound, video, etc. [11]; this environment with the addition of the physical world with digital data, are perceived as elements of real life. When creating augmented reality in space in real time, objects are placed using special software and devices for their reproduction [16].

Using the technologies of augmented reality in the process of preparing future engineers will allow:

- to carry out the integration of fundamental disciplines and visualize the educating process;
- make the learning process holistic, vivid, rich and will strengthen the fundamentalization of engineering education;
- to build an open system of education that will provide each student the opportunity to create a personal trajectory of educating;

- to expand the boundaries of educating — acquire knowledge using the teaching materials of the world's leading technical universities;
- to make the educating process individualized and adapted for each student;
- to increase cognitive activity of students in the process of teaching fundamental disciplines and make the student an active competitor of knowledge;
- to support independent work of the student;
- to intensify the educating process;
- to increase the student's creative thinking and expand the vision of the world.

## **5 Conclusion**

Summarizing the above, it can be argued that for the further implementation of certain components of the application of augmented reality technologies in the process of educating future engineers, it is necessary:

- to identify means of augmented reality that can be used in the process of teaching fundamental disciplines;
- to determine the forms and methods of organizing the process of teaching fundamental disciplines, taking into account the augmented reality in the higher technical school;
- to develop educating materials for visualization of the educating process, which combined theoretical and practical information on the subjects of the specialty and implemented intersubject communications;
- to develop a methodology for teaching fundamental disciplines based on the technology of augmented reality and experimentally test or disprove its effectiveness.

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