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AUGMENTED REALITY IN THE LIFE OF A MODERN PERSON

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Annotation

Augmented Reality mixes virtual and actual reality, making available to the user new tools to ensure efficiency in the transfer of knowledge for several processes and in several environments. Various solutions based on Augmented Reality have been proposed by the research community: particularly in maintenance operations Augmented Reality tools have offered new perspectives and have promised dramatic improvements. This article also examines the concept and technology of augmented reality, provides a rationale for the relevance and timeliness of its use to support educational processes. The article is devoted to the review and study of the possibility of using augmented reality technology in the field of education. An overview of the possibilities and options for using augmented reality technology to support educational processes is given, as one of the options, a new form of visual demonstration of complex objects, models and processes is proposed.

Key words: Augmented reality, educational process, virtual reality, preschool education, primary education, secondary education, higher education.

ҚАЗІРГІ АДАМ ӨМІРІНДЕГІ КЕҢЕЙТІЛГЕН ШЫНДЫҚ

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Аннотация

Толықтырылған шындық виртуалды және нақты шындықты араластырып, пайдаланушыға бірнеше процестер мен бірнеше ортада білім беру тиімділігін қамтамасыз ету үшін жаңа құралдарды қол жетімді етеді. Толықтырылған шындыққа негізделген әртүрлі шешімдерді зерттеу қауымдастығы ұсынды: әсіресе техникалық қызмет көрсету операцияларында Толықтырылған шындық құралдары жаңа перспективалар ұсынды және күрт жақсартуға уәде берді. Бұл мақалада сонымен қатар толықтырылған шындық тұжырымдамасы мен технологиясы қарастырылады, оны білім беру процестерін қолдау үшін пайдаланудың өзектілігі мен уақтылылығының негіздемесі келтірілген. Мақала білім беру саласында толықтырылған шындық технологиясын қолдану мүмкіндіктерін қарастыруға және зерттеуге арналған. Оқу үдерістерін қолдау үшін толықтырылған шындық технологиясын пайдалану мүмкіндіктері мен нұсқаларына шолу жасалды, нұсқалардың бірі ретінде күрделі объектілерді, модельдерді және процестерді көрнекі көрсетудің жаңа формасы ұсынылады.

Түйін сөздер: Толықтырылған шындық, оқу процесі, виртуалды шындық, мектепке дейінгі тәрбие, бастауыш білім, орта білім, жоғары білім.

ДОПОЛНЕННАЯ РЕАЛЬНОСТЬ В ЖИЗНИ СОВРЕМЕННОГО ЧЕЛОВЕКА

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Аннотация

Дополненная реальность смешивает виртуальную и реальную реальность, предоставляя пользователю новые инструменты для обеспечения эффективности передачи знаний для нескольких процессов и в нескольких средах. Исследовательское сообщество предложило различные решения, основанные на дополненной реальности: особенно в операциях по техническому обслуживанию,

инструменты дополненной реальности открыли новые перспективы и пообещали кардинальные улучшения. В данной статье также исследуются концепция и технологии дополненной реальности, дается обоснование актуальности и своевременности ее использования для поддержки образовательных процессов. Статья посвящена обзору и исследованию возможности использования технологий дополненной реальности в сфере образования. Дан обзор возможностей и вариантов использования технологии дополненной реальности для поддержки образовательных процессов, в качестве одного из вариантов предлагается новая форма визуальной демонстрации сложных объектов, моделей и процессов

Ключевые слова: дополненная реальность, образовательный процесс, виртуальная реальность, дошкольное образование, начальное образование, среднее образование, высшее образование.

Introduction

Augmented reality appears as a new interactive technology that allows you to superimpose computer graphics or text information on real-time objects. Unlike virtual reality, AR interfaces allow users to see embedded virtual objects in the real world and manipulate them in real time. At its core, augmented reality is an intermediate link between ordinary reality and full-fledged virtual reality. the process of the emergence of augmented reality. Virtual reality, ideally, should completely replace the world around a person to such an extent that he cannot distinguish an artificial environment from a natural one. However, the question of the practical implementation of full-fledged virtual reality still refers to the distant future - there are no necessary software and hardware solutions. Therefore, it is logical to create a hybrid from the environment we perceive and the virtual objects added to it. Such an approach would make it possible to expand the flow of information received by a person per unit of time and, consequently, to increase the productivity of his work. In other words, augmented reality is a combination of two initially independent spaces on the screen: the world of real objects around a person and the virtual world created on a computer. This interactive technology enables the user to superimpose special 2D and 3D computer objects on top of the video camera image and thus “augment” reality. The educational process is a purposeful holistic process of education and training, a pedagogically planned and realized unity of goals, values, content, technologies, organizational forms, and diagnostic ones. The educational process consists of a number of sub-processes that need to be actively supported. One of the ways to support the educational process is its informatization. The essence of informatization is in the introduction of new information and communication technologies in the teaching and educational activities of an educational institution; with the help of such innovative technologies, it is possible to supplement traditional methods of upbringing or teaching, which will help improve the learning process, accelerate access to information sources. Informatization of the educational process consists in improving the quality of the activities of teachers and students, the purposeful formation of the information culture of the individual, focused on the acquisition of information knowledge, the development of information skills. The question of supporting the educational process with the help of innovative technologies, namely, augmented reality technology, is very relevant due to the fact that the main goals of the educational process are to improve the quality and increase the efficiency of education.

Application of AR technologies in various segments of the education sector

Analysis of modern research on AR in education allowed us to generalize existing opinions on the benefits of augmented reality, AR compatibility with educational technologies, as well as the benefits of AR education.

Tab. 1. Generalization of the results of the study of the use of AR in education

A source	Years	Benefits of AR in education
D.Wagner, D.Schmalstieg [8]	2005	Gives a sense of reality
Virtual and Augmented Reality Technologies: Opportunities and Obstacles to Application [10]	2018	Gives hands-on experience
Augmented reality games: a review [1]	2010	Visualizes complex relationships
Features of using augmented reality technology to support educational processes [6]	2014	Gives experience that cannot be obtained in real life
Augmented reality in the classroom [2]	2000	Concretizes abstract concepts
Augmented reality to promote and visualize scientific knowledge in the Scientific and Technical Libraries [4]	2020	Makes the learning process interesting
Technologies of augmented reality in the field of public administration and sociodynamics [5]	2020	Provides a safe learning environment
Augmented reality in educational inclusion [3]	2019	Saves time and space
Augmented and virtual reality in surgery - the digital surgical environment: applications, limitations and legal pitfalls [7]	2016	Increases student engagement
Augmented reality as a new New Media Experience[9]	2001	Gives flexibility to the educational process

If we make a brief overview of the table, we see that augmented reality has a huge breakthrough both in the way of presenting educational material and in the assimilation of information by schoolchildren and students. The effectiveness of its use is confirmed by various tests and experiments, which show excellent results. For example, a number of experiments were carried out in which one group of children was shown visual material with AR during lessons, and the second group was shown ordinary posters and diagrams. It was found that in the group where augmented reality was used, the percentage of information assimilation by children approached 90%, the level of discipline increased and it was possible to keep the attention of about 95% of the audience, while in the group with two-dimensional benefits, all indicators were half and three times less. It was also found that a three-dimensional image stimulates thinking, develops motor skills, facial expressions, attention and increases the degree of assimilation, memorization and, most importantly, understanding of information. Why does augmented reality affect the educational process of a person so effectively? One of the important points is that AR creates the effect of presence, very clearly displays the connection between the real and the virtual world. The 3D image allows you to visually penetrate into another, virtual reality, which, of course, psychologically attracts a person and activates his attention and sensitivity to the information component. Regardless of the subject being studied, augmented reality helps to increase its attractiveness for students of any age and increases the motivation to acquire knowledge.[1]

Augmented reality in preschool education

Analysis of works on the use of AR in preschool education revealed several characteristic features. In one of the studies, the authors studied the perception of

preschoolers, the level of comprehension of the material and the enjoyment of the process. In the experiment, books for storytelling (a method of transmitting information, knowledge through telling a story) with pictures of augmented reality were used. The study found that most children felt “very happy” during this activity, found it interesting and enjoyed it. The children understood well the stories they were told. AR picture books were attractive to children, and they perceived them as magical and enjoyable. [2]

Another scientific study is devoted to the effectiveness of augmented reality technologies in teaching children the English alphabet. The authors have developed a mobile application using flash cards. The essence of the method was as follows: directing the device with the installed application to the printed flash card, the student saw on the screen a 3D object with interactive information. The results showed that there were significant differences in interactivity and learning characteristics between the control (traditional learning) and experimental (AR learning) groups in favor of the experimental group. ColAR mobile app was used to study the effectiveness of teaching children to draw at an early age using AR technology. The results showed that children can freely operate the app, interact with each other and draw using AR. Technology was seen as a pedagogical innovation. All children enjoyed playing with the app, and teachers noted the benefits of augmented reality for children's development. It should be noted that today typographic products for preschoolers with augmented reality technology appear on the market, for example, children's coloring books, where, using an application on a smartphone, a painted character comes to life and his colors correspond to the colors that the child used. The authors of the books of this publishing house in their coloring pages, educational books, encyclopedias use AR technologies and use three types of information perception - auditory, visual and kinesthetic, which together allows children to better assimilate new information. Another study concerned the interaction of children and parents when using augmented reality picture books [6]. Four groups were analyzed: "parent - main", "child - main", "communicative pair child-parent" and "weak communicative pair child-parent". In a parent-led group, they preferred to tell the children a story. In a group led by children, they manipulated the AR book and involved parents. Parents in a communication group helped their children find augmented reality in the book. In a weak communication pair, the child-parent, the parents to a lesser extent turned to the AR capabilities integrated into the book. [3]

In general, most of the experiments confirm the hypothesis that children take new technologies for granted, and the use of advanced technologies for the category of users does not cause problems, however, it has one serious limitation - the learnability and readiness for innovations of their teachers and parents.

Augmented reality in primary education

Research on the use of AR in primary school education shows a positive impact of this technology on the quality of education. In particular, this is the conclusion reached by South American researchers who conducted an experiment as part of an educational program in geography [4]. The experimental group studied the subject using a mobile navigation application with augmented reality elements and demonstrated greater efficiency of the educational process, better mastery of the material by students and a higher level of academic performance. Another study related to math lessons and the development of spatial abilities of children who used didactic materials with AR markers on paper. Students have shown significant progress in their spatial abilities and improved academic performance. An experiment on the use of AR technology in biology lessons consisted of comparing students' perception of an AR-tagged textbook with a regular textbook. The results showed that the AR

textbook made the lesson more practice-oriented and also more fun for children. Similar results, as well as improved academic performance, have been reported by other authors using a mobile AR gaming app to study biology.

The teachers of the Center for Technical Creativity "Novatsia" conducted their first lessons using the technology of augmented reality in a number of schools in Ivanov back in May 2015. Experimental classes were devoted to the architecture of the future, on which students created the quarters of the future, which later united into a metropolis. According to the results of the experiment, teachers noted that AR helps to develop spatial thinking in children, has a positive effect on the speed of learning material for most children, improves their understanding and perception of how certain volumetric figures look in space. The story-based game Leometry is an example of AR gamification of learning and allows children to master the basics of various sciences. The practice of using the game shows that the use of AR in the game was an important motivator for gaining new knowledge. Augmented reality technologies, including paper educational materials with AR markers, help in teaching foreign languages, increasing the effectiveness of learning through greater student engagement. [5]

Augmented reality in secondary education

A number of studies have been devoted to the use of AR technologies in secondary education, which confirm the prospects of integrating various elements of augmented reality into the educational process. According to the experiment, in which students mastered the physics course program using an AR application, their understanding of the subject was deeper compared to the control group, their academic performance was higher, as well as their interest and involvement in the process. The authors of a study of the motivational and cognitive aspects of the use of AR technology in the educational process came to interesting conclusions, who found that augmented reality tools are especially effective for children with the lowest academic performance in the group, as well as for girls. Moreover, AR is an extremely promising method for explaining abstract phenomena.

Another study concerned the application of the augmented reality system in biology lessons. The students were divided into three groups: children using the AR system on their own; children using AR under the guidance of a teacher; group of traditional training. The groups were compared for learning outcomes, emotional states and experiences. The experiment showed that the AR group under the guidance of a teacher achieved the best out of three results, and the AR group on their own experienced more positive emotions than others. Researchers who compared AR technology with multimedia tools in the context of education developed a manipulative AR system and used it in the experimental group, while the control group used multimedia in the educational process. The study found that the use of AR technology allowed the students in the experimental group to achieve better performance and motivation than the students using the multimedia approach. [6]

Augmented reality in higher education

When analyzing publications related to the use of AR in higher education, the high potential of this technology in various areas is also noted. For example, the results of using augmented reality tools for teaching Chinese show that AR helps students write their first paragraph and master Chinese writing much faster. When comparing educational AR materials and educational videos on YouTube as part of the development of a software development course, AR content turned out to be more effective, its use helped to increase student interest and engagement. Many other researchers also confirm the motivation and involvement of students who are encouraged to use augmented reality applications in the learning process [7].

When comparing AR technology and interactive simulation methods, there was no significant difference in terms of student learning and student engagement, but there was a significant advantage of AR in terms of information perception. In the literature, the most common studies are devoted to the use of AR in postgraduate education. Examples from the field of architectural education speak in favor of AR technologies, the same conclusions are made for the disciplines of natural science, where dynamic content allows better mastering of the material and contributes to the progress of research projects of graduate students. In the exact sciences and engineering, AR technologies contribute to better spatial perception, this is confirmed by research in the field of mathematics education, mechanical engineering. AR systems with Kinect technology are successfully used in physics and mathematics education. In the humanitarian field, using AR helps reduce cognitive load while increasing student motivation and positive attitude. There are studies in the field of medical education, where training dentists using the AR mobile app has become a simple effective tool for transferring knowledge. The study of history using augmented reality applications opens up great prospects, both in terms of the possibilities of content creation, and the positions of emotionality and involvement in the educational process.[8]

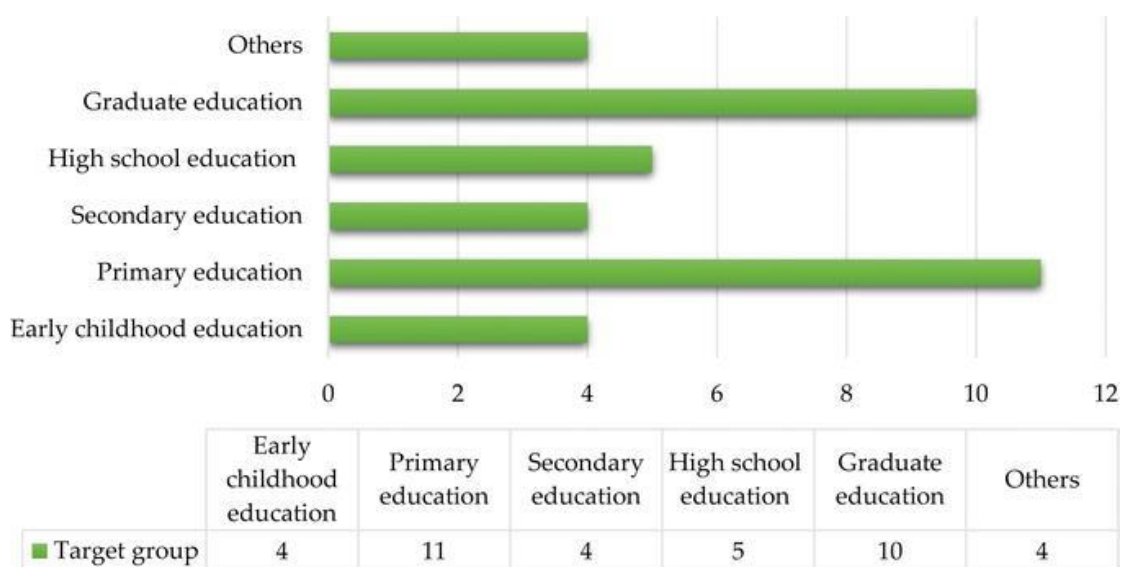
Augmented reality in additional education and training of other target groups

Augmented reality technologies can be used in various areas of continuing education. For example, AR technologies are actively developing in teaching music, training young engineers, designers, and architects. In addition, augmented reality can be integrated into educational programs for people with disabilities and developmental disabilities, for example, children with autism.

Children's Technopark of the Ivanovo Region "Quantorium. Novatoria" since 2018 pays special attention to augmented reality technologies. In the VR / AR Quantum, middle and senior schoolchildren are engaged, who independently develop VR / AR applications for the needs of the educational process of Quantorium, the education sector of Ivanov, as well as other interested parties. For example, in 2019, an application was developed for an educational quest (urban local history orientation) "Mega VR / AR". The augmented reality application "Animated Pictures", developed by the students of Quantorium, became the starting point for the integration of AR technologies in the Isaac Levitan Museum in the town of Plyos, Ivanovo region. Children studying at Quantorium often use augmented reality technology in their presentations, developing applications to improve communication with the teacher and fellow students. [9]

The interaction of a mentor (expert) and a student (employee / specialist) in augmented reality helps to solve problems faster by transferring knowledge in real time. For example, using the Microsoft Dynamics 365 Remote Assist app, technicians can collaborate in video communication via Microsoft HoloLens with remote experts on PCs or mobile devices. In real time, the cameras built into the glasses allow remote experts to see what the specialist sees and clearly (using graphic primitives) indicate important data. The Dynamics 365 Guides app helps employees learn new skills faster. The functionality of the application allows you to create training courses without writing code, which greatly simplifies the process. The goal of the application is to increase professionalism by standardizing processes with step-by-step instructions. It is possible to embed photos, videos, 3D models into the training course, which allows you to create courses for mass training without involving training personnel. After completing the training, statistics are available for each stage, which allows you to determine where additional instruction is needed and improve processes.

One of the examples of using augmented reality as a teaching tool was the practice of remote mastering of laser cutting technology in the Ivanovo “Quantorium. Novatoria”, where, during the COVID-19 coronavirus pandemic, a project was launched to produce protective front screens for doctors on their own equipment at the time of the introduction of the high alert mode, when only one employee could be in the room. The expert remotely using, inter alia, augmented reality technologies, consulted a specialist on the maintenance of a laser machine [10]. Below is given statistics on how augmented reality is developing into education (Pic.1)



Picture 1 Developing augmented reality in educational process

However, if talking about in Kazakhstan it develops more slowly than in other countries. So, let's take an example. Do Kazakh police use wearable devices with augmented reality technology and face recognition? Deputy Minister of Internal Affairs of the Republic of Kazakhstan Saken Sarsenov commented on this issue at a briefing in the CCS, zakon.kz reports. Now innovations related to cameras and their analytical capabilities in the video surveillance system, in principle, are being introduced all over the world. For example, if a red Toyota Camry is on the wanted list, then the camera should react to this kind of car. As for biometric data, this work is only at the initial stage – discussion.

For all the points regarding the need to introduce portable devices and augmented reality technology are being discussed and are not being introduced in the system of internal affairs bodies. From my point of view, a project related to augmented reality and biometrics definition is under discussion. It has not yet been decided that such technologies will be introduced in our country. But at the same time, we are observing the processes that are taking place in the police services and law enforcement agencies of other states. The UK has one of the most advanced police systems. The USA and South Korea are actively moving in this direction. And this is necessary in order to identify the criminals and determine their location as soon as possible, "the speaker concluded.

Conclusion

Immersive technologies with augmented reality elements expand learning opportunities in various fields of education. The integration of AR technologies into educational programs

can become an effective tool in the hands of modern teachers. The use of AR does not require large expenditures for technical re-equipment and regular modernization, since educational content becomes the main component, which can be updated and supplemented by the pedagogical community. Developing quality educational AR content is a challenge that will be on the agenda in the coming years.

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