Involta Ilmiy Jurnali Vol. 1 No.3 (2022, February)

ISJ INVOLTA SCIENTIFIC JOURNAL

"Involta" Ilmiy Jurnali

Vebsayt: https://involta.uz/

IMMERSIVE AUGMENTED REALITY AND VIRTUAL REALITY TECHNOLOGY FOR EDUCATION

Dilyorjon Solidjonov

Kokand University

ABSTRACT: New technologies, such as the commercial "Oculus Rift," now make immersive-VR accessible in a variety of educational settings. In the previous two years, this study has conducted a review of the scientific literature on the benefits and potentials of using immersive virtual reality in education. It demonstrates how virtual reality, in general, and immersive virtual reality, in particular, have mostly been employed for adult training in unique situations or for university students. Technology then focuses on the potential benefits and cons of using it in education, with specific reference to diverse user groups such as children and people with cognitive impairments.

Keywords: Virtual Reality; Augmented Reality: Education; Immersion; Educational Technology.

INTRODUCTION

Since the word "Virtual Reality" (VR) was originally used in the 1960s, it has grown in various ways, becoming increasingly comparable to the actual world. There are two types of virtual reality: non-immersive and immersive. The former is a computer-based environment that may imitate locations in actual or imagined worlds; the later takes the concept a step further by creating the sensation of being physically present in a non-physical world. While non-immersive VR may be powered by a regular PC, immersive VR is still in its infancy as the necessary hardware becomes more user-friendly and affordable. In the past, utilizing equipment such as a helmet with goggles was extremely difficult, but new gadgets are being created to improve usability for the user. VR, which is founded on three core principles: immersion, interaction, and user participation with the environment and story, has a lot of potential in education since it motivates and engages students. Due to the expensive cost of the devices and their limited usefulness, the application of immersive-VR in educational games has been restricted thus far. Virtual reality and augmented reality are built on interactive feedback (e.g. visual, audio, haptic). As a result, developments in this field, from its very inception, have been based on position and orientation sensors as well as restitution devices. The first part of this chapter will therefore provide a detailed discussion on the technology used today, both in a professional context and in those used by the general public. Indeed, equipment, which has been restricted to professional applications until recently, is now available at low prices and this has revolutionized the industry. It is thus important that we step back and appraise existing solutions. There are numerous benefits of employing virtual reality in a teaching (professional and academic) or training context, which are detailed below. To name a few: the elimination of human risk; the use of material that is rare or difficult to obtain, as well as tedious and/or expensive; the ability to recreate complex circumstances; cost savings; equipment availability; and, ultimately, the ability to regulate the learning environment/situation. Thanks to virtual persons, group learning utilizing VR can solve the challenge of not having enough collaborators. Remote participants can also be added, and imaginary coworkers' behavior can be moderated. Virtual reality also allows for the very realistic recreation of real-life aspects. The learner is expected to comprehend specific components of the experience by using the simulated system, which they will be able to use in real-life circumstances. These settings, on the other hand, are far more adaptable

Issn 2181-2632 DOI: https://doi.org/10.5281/zenodo.6655097

than real-life ones (e.g. the ability to modify the situation, the simulation of rare conditions, controlling specific parameters, the reusability and adaptability of scenarios, reversibility of actions, ability to monitor learners).

MAIN BODY

Virtual environments, which are frequently utilized for training in settings that are highly similar to real-life events, do not necessarily provide pedagogic control. When control and monitoring capabilities are provided, it is feasible to customize information for each student by presenting them with the most appropriate scenario (progression along the learning path, remediation of errors, reflexive New Applications 49 approach, etc.). The following points might be examined in order to manage and adjust settings to the demands of the learner:

– Diagnosing erroneous concepts and dynamic learner profiling: the general idea is to be able to detect erroneous behavior and then to try and associate this behavior with errors in knowledge or the wrong application of this knowledge. This type of approach is often implemented by smart trainers [BUC 10]. Two types of approaches can be used to diagnose errors: the generative approach and the evaluative approach. The generative approach consists of generating the solution to the given problem as well as certain typical errors and then comparing this with the solution given by the student. These steps are not always sufficient to determine the type of intervention to be carried out, and their ability to explain behavior remains rather limited. The evaluative approach is based on what is called the "constraint-oriented" approach, where the trainer verifies how far the learner respects certain conditions. This type of approach is well adapted to diagnostic tasks but is less useful for procedural tasks where respecting an order is primordial. Researchers propose alternative methods of diagnosis, based on an epistemological model of knowledge of the subject, which examines actions and the reasons behind these actions (in themselves, and not relative to an expected solution). The error is considered a symptom of the knowledge.

Issn 2181-2632 DOI: https://doi.org/10.5281/zenodo.6655097

– Assistance: assistance or feedback may be offered to allow the learner to adopt reflexive learning (i.e. allow them to reflect on the task and their learning). We can make use of certain functionalities that VR offers (slowing down the scene, speeding it up, changing the point of view, looking through obstacles, visualizing processes that are not accessible to our senses, asking for sensory reinforcement or substitution, concretizing abstract concepts). We can define two kinds of assistance based on whether they occur within or externally to the situation: intra-diegetic and extra-diegetic.

– Controlling the scenarios: this has to do with deciding on and orchestrating the situations and narrative that will allow the student to learn better (verification of acquired skills, reinforcement of skills and development of new skills). Controlling the learning process often means that there is no adaptability. Freedom of action is not compatible with control and trying to marry control and adaptability can risk bringing in incoherence, and so on. We talk of the narrative paradox when discussing the fundamental opposition between interactivity and narration: giving the player a greater capacity for action will interfere with the script prepared by the author.

Variability in scenarios is sometimes achieved only at the cost of a great deal of design work, where all possible deviations must be explicitly, manually described. The effort needed to bring in coherent and precisely controlled scenarios is called an authoring bottleneck [SPI 09]. This highlights the necessity of putting in place script writing systems that make it possible to create easily adaptable environments. However, it is quite frequently the case that systems stop applying an overlay of control on a simulation composed of independent entities, and that interventions by these systems will disrupt the coherence of the environment by modifying the simulation states on the fly. There are two ways of overcoming this problem: scenario-oriented approaches (which steer the virtual environment at the global level) and independent virtual-character-oriented approaches, which bring in scenarios based on the behavior of the user and the virtual characters. The scenario-oriented approaches emphasize the overall quality of the scenario (a complete overview of this is given). The complete description of all possible scenarios in the

Issn 2181-2632 DOI: https://doi.org/10.5281/zenodo.6655097

simulation must be defined. There is thus complete and centralized control over the simulation. The level of guidance may, however, vary from completely guided, to total freedom for the user. These narrative models are mainly based on specific representations of the 3D environment which make it possible to enrich the geometry of objects through higher level information: informed environments (smart-objects or objects-relations models). In the other, character-oriented approaches, the narrative is built out of the interactions between the user and the virtual characters that populate the environment. Control is distributed and each character is responsible for their own decision-making. These approaches are focused on the creation of cognitive virtual characters (a comprehensive introduction to this can be found). In reality, a very fine line exists between these two approaches, and several parameters must be taken into account, such as the production of scenarios in a static manner (scripted approach), or a dynamic manner (generative approach), or even whether the control is centralized or distributed. Finally, most approaches use a hybrid of these two orientations to address the above-mentioned problems. Examples of these are Thespian and Crystal Island. To realize the full potential of AR/VR technology in education, policymakers may play an important role in driving adoption and stimulating innovation. The Department of Education should be directed by Congress to assist in bridging existing knowledge and content gaps via:

- providing resources and opportunities for educators to develop the skills and knowledge needed to successfully deploy these technologies, and developing resources and guidance to integrate AR/VR technologies into digital literacy initiatives to reduce the "learning curve" for students at all levels;
- investing in research into best practices to mitigate health and safety concerns for young children, and providing guidance on age-appropriate use;
- providing resources and opportunities for educators to develop the skills and knowledge needed to successfully deploy these technologies, and developing resources and guidance to integrate AR/VR technologies into digital literacy initiatives to reduce the "learning curve;

Issn 2181-2632 DOI: https://doi.org/10.5281/zenodo.6655097

- Investing in government educational content for AR/VR and expanding AR/VR innovation in colleges and universities, as well as supporting initiatives to expand access to AR/VR devices and applications, will help to accelerate the development of quality, relevant, and age-appropriate immersive educational content.

AR/VR technologies offer significant potential to enhance learning at all levels and across disciplines. As immersive technologies evolve, new use cases in educational contexts are continually emerging. This section highlights some of the recent innovations that are building the foundation for the future of immersive educational technologies. **K-12 Education: Enriching Classroom Experiences and Expanding Opportunities.** Immersive technologies have the potential to create more engaging, effective, and equitable learning environments for children. Current solutions in this space include libraries of immersive content suitable for educational use, specialized content for targeted subjects and learning levels, and tools developed specifically to support students with learning disabilities. **Immersive Learning Curricula and Resource Collections.** Many existing AR/VR products for K-12 learning offer preset curricula and collections of immersive experiences teachers can adapt to specific learning objectives. Existing offerings include publicly available resources from government agencies, education-focused collections from libraries of immersive content, and specialized services from companies focusing specifically on implementing AR/VR in immersive experiences.

Public Resources. The Smithsonian Institution offers a repository of open-access 3D models that allow users to view items from Smithsonian museums' collections in their physical surroundings using AR on a mobile device.37 Unlike print or digital two-dimensional representations, these models give the viewer a sense of scale and allow them to interact with them in three-dimensional space. Educators can use these resources to enhance classroom learning in subjects such as natural and U.S. history. The initial collection comprises 10 items, including full-size skeletons, cultural objects, and statues, all available with any camera-enabled mobile device on the web-based Voyager platform.

ClassVR is a full-service immersive education platform from edtech provider Avantis.47 The service includes both the requisite hardware (plastic VR headsets) and a

Issn 2181-2632 DOI: https://doi.org/10.5281/zenodo.6655097

library of curriculum-aligned immersive educational content, which teachers can control from a centralized management system on a single computer.48 Unlike decentralized libraries that do not allow teachers to control the experience once students are in-headset, this system allows teachers to integrate VR into guided lessons.

Kai XR is a subscription-based immersive learning platform that was developed to address opportunity gaps in education—namely access to field trips and other off-site enrichment activities.49 The platform offers guided, multilingual virtual field trips to museums, monuments, historical sites, and even outer space.50 The company offers affordable headsets, but the platform is also accessible on computers and mobile devices. In addition to field trips, the platform includes tools to teach students how to build their own immersive spaces and virtual experiences.

Project VOISS (Virtual Reality Opportunities to Implement Social Skills) is a Department of Education-funded program based out of the University of Kansas Center for Research on Learning and Department of Special Education.56 The project uses VR experiences to help middle school-aged students with learning disabilities develop and practice social skills. The program provides students and teachers with a low-risk, controlled environment to practice many common scenarios with a headset or web-enabled device.

Floreo offers VR-based lessons in social and life skills for young people with ASD.58 Through story-based interactive scenarios, users can practice conversations and social cues in a gamified environment. Educators or other supervisory figures can view progress and guide the experience via an application on a tablet or mobile device. The experiences focus on building social connections, simulating real-life interactions, and practicing emotional-regulation techniques.

CONCLUSION

Issn 2181-2632 DOI: https://doi.org/10.5281/zenodo.6655097

The application cases discussed in this study are just a small part of the ever-growing area of immersive education. New opportunities will likely develop as technology progresses and becomes more widely adopted. Going forward, it will be important to ensure instructors have the necessary skills and knowledge to implement AR/VR solutions in their lesson plans and create opportunities to develop necessary content, including equipping students and educators with the skills to do so. Policymakers should support further innovation by facilitating content development, investing in necessary research into safety and efficacy, and supporting efforts to expand access to these technologies.

REFERENCES:

1. Elmqaddem, N. (2019). Augmented reality and virtual reality in education. Myth or reality?. *International journal of emerging technologies in learning*, *14*(3).
2. Allison, D., & Hodges, L. F. (2000, October). Virtual reality for education?. In *Proceedings of the ACM symposium on Virtual reality software and technology* (pp. 160-165).
3. Hedberg, J., & Alexander, S. (1994). Virtual reality in education: Defining researchable issues. *Educational Media International*, *31*(4), 214-220.
4. Solidjonov, D. (2021). E-LEARNING SYSTEM AND ITS GREAT DEVELOPMNET IN 2020. *Scienceweb academic papers collection*.
5. Solidjonov, D. (2021). ISSUES OF ECONOMIC DEVELOPMENT AND INTERNATIONAL INTEGRATION IN THE NEW UZBEKISTAN. *Scienceweb academic papers collection*. Solidjonov, D. Z. (2021). The impact of social media on education: advantage and disadvantage. *Экономика и социум*, (3-1), 284-288.
6. Kavanagh, S., Luxton-Reilly, A., Wuensche, B., & Plimmer, B. (2017). A systematic review of virtual reality in education. *Themes in Science and Technology Education*, *10*(2), 85-119.
7. Solidjonov, D. Z. O. (2021). The impact of the development of internet technologies on education at pandemic time in Uzbekistan. In *СТУДЕНТ ГОДА 2021* (pp. 108-110).
8. Solidjonov, D. (2021). Modern education and useful methods for teaching. *Scienceweb academic papers collection*.

Issn 2181-2632 DOI: https://doi.org/10.5281/zenodo.6655097