

DEVELOPING EDUCATIONAL VR/AR APPLICATIONS ACROSS PLATFORMS: THE IMPORTANCE OF UNITY AND ITS SDKS

Beknazarova Saida Safibullayevna

*Professor, Dsc. technical science, professor of department Television and
media technologies Tashkent University of Information Technologies named after
Muhammad Al- Khwarizmi.*

Makhammadjon Makhammadjonov

Lecturer at Department of Computer Science in Central Asian University

Abstract

The development of Virtual Reality (VR) and Augmented Reality (AR) technologies has greatly influenced educational methods around the world. Unity, one of the most widely used game engines, offers cross-platform support through various SDKs, making it easier to create immersive learning experiences. Since the release of Apple Vision Pro, public interest in AR and VR has grown significantly. In recent years, there has been an increasing amount of information available about these technologies. But what types of devices exist? And how is this technology progressing? In this paper, we'll explore the current state of AR and VR in Uzbekistan. Today, VR has become a part of everyday life, bringing new opportunities for entertainment, education, and work. Game engines play a crucial role in building these virtual environments. This paper also highlights the benefits of using Unity for developing VR/AR applications.

Keywords: Augmented Reality (AR), Virtual Reality (VR), Mixed Reality (MR), Unity, development.

Introduction

New technologies are developing in the world from year to year. Most of them are aimed at solving existing problems or improving existing solutions. Similar efforts are being made to create virtual reality and virtualize things. With the increasing demand for interactive and immersive learning experiences, VR and AR have emerged as transformative technologies in education. Unity, with its powerful development ecosystem and support for multiple platforms, allows

developers to create VR/AR applications for various devices, such as VR headsets (both standalone and PC based), and mobile AR. In Uzbekistan, the adoption of digital learning technologies is still developing, but succeeded the usage of VR/AR tools in education. Additionally, different industries have been using these technologies to solve different problems and enhance current states. Especially, manufacturing companies have already begun to use VR demonstration tools before creating new factories and also imitating the process of the manufacturing.

Devices

We in Central Asian University use Microsoft Hololens 2, Meta Quest 3 and 3S, Apple Vision Pro to explore and implement VR and AR technologies. Each device has its own advantages, which allow you to create different developments. Let's look at them in turn.



Figure 1. Microsoft Hololens 2 and its interface

The second edition of Microsoft HoloLens, which came out three years ago, has opened up even more AR possibilities. Microsoft HoloLens 2 has become the most popular mixed reality headset among corporate clients. The device's unique solutions are successfully used in various areas of industry and production and are also implemented in healthcare, education, and business. Among the key capabilities of the device, it is worth highlighting hand and eye tracking, voice control support, as well as spatial mapping, which allows you to link digital content to physical objects or surfaces. A Developer version was released

especially for developers, supporting the most popular and frequently used platforms, such as Azure, Unity Pro, and others.



Figure 2. Apple Vision Pro

Apple Vision Pro is a gadget that separates the gap between the real and virtual world, which is called mixed reality. By wearing Vision Pro glasses, you will combine digital vision and real surroundings in your field of vision. Compared to other devices, it has more opportunity to create applications. It is possible to develop amazing applications through highly refined hand gesture recognition, facial expression reading, and eye tracking. It is expected that MR technology has a huge potential to revolutionize the development of VR/AR applications. And Apple Vision Pro is the device which developers can realize using it.



Figure 3. Meta Quest 3S

Meta has been introducing its Quest series of headsets for a while now. Meta had already gained a large audience with its first and second releases. After analyzing the many bugs and shortcomings that existed before, it released its third version last year. This third version used a lot of advanced and innovative technologies, and several times cheaper than the Apple Vision Pro but offering many of the same features. Meta Quest 3 and 3S headsets are powerful devices for developing VR and AR applications and they are one of the most popular devices among VR users around the world.

Unity and its Cross Platform Capabilities

Unity is a cross platform game engine released by Unity Technologies in 2005. It is used to create single-player and multiplayer games with modern 2D and 3D graphics for platforms such as PC, PlayStation and other platforms.

Unity is also used to create applications for browsers and mobile platforms like Android and iOS. With Unity, developers can create applications using AR and VR technologies. In that case many SDK and libraries may help integrate native functions of AR and VR. Additionally, Unity technologies are used in film to create computer animation, as well as in industry to develop 3D applications for AR and VR.

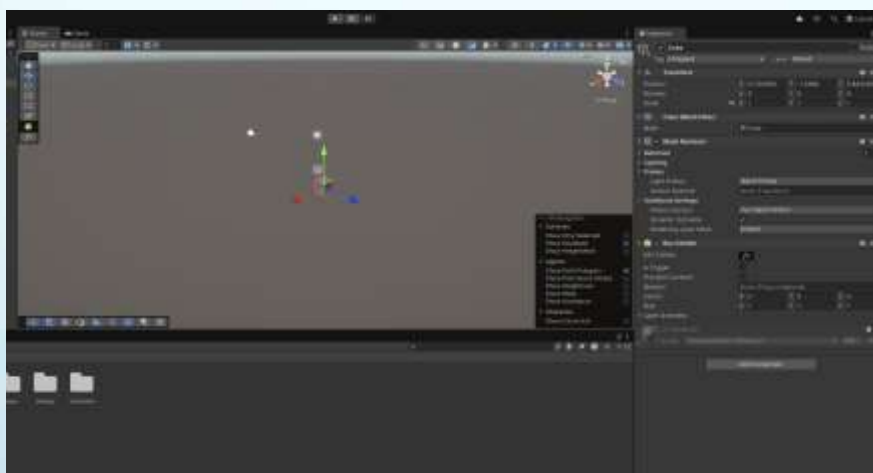


Figure 4. Interface of Unity

Unity is a cross-platform game engine that is used to create 2D and 3D games, as well as interactive applications, including VR. Unity has a huge developer community and a big amount of market, it offers a rich selection of tools and resources. Unreal Engine, on the other hand, is famous for the unrivaled quality of its 3D assets and open source code.

The Unity engine is one of the best platform used by many developers of VR games and apps. Its long-standing popularity has created a large community, as well as many online tutorials and examples to draw from. Unity also has a huge library of visual assets which called Asset Store – tens of thousands of objects, models, and environments to choose from, in different styles. Unity uses a relatively simple programming language, C#, and the engine itself supports and works well with most popular VR systems, including Apple Vision Pro, Google Daydream, Cardboard, Meta and Steam VR. Unity has a flatter learning curve, allowing developers of all skill levels to quickly start creating projects.

Virtual reality is going beyond gaming. Virtual reality applications are finding applications in education, medicine, construction, and other fields. While Unity is widely used in game development, its application across industries requires a broader analysis beyond gameplay features.

Unity provides a versatile development environment with built-in support for VR/AR devices through the XR Interaction Toolkit and various SDKs, including:

- OpenXR: Standardized API for XR projects;

- ARKit (iOS) and ARCore (Android): Mobile AR solutions. AR Foundation package makes easy to create AR applications;

- Oculus Integration SDK: Enhancements for Meta Quest devices;

- SteamVR SDK: Support for HTC Vive and other PC-based VR platforms.

Using these SDKs, developers can easily build VR/AR apps that work smoothly on different devices, saving time and making them more accessible to everyone.

Conclusion

As we can see, Unity's cross-platform capabilities offer a modern solution for integrating VR/AR into the education sector. By applying Unity's SDKs, developers can create immersive educational experiences that run on various devices, ensuring accessibility and engagement. Unity offers many advantages with its easy integration and powerful features. Creating educational VR/AR applications in Unity gives fast results. To summarize, Unity serves as one of the best engines for developing VR/AR applications. Future research should look into affordable ways to use VR/AR in Uzbek education, create local content, and train teachers to make the biggest impact.

References

- [1] Developing virtual reality applications with Unity. Jason Jerald; Peter Giokaris; Danny Woodall; Arno Hartholt; Anish Chandak; Sébastien Kuntz, 2014
- [2] Virtual Reality (VR) Automated Testing in the Wild: A Case Study on Unity-Based VR Applications. Dhia Elhaq Rzig, Nafees Iqbal, Isabella Attisano, Xue Qin, Foyzul Hassan. 2023
- [3] 3D modelling and visualization based on the unity game engine – advantages and challenges. I. Buyuksalih, S. Bayburt, G. Buyuksalih, A. P. Baskaraca, H. Karim, and A. A. Rahman, 2017
- [4] Using the Unity Game Engine to Develop SARGE: A Case Study. Jeff Craighead, Jennifer Burke, and Robin Murphy, 2014
- [5] Educational Game Making-Tool Development using Unity3D Engine: Birth of Game. Lim, C.J., Guen, Jeong Yun, 2014