VR Storytelling With Virtual Characters In Unity 3D

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***Abstract*— Virtual Reality (VR) in storytelling represents a revolutionary shift in narrative creation and experience. Unlike traditional media, which typically involves passive consumption of content, VR provides an immersive and interactive environment where users are actively engaged in the story. Existing storytelling methods primarily encompass traditional media formats such as books, films, television shows, and oral storytelling. These approaches generally involve a linear narrative structure where the audience passively consumes the content. Proposed VR storytelling using Unity 3D involves creating a virtual reality environment that offers an immersive and interactive narrative experience. Utilizing Unity 3D's robust tools and packages, developers can design a virtual space that simulates traditional settings, such as a home where storytelling takes place. The Oculus Quest device can be used to experience the immersion and interactivity of VR storytelling, supported by Unity 3D. VR storytelling modernizes the traditional experience, creating a unique, engaging, and emotionally impactful medium that combines the richness of past storytelling with the advancements of contemporary technology.**

Keywords—Virtual Reality, Unity 3D, Storytelling, Immersion, Interaction

I. INTRODUCTION

Virtual Reality (VR) has transformed traditional storytelling into an immersive, interactive experience where users can become active participants. Unlike passive media, VR storytelling places users directly within the narrative environment, fostering a sense of presence and deeper emotional engagement. This immersive quality has shown significant potential to enhance user connection with the narrative and encourage empathy for characters and events within the story [9]. VR storytelling is particularly effective because it allows users to move beyond observation and actively engage with the plot, becoming part of the unfolding story. This capability positions VR as a powerful medium for creating impactful and memorable experiences.

Virtual Reality, as a technology, has revolutionized how humans interact with digital environments. By simulating real-world sensory experiences, VR allows users to explore, interact, and immerse themselves in environments that were previously inaccessible. In addition to entertainment, VR has made strides in education, healthcare, and cultural preservation by providing an interactive and safe space for learning and exploration. The integration of VR into storytelling pushes the boundaries of narrative possibilities, offering dynamic settings, responsive characters, and user-centric interactions that redefine traditional narratives. Its ability to create a feeling of "presence" uniquely positions VR as a transformative tool in digital media.

Traditional storytelling methods, while effective, often lack the level of interactivity that VR can provide, limiting the depth of engagement users can develop with the characters or plot. As a result, users may experience these stories as outside observers rather than involved participants. By introducing interactivity, VR storytelling offers a way to overcome these limitations, making stories more personalized and emotionally resonant for users [12].

Storytelling has always been a cornerstone of human communication, shaping cultures, educating generations, and fostering emotional connections. Beyond entertainment, storytelling serves as a powerful means of imparting values, lessons, and shared experiences. Through stories, individuals find common ground, build empathy, and develop a deeper

understanding of diverse perspectives. The significance of storytelling lies in its ability to bridge gaps—be it between cultures, generations, or emotions—making it an essential medium for connection and learning. When combined with VR, storytelling evolves into an even more potent tool, where interactivity and immersion amplify its impact, making narratives not only heard but also felt.

Moreover, advancements in VR technology, including high-fidelity graphics, responsive avatars, and interactive environments, have paved the way for storytelling experiences that were previously unimaginable. These technologies enable seamless integration of sensory immersion with narrative progression, thereby fostering a more holistic engagement. Tools like Unity 3D and XR frameworks have made it easier for developers to create dynamic storytelling environments that respond to user inputs in real-time, enhancing the sense of agency within the story.

The shift towards immersive media is not just technological but also cultural. The growing preference for experiential content highlights a broader trend in media consumption, where audiences seek active engagement rather than passive viewing. VR storytelling aligns with this trend by blending interactivity, immersion, and emotional depth into one cohesive medium. This fusion creates an opportunity to reimagine traditional narrative structures, enabling nonlinear, user-driven storytelling pathways that adapt to individual choices and preferences.

This project seeks to explore these possibilities by developing an interactive VR storytelling environment where users not only witness but also influence the narrative through their interactions with avatars and the environment. The primary goal is to create a dynamic VR storytelling experience that leverages Unity 3D's robust development ecosystem, the Oculus Quest 2's hardware capabilities, and innovative interaction mechanisms to provide users with a deeply engaging and memorable journey.

II. RELATED WORK

The field of Virtual Reality (VR) storytelling has gained considerable interest in recent years, with applications spanning cultural tourism, education, and empathy-driven narrative experiences. VR's ability to create immersive environments offers a unique platform for interactive storytelling, where users can engage with the narrative in a way that enhances emotional connection and involvement.

Alharbi et al. (2023) [1] introduce Nanotilus, a VR-guided tour system for navigating dense 3D environments, such as molecular models or architectural spaces. The system uses path planning and scene sparsification to improve user navigation and engagement, especially in visually complex settings. While Nanotilus is effective for scientific visualization, its limited application to broader VR storytelling contexts indicates a potential for future adaptations to diverse immersive experiences.

Zhang (2021) [2]explores AI-generated interactive storytelling, with a focus on how virtual characters express emotions and engage in real-time narratives based on player choices. The study emphasizes the role of AI in enhancing immersion by eliminating pre-scripted plots and creating in-situ, dynamic storytelling experiences. Although this approach enhances personalization, the study acknowledges the difficulty in handling complex user choices in real-time. Future work is directed at improving AI capabilities for richer, multi-layered player interactions.

Christofi et al. (2022) [3] conducted a systematic review on VR storytelling's potential to enhance empathy, particularly through first-person perspectives and embodied experiences. The review found that VR methods can increase empathy more effectively than traditional approaches, especially when using perspective-taking techniques. However, inconsistent results emerged when comparing VR to non-VR methods, with limited interaction and lack of avatar responsiveness diminishing emotional impact. The study suggests future research on more interactive VR experiences with responsive avatars to improve empathy outcomes.

Zhou et al. (2023) [4] developed a VR platform for historical education that uses dynamic storytelling to create an interactive learning experience centered on internet history. This platform allows users to explore historical events from a first-person perspective, enhancing engagement and comprehension. While effective in creating an immersive learning environment, the platform faces challenges with device

accessibility and some module completion issues, pointing to a need for further testing and refinement.

Xing et al. (2023) [5] integrate restoration techniques with VR storytelling to boost cultural education by recreating historical landmarks in VR. This approach combines interactive and immersive storytelling, providing an engaging educational experience for users. However, the study notes that the current linear experience limits user interactivity, suggesting that future work should incorporate non-linear storytelling to enable more user engagement and control.

Rizvic et al. (2022) [6] present a VR application for teaching prehistory through interactive digital storytelling, allowing users to engage with digital artifacts and historical narratives. The study shows that immersive learning in VR enhances understanding of cultural heritage, although technological limitations and occasional motion sickness present challenges. These findings suggest that further improvements in VR technology are needed to optimize accessibility and usability in educational contexts.

Gonzalez et al. (2021) [7] discuss VR's potential for fostering empathy by presenting stories from multiple perspectives, including point-of-view shifts and flashbacks. This approach effectively engages users emotionally, making it suitable for educational and therapeutic applications. However, the study highlights limited real-time interaction as a drawback, suggesting further development of dynamic responses for empathy-driven storytelling.

Fernandez et al. (2020) [8] explore VR's educational applications, focusing on collaborative storytelling where users co-create narratives. This approach promotes engagement and teamwork, making it valuable for interactive learning. However, the study notes that diverse user inputs can disrupt narrative coherence, and it suggests incorporating structured narrative frameworks to maintain educational focus within collaborative storytelling.

Mueller and Grimm (2018) [9] emphasize the role of spatial design, realistic graphics, and sensory immersion in creating engaging VR experiences that enhance users' emotional presence. While immersive VR environments can be compelling, the study warns that overly complex interactions and high realism may overwhelm users, impacting usability. Future work calls for balancing sensory engagement with user-friendly interactions to optimize the VR storytelling experience.

Ochoa and Campos (2019) [10] explore VR storytelling's educational potential, examining how interactive narratives make abstract concepts more relatable and improve knowledge retention. The study suggests that VR storytelling can enhance comprehension of complex topics but acknowledges challenges in adapting narratives to varied learning styles. Future research may focus on adaptive VR storytelling to better support different user preferences and engagement levels.

Smith et al. (2017) [11] review VR and AR applications in digital storytelling, highlighting VR's capacity to create deeply engaging and interactive experiences across education, tourism, and cultural heritage. While VR's immersive nature fosters strong user engagement, the study notes challenges in maintaining narrative coherence with unpredictable user interactions. It suggests designing structured yet flexible storylines to balance interactivity with narrative consistency.

Foni et al. (2010) [12] examine VR storytelling combined with gamification to enhance cultural tourism experiences, using quests and rewards to increase user engagement with cultural sites. The study underscores the educational value of interactive, gamified VR environments but notes that task-based structures may restrict users to specific paths, limiting narrative exploration. Future work suggests exploring interaction models beyond gamification for freeform storytelling.

III. METHODOLOGY

A. System Overview

This project creates a VR storytelling environment that emulates a traditional home setting where a grandparent narrates stories to children. The application is developed using Unity 3D and experienced through the Oculus Quest headset, the system integrates environment design, character animation, interactive controls, and multimedia synchronization to deliver an engaging storytelling experience. The narrative is structures around three stories: The Wise King and theElephant, Jhansi Lakshmi Bai, and the Honest Wood Cutter.

B. Development Environment and Tools

The development process begins with establishing both the hardware and software requirements. Unity Hub and the Unity Editor (LTS version) form the foundation for the project setup, while the Oculus Integration package is employed to enable VR functionalities on the Oculus Quest 2. Avatar creation is facilitated through Ready Player Me, and animations are sourced from Mixamo. Additional multimedia elements—such as story videos created via ConvertToVideo.com, images from ChatGPT and Freepik, audio narrations generated by Luvvoice.com, and background music obtained from Zedge.net—are integrated into the application. These tools collectively provide a robust framework for building a comprehensive VR storytelling platform.

C. Scene Design and Development

The virtual environment is constructed by importing various assets from the Unity Asset Store. Key asset packages include SimpleNaturePack for natural elements (e.g., trees, bushes, and flowers), Brick Project Studio's Apartment Kit for house structures, Nappin for indoor props such as sofas, and RPGPP_KT for additional architectural and natural elements. The scene design comprises three distinct segments: the Start Menu Scene, the Main Storytelling Scene, and the Thank You Scene. The Start Menu Scene introduces users to the interface with a "Start" button activated via the Oculus controller, while the Main Storytelling Scene displays the narrative through interactive multimedia and animated avatars. The Thank You Scene provides a concluding interface with a thank-you message and background audio, ensuring a smooth transition from the immersive experience back to the user.

D. Avatar Creation and Animation

Avatar generation and animation are critical to the immersive storytelling experience. Avatars representing a grandmother, children, and neighbors are created using Ready Player Me, ensuring diverse character representation within the scene. Each avatar is assigned an Animator Controller, and realistic motion sequences are applied using animations from Mixamo. This process synchronizes the avatar actions with the narrative flow and multimedia content, enhancing the realism and engagement of the storytelling.

E. Interactive Elements and User Interaction

User interaction is primarily managed through Oculus controller inputs. The application employs the OVRCameraRig for user navigation, with movementscontrolled by the Oculus Touch controller thumbstick. Users trigger scene transitions through these controller inputs. This approach ensures an intuitive and responsive user experience that maintains the immersive quality of the VR storytelling environment.

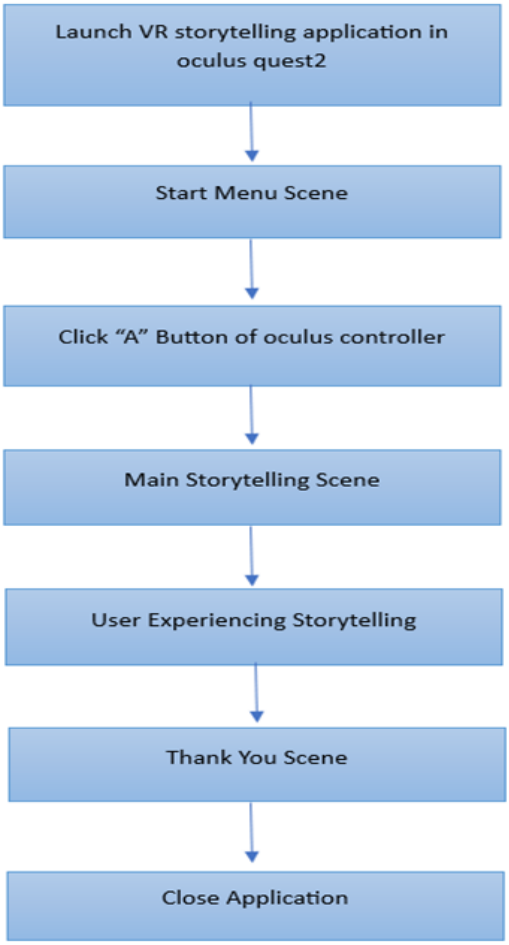

Fig. 1: User Interaction

F. Script Implementation

Several custom scripts are developed to manage user inputs, scene transitions, and multimedia synchronization. The MenuController.cs script monitors Oculus controller inputs to handle transitions from the Start Menu Scene to the Main Storytelling Scene. The VideoStoryNarrator.cs script orchestrates the synchronization of audio narration, video playback, and avatar animations, and it triggers the

final transition to the Thank You Scene once the narrative concludes. Additional scripts, including OVRMovement.cs and OculusControllerMovement.cs, are employed to manage camera movement and the user's navigation within the virtual space. Together, these scripts ensure a cohesive and responsive interactive environment.

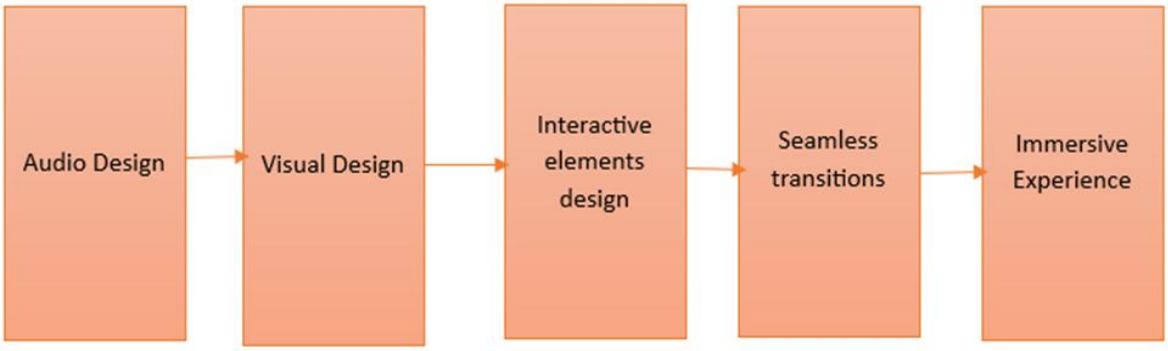

Fig. 2: Immersion Enhancement flowchart

G. Immersion Enhancement and application Deployment

Immersion is further enhanced through meticulous visual and audio design. The application leverages realistic textures, dynamic lighting, and detailed environmental elements to create a visually compelling scene, while synchronized audionarration and background music augment the immersive experience.

The VR storytelling application is ultimately deployed on the Oculus Quest 2, where users experience a streamlined flow from launching the application, navigating the Start Menu, engaging with the story in the Main Scene, and finally transitioning to the Thank You Scene. This structured progression, combined with interactive and multimedia-rich content, forms the basis for a memorable and engaging VR storytelling experience.

IV. RESULTS

A VR Storytelling using Avatars application is developed using Unity. The application has three scenes namely StartMenuScene, MainStorytellingScene and ThankYouScene. There is smooth transition between these scenes. A traditional storytelling is experienced through virtual reality using oculus quest 2 device. In this application one grandmother represented by an avatar narrates stories to the children in the house and related videos are displayed in the scene which enhances children interest to listen to stories. User can explore through the scenes using oculus controllers.

Fig. 3: Welcome Scene

Fig. 3 is the welcome scene of the application. By clicking 'A' button on oculus controllers this scene takes user to the main storytelling scene.

Fig. 4 is the main and dynamic scene of the application. Once user enters into this scene grandmother starts narrating the stories to the children and related stories played in synchronization with the narration. User can interact with this scene by exploring it using joystick of lefthand controller.

Fig. 4: Main Story telling Scene

Fig. 5: Thank You Scene

Fig. 5 is the concluding scene of the application which has thank you message for the user.

V. CONCLUSIONS

The VR storytelling system developed in this project successfully integrates sequential narration, interactive visuals, and user-driven exploration to create an immersive experience. By leveraging tools like Unity, Ready Player Me, and Mixamo, the system presents a cohesive environment where avatars narrate stories while synchronized videos enhance the narrative flow. Movement within the scene, facilitated by Oculus Quest 2 controllers, further immerses the user in the storytelling experience. This project demonstrates the potential of VR as a medium for interactive and engaging storytelling, paving the way for more dynamic and user-centric narratives.

REFERENCE

[1] R. Alharbi and F. Shaikh, “Nanotilus: Generator of Immersive Guided-Tours in Crowded 3D Environments,” in 2023 IEEE 7th International Conference on Virtual Reality and Augmented Reality (ICVRAR), pp. 305–312, 2023.

[2] M. Zhang, “Design and Implementation of Virtual Characters' Expression of Interactive Storytelling,” in 2021 International Conference on Artificial Intelligence and Virtual Reality (AIVR), pp. 57–63, 2021.

[3] M. Christofi, T. M. Robertson, and P. Zikas, “The Use of Storytelling in Virtual Reality for Studying Empathy: A Review,” in 2022 Journal of Virtual Reality Applications, vol. 30, no. 4, pp. 295–312, 2022.

[4] Z. Zhou, Y. Xing, and T. Xie, “Virtual Reality for Historical Education: Designing an Immersive and Interactive Platform for 3D Digital Heritage and Dynamic Storytelling,” in 2023 IEEE 8th International Conference on Digital Heritage (ICDH), pp. 741–748, 2023.

[5] Y. Xing, H.Y. Kwan, and S.Y. Zhang, “Enhancing Cultural Education through Integrating Restoration and VR Storytelling Exploration,” in 2023 IEEE 8th International Conference on Image, Vision, and Computing (ICIVC), pp. 645–648, 2023.

[6] S. Rizvic, N. Hulusic, and L. Liarokapis, “Learning About Prehistory through Interactive Digital Storytelling,” in 2019 11th International Conference on Virtual Worlds and Games for Serious Applications (VS-Games), pp. 1–8, 2019.

[7] Gonzalez, J., Lopez, M., & Perez, F. “A VR interactive story using POV and flashback for empathy,” Int. J. Virtual Real., vol. 15, no. 2, pp. 125-138, Aug. 2021.

[8] Fernandez, A., Jimenez, R., & Martinez, S. “Virtual reality and collaborative storytelling for education and training,” Educ. Tech. Res. Dev., vol. 28, no. 3, pp. 200-215, May 2020.

[9] Mueller, T., & Grimm, D. “Immersive environments and virtual reality,” J. Virtual Real. Appl., vol. 6, no. 4, pp. 287-301, Oct. 2018.

[10] Ochoa, M., & Campos, L. “Augmenting learning through VR storytelling,” Comput. Educ. J., vol. 34, no. 1, pp. 45-62, Mar. 2019.

[11] Smith, R., Zhang, X., & Lee, T. “Virtual and augmented reality in digital storytelling,” Digital Storytelling J., vol. 12, no. 2, pp. 89-105, Jun. 2017.

[12] Foni, A. E., Papagiannakis, G., & Magnenat-Thalmann, N. “Gamified VR storytelling for cultural tourism using 3D,” ACM J. Comput. Cult. Herit., vol. 3, no. 1, pp. 1-18, Feb. 2010.