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History Education with VR

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Demo Video: https://youtu.be/aD97Gm6A-B4

Description of the Application

Virtual reality (VR) is used in various fields such as games, training, marketing and education, and its impact on memory and well-being is well recognized.

With the introduction of affordable hardware and smartphones, virtual reality can be used for history education. With the help of the VR History Traveller app, students can take tours virtually anytime in history. It impacts students' learning of history, particularly in terms of learning motivation, memory and retention.

The VR History Traveller is a history education application, through which students are able to travel to a specific time and location to experience and view the history event themselves. History is an important part of human knowledge, Solomon (935 BC) wrote in the Ecclesiastes:

> *"What has been will be again, what has been done will be done again; there is nothing new under the sun."*

If each generation is able to learn from history, from what we as humans have done correctly, and incorrectly, there will be less world war, fewer disasters in the future.

However, traditional history education is mostly based on the text or with low-resolution photos in a book. Due to the limitations of a book interface, it is hard for students to be related to a historical event, thus they are less interested and less motivated to learn history. What people experience has a deeper impact on their mind than what people read or hear. The application is also helpful for those who may have reading difficulty such as dyslexia, it can be used in a school setting with students. The high-fidelity and customised interaction design of the application will engage the student to enjoy learning history more than ever.

This application is a virtual environment simulator that recreates a historical event virtually. Students can use this application via a VR headset, and/or additional VR Treadmill, able to use a sitting, standing or walking position entering the virtual environment. Take an example of the demo scene. Once they enter the virtual world, they will find themselves appearing in the centre of a military base in the middle of the Hürtgen forest. Students can interact with the surroundings by walking around and picking up certain items, more interaction details are presented in the next section of this report.

Note: The application intends to recreate real historical events, thus the environment design aims to be as close to reality as possible. In this demo scene, it applies the animation soldier characters. In the next stage of development, a more realistic character performed by computer graphics and artificial intelligence (AI) can be added to the scene.

Interaction Design

In the VR History Traveller application, students are able to time travel to a specific historical event by selecting a time and location or simply by naming the historical event, such as the Battle of Hürtgen Forest - WW2 shows in the demo scene.

After selecting the event's time and location, the student will be joining the scene in a first-person view with the VR headset. It allows the student to walk around the scene while the event was occurring. The student may choose to freeze the time in the VR scene, and then be able to observe the surrounding details while all the characters stop moving. There are following interactive features in the application:

1. When the student walks close to the radio, the documentary radio audio related to the historic event, the *1944 US Radio chatter* (Wilson, 2015) will be played. The audio interface enhances the level of immersion in the virtual scenes. **(Implemented)**
2. When the student walks to the TV, the video player will be triggered and a documentary video such as *I was a combat medic in the Hürtgen Forest - Pvt Charles N. Shay* (Florent Plana, 2019) with further information of history will be played. **(Implemented)**
3. The student is able to grab and throw items such as radio, boxes and barrels in the VR environment (Wester, 2018). The students can closely examine the virtual objects around them, make them feel that they are part of the environment in the virtual world. Simple object interaction not only enhances the level of immersion but also encourages the student to have further interaction in the virtual environment. **(Implemented)**
4. The student may choose to talk to a character in the scene, such as asking simple questions, *"which year it is and where I am?"* The character will respond according to the script in that event. **(To be implemented)**
5. Interview interaction with 3D characters. The student is able to interview the characters in the VR scene. The application will generate the answer based on historical records. The audio, body movement, facial expression of the characters will be generated by AI models. **(To be implemented)**

Descriptions of 3D Models

1. Terrain: Imported - Added collider for scene edge.
The forest terrain supports unity terrain billboards. Dream Forest Tree created by IL.ranch:
https://assetstore.unity.com/packages/3d/vegetation/trees/dream-forest-tree-105297

2. TV screen and video player: Created.
The screen appears on top of the TV will be triggered when the user walks near the TV object. The model contains a 3D cube, a video player and a capsule trigger area.

3. Trees, plants, particles, water, reflect, wind and shafts: Imported - Add collider.
All trees and bushes made with 'Unity Tree Creator'. Dream Forest Tree created by IL.ranch:
https://assetstore.unity.com/packages/3d/vegetation/trees/dream-forest-tree-105297

4. FPS Controller: Imported - Added particles in the view and adjusted steps volume.
Allow the user to walk in the first-person view, containing walking, running, and jumping. Users can control via keyboard and mouse in the demo scene. Downloaded from the First Person Avatar package on Mylo: https://mylo.utas.edu.au/d2l/le/content/357522/viewContent/3482098

5. Crate and Barrels: Imported - Added collider and scaled.
This is a set of crates and barrels that created by Kobra Game Studios:
https://assetstore.unity.com/packages/3d/props/industrial/crate-and-barrels-73101

6. Old Radio: Imported - Added collider, audio playing and pickup action script.
Model of old transistor radio receiver created by IL.ranch:
https://assetstore.unity.com/packages/3d/props/interior/old-radio-ocean-72923

7. Vintage TV Set: Added collider and scaled.
The package contains four TV models created by Dmitriy Dryzhak
https://assetstore.unity.com/packages/3d/props/electronics/tv-set-26193

8. Army Bunker: Imported - Added collider and scaled.
US army bunker created by Duane's Mind
https://assetstore.unity.com/packages/3d/props/army-bunker-2093

9. Military Vehicles: Imported - Added collider and scaled.
M3A1 Scout Car created by IGIIID:
https://assetstore.unity.com/packages/3d/vehicles/land/m3a1-scout-car-53149
Russian Military Vehicles T9 created by Milos Baskic:
https://assetstore.unity.com/packages/3d/vehicles/russian-military-vehicles-lite-t90-104569

10. Soldier Characters: Imported - Added collider.
This package contains rigged and textured soldiers with walking animation.
Created by TheAvatarStudio:
https://assetstore.unity.com/packages/3d/characters/humanoids/soldiers-pack-577

References

Florent Plana. 2019. *I was a combat medic in the Hürtgen Forest - Pvt Charles N. Shay.*
https://www.youtube.com/watch?v=PD6s3HZ45JY

Matt Wester. 2018. *EASILY Pick up and Throw Objects | Unity 2018 Tutorial.*
https://www.youtube.com/watch?v=_xMhkK6GTXA

Mick Wilson. 2015. *1944 US Radio chatter with colour tank photos.*
https://www.youtube.com/watch?v=SqRyM8tEdN0