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Echoes of Union Depot

A virtual reality educational game for historic preservation and public awareness

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This paper presents the design, development, and potential impact of Echoes of Union Depot, a virtual reality (VR) game aimed at promoting historic preservation and raising public awareness about El Paso's Union Depot, a building listed on the National Register of Historic Places Inventory. The game leverages the immersive capabilities of VR technology and 360° images to engage players in exploring the site's rich history and architectural evolution. Players assume the role of a time-traveling detective, guiding lost spirits to resolve their past and move on. The paper outlines the development process, highlighting the use of 360° panoramic images and 3D Vista Virtual Tour Pro software to create an accessible and user-friendly experience that fosters historic preservation awareness and cultural appreciation. The study also discusses limitations and areas for future research, including expanding the scope to include other heritage sites, working with historians and cultural consultants for accurate representations, and evaluating the game's effectiveness in promoting awareness and fostering a sense of community pride.

Keywords: *Historic Preservation, Educational Games, Registered Historic Buildings, Virtual Reality (VR), Cultural Heritage, Public Awareness.*

INTRODUCTION

According to the National Park Service, historic preservation is how humans communicate with their past concerning their future. Historic preservation enables individuals to identify significant aspects of history and elements that can be conserved for future generations. This method effectively conveys the current generation's comprehension of the past to those who come afterward. Historic preservation can embrace various factors, such as individuals, events, concepts, locations, and moments (NPS, 2023a). Considering historic buildings, they hold various values for individuals, including existence, choice, altruism, community identity, and recreation (Counts, 2003). These values render such buildings essential for present and future generations, as they enhance the quality of life and lifestyle. As a finite resource, preserving and restoring historic buildings is crucial. One of the most notable preservation initiatives in the United States is the inclusion of properties in the National Register of Historic Places. Established under the 1966 National Historic Preservation Act, the National Park Service administers this national initiative, which aims to unite and bolster both public and private endeavors in recognizing, assessing, and safeguarding the United States' historical and archaeological treasures. It means the National Register of Historic Places serves as the authoritative catalog of the country's historically significant sites deserving of conservation (NPS, 2023b). Generally, any historic or prehistoric district, site, structure, building, or object and any related remaining recording, material, and artifact to these properties or resources which fits in

the category of historic properties or historic resources are already included in or qualified for inclusion in the National Register list (ACHP, n.d.). The National Register of Historic Places also documents cultural heritage for interpretation and educational purposes (Risk, 1994). According to De Guichen and d'leteren (2009), preserving cultural heritage largely relies on public awareness and informed decision-making by governing bodies. Hence, even though these historic structures are registered for the sake of preservation, the general public may still lack awareness of their significance.

As an emerging media form, gaming can foster awareness and submerge participants in virtual worlds. The concept of gamification has gained traction in various domains, including education and practice, as gaming becomes more widespread in everyday life. Not only do games hold educational value, but they can also impart cultural heritage and deliver detailed information to players via in-game interactions (Huang and Soman, 2013). Mortara et al. (2014) maintain that games' virtual environments grant extensive access to cultural heritage for diverse audiences. Notably, games have a transient nature, enabling them to traverse different cultures, exemplify cultural globalization, and promote intercultural exchange (Šisler et al., 2017). Since 2002, educational games, also known as serious games, have risen in popularity for purposes beyond mere leisure (Alvarez and Djaouti, 2011; Anderson et al., 2009; Becker, 2007; De Freitas and Liarokapis, 2011). Educational games have the potential to instruct players about a specific subject matter or improve a particular ability by providing practice in different fields, including cultural heritage (Örnek and Seçkin, 2016; Sharafi Rohani and Kim, 2022). De Freitas and Liarokapis (2011) assert that the educational success of games can be ascribed to their audiovisual components, which facilitate memory retention.

The main objective of this paper is to increase public awareness about the significance of preserving Union Depot, a nationally registered historical building located in El Paso. The study has

developed a virtual reality (VR) game using 360° panoramic images of the building to educate users about the structure's importance and history. The game is created using 3DVista Virtual TourPRO software and aims to encourage users to visit the building and engage with the relevant content, both virtually and in situ. Hence, the study eventually aims to answer how a virtual reality game can effectively raise public awareness about the importance of preserving historic buildings, particularly those listed on the National Register of Historic Places. What critical design elements and features should be incorporated into the game to ensure a successful and engaging educational experience for players?

LITERATURE REVIEW

Educational games have become a popular tool for engaging the public in historic preservation and fostering an appreciation for cultural heritage. In recent years, numerous studies have explored the development and assessment of games specifically designed for this purpose. For instance, Mortara et al. (2014) presented a comprehensive review of serious games aimed at enhancing the understanding and experience of cultural heritage, highlighting their potential for engaging users in innovative ways. Also, the authors investigated the evolution of virtual landscapes in educational games and their impact on the educational content conveyed previously, addressing a gap in the literature (Afshar et al., 2022). In addition, the study aimed to understand the relationship between virtual landscape transformation, VR technology, and game content delivery.

Several recent examples of games for historic preservation include the *Cultural Memory Game* (Chatzopoulos et al., 2020), which uses augmented reality to engage players with historical content and foster collaboration; *TimeMesh* (Di Tore et al., 2018), a location-based mobile game designed to enhance the learning experience of visitors to historical sites; and *EcoCity: The Lost World* (Ozcinar et al., 2021), a serious game that aims to raise awareness about the preservation of ancient cities by immersing players

in a realistic 3D environment. Another example is *The Time Traveler* (Schrier, 2020), an alternate reality game that teaches players about the history of a specific location through interactive storytelling and challenges. In *Heritage Quest* (Karaman et al., 2020), a virtual reality game, players explore cultural heritage sites and solve puzzles, promoting engagement with historical content. *Ghosts of a Chance* (Klopfer et al., 2018) is an educational game that utilizes a museum's collection to create a narrative-driven, interactive experience, engaging players in the process of historic preservation. Lastly, as a series of continuous research endeavors focused on the preservation of both tangible and intangible heritage, specifically concerning the Silk Roads and their associated caravanserais, the authors developed three educational games named the *Sericum Via* (Eshaghi et al., 2021), the *Anatolian Journey* (Vaez Afshar et al., 2021), and the *Khan Game* (Varinlioğlu et al., 2022). Throughout this series, the researchers have tried to develop serious games that leverage GIS data. With each successive study, the series demonstrates an evolution in game development and the incorporation of game elements, reflecting an ongoing commitment to refining these educational tools for historic preservation.

METHODOLOGY

Setting

As discussed, the primary purpose of this research is to raise public awareness for the sake of historic preservation. Therefore, as the game's development setting, the study selected the Union Depot, a registered historic building in El Paso. This historical building was registered nationally in 1975 as El Paso Union Passenger Station (NRHP, n.d.). According to the National Register of Historic Places Inventory - Nomination Form (1975), the Union Passenger Station was constructed in 1905, showcasing a Neo-Classical design on the intersection of Coldwell and San Francisco Streets at the western boundary of downtown El Paso. As the first union station created

explicitly for managing international traffic in the United States, it holds a prominent place in the country's railroad history, highlighting the city's significance as a transportation center. Designed by the Chicago-based architecture firm Daniel H. Burnham & Company, the station boasts a six-story bell tower at its northeast corner.

Game Design and Story

This paper presents *Echoes of Union Depot*, a virtual reality (VR) game aimed at promoting historic preservation and raising public awareness about El Paso's Union Depot, a building listed on the National Register of Historic Places Inventory. Since it is suggested that innovative media formats like 360° videos be utilized for digital storytelling in order to create immersive experiences through the use of VR technology (Sylaiou et al., 2018), hence, by leveraging the immersive capabilities of VR technology and 360-degree images of the Neo-Classical architecture, players assume the role of a time-traveling detective, guiding lost spirits to resolve their past and move on. The game fosters a deeper appreciation for the significance of preserving heritage sites through engaging explorations of the Union Depot's history, architectural evolution, and cultural impact. The VR experience showcases the station's significance as the first union station built explicitly for handling international traffic in the United States and its role in connecting people and cultures. Additionally, A scoring system is incorporated to enhance player engagement and foster a sense of accomplishment.

Echoes of Union Depot is set in contemporary times and weaves urban legends surrounding Union Depot into its narrative. Players are assigned by a mysterious figure, The Stationmaster, to travel through time and assist trapped spirits in finding closure by uncovering their stories and the history of the station. As players progress through the game, they earn points for solving puzzles and making key decisions, enhancing engagement and fostering a sense of accomplishment. The immersive VR experience of the game allows players to explore the

Union Depot across different eras and witness key moments in American railroad history. The narrative unfolds through interactions with diverse characters, puzzle-solving, and decision-making, culminating in restoring the Union Depot and liberating the trapped spirits.

The following diagram (Figure 1) visually represents the game flow and method for *Echoes of Union Depot*. This flowchart illustrates the key steps and interactions that players will experience throughout the game. The diagram serves as an overview of the game's structure, providing a comprehensive understanding of the narrative progression, exploration, and decision-making elements that contribute to the immersive VR experience and the promotion of historic preservation awareness. The scoring system adds an extra layer of engagement to the game, motivating players to interact with the game's various elements and compete with others for high scores. The scoring logic can also be used to gather insights into players' interaction with the game, enabling developers to identify areas for optimization and improvement.

The target group for *Echoes of Union Depot* consists of history enthusiasts, students, educators, local community members, and casual gamers interested in immersive storytelling and puzzle-solving experiences. The game is designed to engage this diverse audience through a captivating narrative, historical exploration, and interactive gameplay elements.

Therefore, the recommended age range for *Echoes of Union Depot* would be 12 years and older. This age range is appropriate as the game focuses on historical exploration, immersive storytelling, and puzzle-solving, which requires a certain level of cognitive ability and comprehension skills. While *Echoes of Union Depot* offers an engaging and educational experience, it faces certain limitations when competing with commercially successful games. These limitations, however, do not detract from the game's primary focus on promoting historic preservation and education.
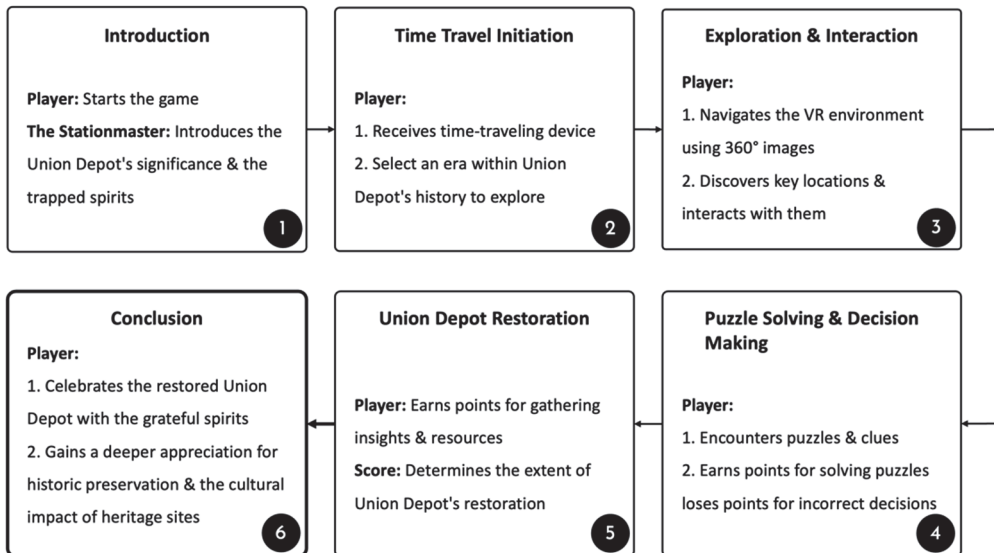

Figure 1
Game's key steps and interaction flowchart

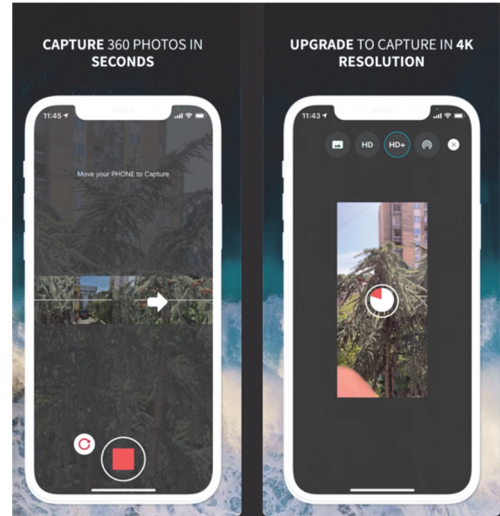## Visual Material and Game Development

Based on the conversations thus far, the research chose to employ 360° panoramic images as the visual content for the game creation process. As a result, 360° panoramic field photography was used in the investigation. In this regard, due to the literature, a 360° camera and an action camera can function as affordable, rapid, effective, lightweight, and high-resolution instruments (Prittinen, 2021). The GoPro Max camera is one of the top 360° action cameras on the market. However, a more cost-effective option is desirable due to budget limitations and the goal of utilizing existing devices inventively. Consequently, the research emphasized enabling 360° photography using smartphones.

Among available applications, the Panorama 360 & Virtual Tours (2023) application, which is compatible with iOS devices, appears to be the most efficient and appropriate choice (Figure 2). Utilizing the app's free trial, 360° perspectives of the target building were obtained. While this approach offers several benefits, the resulting images do not include sky and ground views, which can be captured using a GoPro Max for a comprehensive 360° experience. Nevertheless, as smartphone photography does not necessitate a tripod stand like the GoPro, the produced images can be used directly without the need for post-production editing to remove the tripod's presence in the final image.

The development process of *Echoes of Union Depot* is facilitated by the 3D Vista Virtual Tour Pro software, capitalizing on its e-learning and gamification features to create engaging virtual tours with 360° panoramic images and interactive multimedia elements, enabling developers to construct detailed and engaging spaces for players to explore efficiently. Moreover, the software's user-friendly interface and various pre-built features, such as hotspots, navigation tools, and multimedia

support, significantly reduce the learning curve and development time. This allows creators to focus on crafting compelling narratives, designing intriguing puzzles, and enhancing the overall player experience (Figure 3).

Vishwanath et al. (2017) state that, at present, users can opt for affordable smartphones, cost-effective VR headsets, and VR applications, which enable them to access VR-compatible games, 360° videos, and panoramas more efficiently than ever before, in addition to using Head-Mounted Displays for immersive experiences with 360° media (Argyriou et al., 2020). Therefore, the software's user-friendly interface, compatibility with various platforms and devices, and its support for both VR and web-based experiences further contribute to the game's ease of development. Furthermore, this adaptability ensures that the game remains accessible to a wide range of players, regardless of their device or system capabilities.

Figure 2
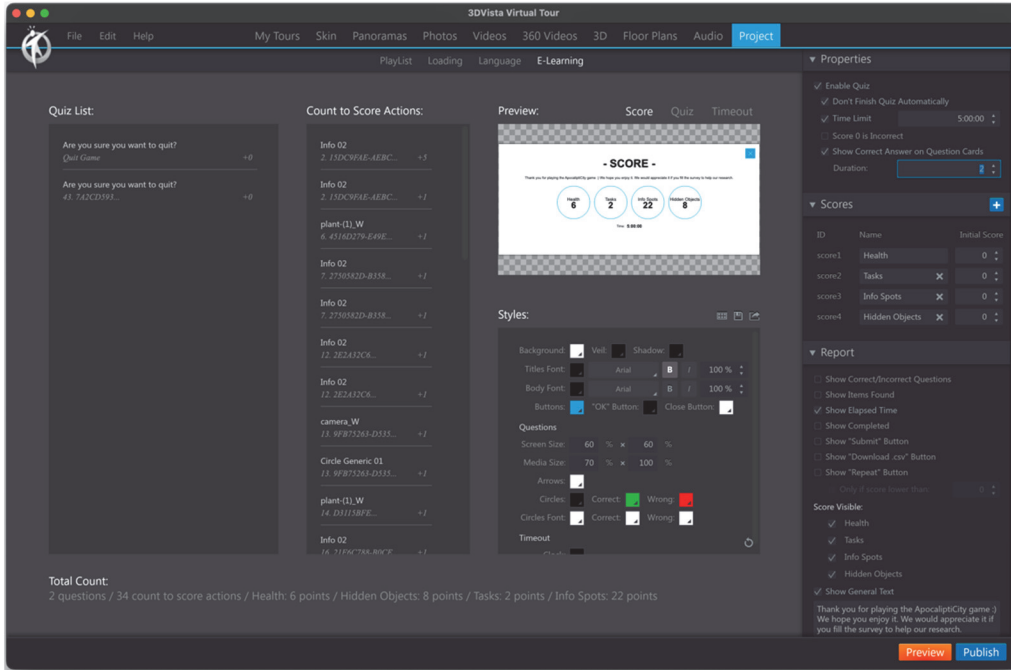Panorama 360 &
Virtual Tours
application

Figure 3
Game
Development
Process

The 3D Vista Virtual Tour Pro software offers the possibility to integrate scoring systems within the game, enabling players to earn points as they progress through *Echoes of Union Depot*. This feature can be woven into the narrative, as players are encouraged to help the trapped spirits by solving puzzles, uncovering historical information, and making key decisions. As players accumulate points, they not only contribute to the resolution of each spirit's story but also gain a tangible sense of accomplishment and engagement in the game. Hence, by integrating quizzes, challenges, and interactive components, the study developed an interactive game experience that fosters historic preservation awareness, engages players in exploring heritage sites, and provides an enjoyable learning experience (Figure 4).

Overall, the *Echoes of Union Depot* game benefits from a streamlined development process, enabled by the 3D Vista Virtual Tour Pro software, which simplifies the creation of rich, immersive environments and interactive elements, resulting in an engaging experience that promotes historic preservation awareness and cultural appreciation.

Finally, integrating Google Analytics and a custom script in the game can enable recording player interactions, such as clicks, location, and browser information, while the script captures individual scores from various in-game challenges. This valuable data allows developers to identify less-visited areas of the virtual environment and pinpoint more challenging puzzles, providing insights for further optimization and enhancing user engagement in the game.

Figure 4
Echoes of Union
Depot Game Screen
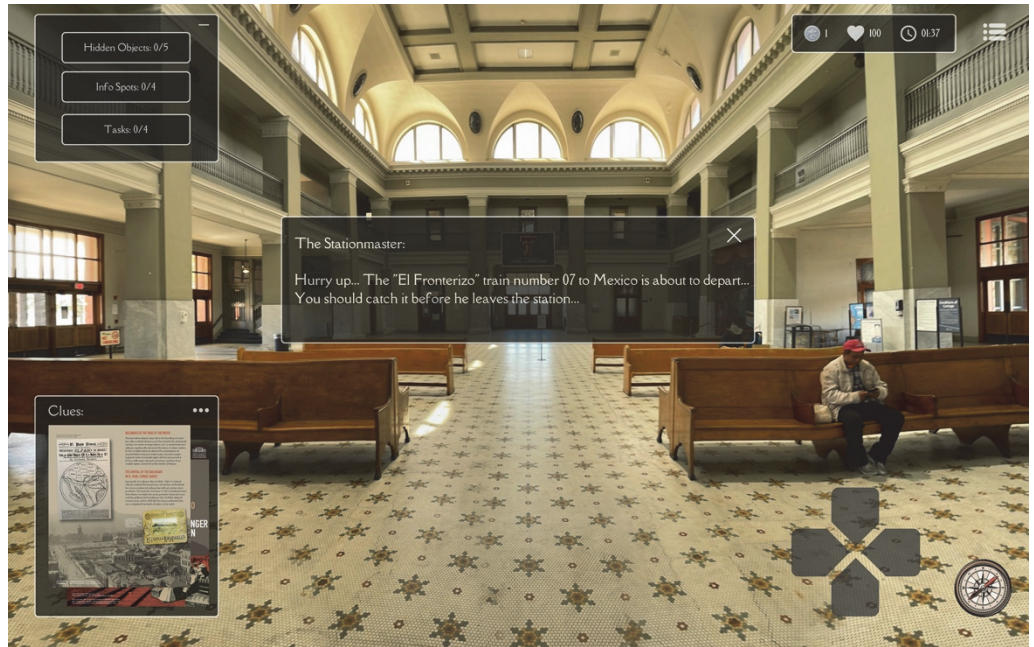
CONCLUSION AND DISCUSSION

Echoes of Union Depot emphasizes the importance of preserving sites and buildings listed on the National Register of Historic Places Inventory by engaging players in the rich history and cultural impact of the Union Depot. By harnessing the power of VR technology and 3D Vista Virtual Tour Pro, the game encourages a deeper understanding of the significance of historic preservation and fosters community pride and involvement in protecting local heritage. This innovative approach serves as a model for future efforts to raise awareness and promote the preservation of other historically significant sites.

In conclusion, the *Echoes of Union Depot* game offers an accessible and user-friendly experience due to its web-based nature, incorporating the possibility of VR mode using a headset, eliminating the need for high-configuration systems, and its streamlined development process, making it a valuable tool for promoting historic preservation awareness and engaging diverse audiences in the appreciation of cultural heritage.

While *Echoes of Union Depot* has demonstrated the potential of utilizing virtual reality and interactive storytelling to promote historic preservation and public awareness, the study has limitations and areas for future research to address. Considering the scope, this game focuses primarily on Union Depot and its history. Expanding the scope to include other heritage sites listed on the National Register of Historic Places Inventory could increase the game's educational and preservation impact. Additionally, regarding cultural sensitivity, the developed game incorporates historical events and characters but may only partially capture the complexity and nuance of some cultural contexts. Future iterations could consider working closely

with historians and cultural consultants to ensure accurate and respectful representations. As for future work, the study needs to focus on the evaluation of impact. Assessing the game's effectiveness in promoting historic preservation awareness and fostering a sense of community pride requires systematic evaluation. Future studies could involve pre- and post-game surveys, interviews, or focus groups to gauge players' attitudes and knowledge changes. In this regard, comparing VR and web-based experiences via analyzing the differences in player engagement and learning outcomes between the VR mode using a headset and the web-based game accessible on any device or browser could provide valuable insights into optimizing the game design for various platforms. As mentioned, incorporating Google Analytics in the game link, which tracks the players' interactions and performance, can provide valuable insights for optimizing the game experience and enhancing user engagement. Finally, with the new update of the 3D Vista Virtual Tour Pro software, which allows the use of 3D models in addition to 360° photos, future research could explore how the integration of 3D models can enhance the overall immersion and interactivity within the game. This could lead to more engaging and realistic virtual environments, improving the player experience and educational outcomes.

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