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Análisis de experiencias culturales desarrolladas con tecnologías de realidad virtual

Analysis of cultural experiences developed with virtual reality technologies

Análise de experiências culturais desenvolvidas com tecnologias de realidade virtual

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Ciencias técnicas y aplicadas
Artículo de investigación

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Resumen

Los personajes digitales aparecen y se comportan como criaturas imaginarias o reales dentro de un entorno generado por computadoras. Estos personajes son vistos como aspectos críticos de las aplicaciones del patrimonio cultural, que añaden valor y amplían el compromiso y la motivación del usuario de diferentes maneras. Este artículo presenta un análisis de las diversas aplicaciones que utilizan personajes digitales e intenta identificar cómo se aplican, sus características clave y el papel que desempeñan en la expansión de la experiencia cultural. El objetivo principal de esta revisión es proporcionar a los diseñadores que crearán más personajes digitales en el futuro información sobre las características probables que deben considerar para expandir la experiencia del usuario. También tiene como objetivo alentar a los diseñadores de personajes digitales a identificar los elementos positivos particulares y los problemas críticos que rodean a los personajes digitales. Se descubrió que la mayoría de los personajes digitales se pueden determinar en función de dos aspectos: el entorno y los niveles de interactividad. Se concluyó que, aunque los diseñadores de personajes digitales deben considerar la mejor manera de crear herramientas de realidad virtual que satisfagan las necesidades del usuario y expandan su interacción con las experiencias culturales, las herramientas actuales y los enfoques de desarrollo requieren un mayor crecimiento.

Palabras clave: Realidad virtual; cultura; tecnología; personajes digitales.

Abstract

Digital characters appear and behave like imaginary or real creatures within an environment generated by computers. These characters are seen as critical aspects of cultural heritage applications, which can add a large amount of value and expand user engagement and motivation in different ways. This paper presents an analysis of the various applications that use digital characters and tries to identify how they are applied, their key features and the role they are playing in expanding the cultural experience. The main objective of this review is to provide designers who will create more digital characters in the future with information on the likely features they need to consider expanding the user experience. It also aims to encourage digital character designers to identify the particular positive elements and critical issues that surround digital characters. It found that the vast majority of digital characters can be determined based on

two aspects: the environment and interactivity levels. It concludes that even though digital character designers need to consider how best to create virtual reality tools that meet the user's needs and expand their interaction with cultural experiences, the current tools and development approaches require more growth.

Keywords: Virtual reality; cultural; technology; personajes digitals.

Resumo

Personagens digitais aparecem e se comportam como criaturas imaginárias ou reais em um ambiente gerado por computador. Esses personagens são vistos como aspectos críticos das aplicações do patrimônio cultural, que agregam valor e ampliam o compromisso e a motivação do usuário de diferentes maneiras. Este artigo apresenta uma análise das várias aplicações que os personagens digitais usam e tenta identificar como eles são aplicados, suas principais características e o papel que desempenham na expansão da experiência cultural. O principal objetivo desta revisão é fornecer aos designers que criarão mais personagens digitais no futuro informações sobre as características prováveis que eles devem considerar para expandir a experiência do usuário. Também visa incentivar os designers de personagens digitais a identificar os elementos positivos específicos e os problemas críticos que envolvem os personagens digitais. Foi descoberto que a maioria dos caracteres digitais pode ser determinada com base em dois aspectos: o ambiente e os níveis de interatividade. Concluiu-se que, embora os projetistas de personagens digitais devam considerar a melhor maneira de criar ferramentas de realidade virtual que atendam às necessidades do usuário e expandam sua interação com experiências culturais, as ferramentas atuais e as abordagens de desenvolvimento exigem maior crescimento.

Palavras-chave: Realidade virtual; cultura; tecnologia; personagens digitais.

Introducción

Culture is often linked to the objects, the materials and the environment that was created and used by a given population. In many instances, culture also relates to the behaviors and knowledge acquired by this population. Virtual reality is increasingly becoming a popular tool for re-enacting previous cultures and displaying how they used to behave and exist in their original environment (Anderson et al., 2010). Setting up 3D virtual worlds is slowly being seen as one of the most interactive, dynamic and affordable ways in which to bring together the knowledge,

environment and specific artifacts linked to culture. These virtual reconstructions have grown popular in recent times, providing visitors the chance to become integrated into a digital world that reconstructs artifacts and buildings from a historical place and time (Bogdanovych et al., 2010). However, many virtual reconstructions are criticized for presenting objects that do not expand the user's experience. As a result, more museums are starting to use virtual human beings to show behaviors and appearances, which are the same as those of the original inhabitants.

These virtual human beings interact with the user and the environment by using actions such as moving, using tools or speaking (Rahaman, 2018). Depending on how they have been set up, virtual humans used in applications meant to preserve culture might play different roles. They could either be decorative or used to carry large amounts of knowledge or even act as a guide. The ultimate objective of integrating virtual human beings into this virtual environment is to ensure that users have a more realistic experience (Lee et al., 2010). This move follows the growing trend driven by emerging technologies that try to bring together entertainment, training, and education. In this area, virtual humans act as teachers to attract the attention of the players and create user-friendly applications.

Interactive applications integrated with unique technologies including virtual worlds, serious games and augmented reality can help to break down information and act as learning platforms for archaeology, culture, and history. They might offer users opportunities to visualize content and be a part of realistic as well as imaginary environments (Magnenat-Thalmann & Papagiannakis, 2010). They also allow for user interactions, the blending of virtual and physical content and single or multi-user experiences. The applications also allow museums and art galleries to put in additional information such as media and descriptions of the pieces (Shih, Jheng & Tseng, 2015). The additional interactivity provides users with the chance to navigate as well as analyze the content. It also has such features as mini-games or interactive digital stories linked to the cultural and historical context of the particular subject (Vosinakis & Avradinis, 2016). In this regard, virtual reality can not only allow people to closely examine any reconstructed artifacts or buildings but can also act as a motivating tool to add on to the knowledge people already have and subsequently enhance the amount of interest they have in different cultures.

Generally, digital characters are described as computer-created characters that look like human beings. There are two common types of virtual humans: virtual agents and avatars. Avatars are

digital representations of a user, which can either be in the form of images or characters in a virtual world (Bekele et al., 2018). A virtual agent is a digital character that is computer-guided which might or might not look like a human being, but it does have such human abilities as gestures or speech. Digital characters present the chance for additional interactivity where users can freely explore and navigate the content. These characters increase a large amount of cultural value by enhancing engagement and motivation (Billinghurst, Clark & Lee, 2015). Reconstructed cities or buildings can feel empty without living human beings acting or moving in them. Additionally, digital characters can reconstruct the right context for cultural monuments and artifacts. They might show how a specific building or piece of art was developed. They might wear the right accessories and clothes or carry out rituals inside the temple (Bustillo et al., 2015). More importantly, it is the use of these virtual humans to represent the aspects of culture that are not easily seen. For instance, they could recreate daily activities and life, rituals and customs of lost or ancient cultures or show dances or theatrical plays from certain cultures. These virtual humans also provide a natural and engaging way for users to go through large museums and probably give more information (Carmigniani et al., 2011). It could also discuss with the users and answer questions about the type of content they are interacting with.

There is a growing use of virtual humans in cultural heritage applications; however, their functional elements have a broad range of differences. Depending on the goals and type of each application, these characters often have diverse design elements when it comes to their interface with human beings, their capabilities for interaction, their independence and believability (Carrozzino & Bergamasco, 2010). In spite of these examples of virtual reality, there has been little effort to systematically collect and document information on this aspect. There are numerous older reviews done on virtual humans that provide a broad understanding of the issues with design and implementation and the potential for research. However, much of this research does not emphasize on how to preserve cultural heritage (Chang et al., 2015). On the other hand, current studies done on virtual environments and cultural heritage but they do not focus on digital characters. This particular study aims at filling this gap.

The main objective of this paper is to analyze the use of virtual humans in virtual reality applications that have been developed to spread cultural information and inform more people about culture. The paper will examine the technological challenges that come with the use of virtual humans and the impacts this interaction has had on learning effectiveness and user

engagement. This paper intends to identify recommendations as well as good practices that can be followed when setting up cultural heritage applications that have virtual reality. The paper will examine the following hypothesis: to what extent can virtual reality technologies such as virtual humans be used to enhance the cultural experience?

Methodology

This study was based on a review of scholarly articles found in well-known search engines such as Google Scholar. The initial search used keywords such as "virtual reality", "virtual humans" and "cultural heritage applications". The search produced over 90 results which were filtered further based on their importance to cultural heritage, the paper's quality and the extent to which digital characters contribute to the application. Papers that did not reach these criteria or did not have a clear description of the functionality and use of the digital characters were excluded. The resulting papers were 15. These were thoroughly examined to find out a) what were the main design and implementation elements of the digital characters, b) how do these characters help the application to achieve its goals and c) important results and design aspects of the digital characters.

Results

The study found that there is a broad range of implementations as well as uses for the digital characters in the heritage applications. Based on the findings, we found two specific design elements linked to the digital characters including environment and interactive.

The first dimension related to the application of digital characters in cultural heritage applications is the particular environment they are placed in. The most common move for many museums or art galleries is to create a completely virtual environment. In this case, the characters are situated as a part of the digital space that could represent a place of cultural importance such as an exhibition space or a reconstruction (Carmigniani et al., 2011). All the different events that take place in this environment, as well as the user, are also shown here as an avatar. The characters are completely aware of the places and the objects within the 3D representation. They therefore move and interact within this environment. In some types of mobile applications, the characters are set up in an environment that has been augmented, presented either next to or at the top of the real

world image which comes from the device's camera (Carrozzino & Bergamasco, 2010). In most cases, the systems are based on location, which means that the characters depend on the place the user is standing and where he or she is looking at. For instance, the character might refer to some information that can be found in the physical space.

Virtual reality-based tour guides provide tourists with the chance to have realistic and intuitive experiences by imposing the virtual elements on cultural heritage sites. For example, a mobile augmented reality application created by Italian company Arvizio enables users to immerse themselves in the ancient Roman city of Pompeii and view it as it appeared over two centuries ago (Retro Futuro, 2020). In some instances, the characters are not only placed on the real-world image but are also allowed to blend into the physical environment.

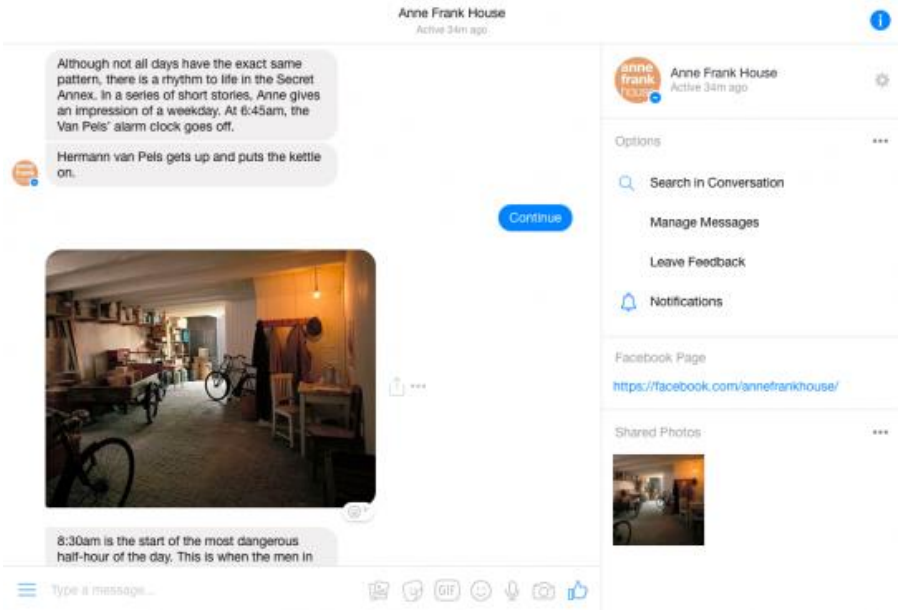
This creates the idea that the characters are a part of the real world. These applications are "mixed reality" because the objective is to efficiently bring together the real environment with the digital content (Mortara et al., 2014). Using these particular systems, which often depend on high-end equipment, visitors to cultural sites have the chance to view the physical environment and the digital characters that are a part of it. For example, the London based immersive technology firm, Arcade, applies augmented reality to improve the visitors' experiences of public spaces and tourist attractions (Springwise, 2019). Collaborating with the Sea Life London Aquarium, Arcade created a chatbot named Roxy, that interacts with the visitors as seen in fig 1 below.

Fig 1: An image of Roxy, automated chatbot available on mobile applications that guides visitors through the Aquarium experience

Source: https://arcade.ltd/sea-life-ar-chatbot/

Finally, there are hybrid cases, where a digital character is a part of a certain digital application, which has been set up in a public space, such as an exhibition or a museum, and it interacts and speaks with the visitors. In this case, the character is also aware of the context in the sense that it might recognize any new visitors. The character will then use this information to refer the new visitors to cultural objects or places found within the public space (Bogdanovych et al., 2010). As an example, the Anne Frank museum located in Amsterdam provides visitors with the opportunity to see Anne Frank's home as it was in the time that Frank and her family were hiding from the German Nazis. In 2017, the museum began using a chatbot that sought to provide the visitors with additional information about Anne Frank's life (fig 2). The chatbot uses the Messenger application, which means that the information can be given, by the museum without needing display boards (Charr, 2019). The presence of the chatbot thereby means that the museum remains as it used to be in the Second World War.

Fig 2: A snapshot of a conversation with the chatbot used by the Anne Frank Museum



Source: http://www.wearemuseums.com/how-can-bots-and-ai-make-history-and-art-more-accessible/

Virtual reality is also becoming popular because of the high level of interaction possibilities it provides between the users and the digital characters. Non-interactive digital characters are the most popular in many museums and art galleries. These characters often carry out their actions irrespective of any activity by the user (Lee et al., 2010). The designer might have already

decided the designer but in all instances, they are not impacted by user presence. Many cultural heritage applications use non-interactive characters. Their important role is to recreate some features or aspects of ancient cultures, events or to show famous people from the past (Bustillo et al., 2015). For instance, an application referred to as England's historic cities uses augmented reality to help tourists interact with various heritage sites located all over the country (Bullock, 2017). At locations such as Durham Cathedral, which is located in the north as well as Salisbury Cathedral in the country's south, historical figures act as guides. Information is presented on the walls of these locations and over different artifacts. For instance, William Shakespeare takes visitors through his life history in his family home located in the English city of Stafford- upon Avon(fig 3).

Fig 3: A virtual look into William Shakespeare's home

Source: https://www.midlandsbusinessnews.co.uk/

In another case, visitors can still experience Brazil's natural history and culture through a virtual tour. A fire heavily destroyed the museum in 2018 losing over 90 percent of its collection (Marshall, 2018). However, the application allowed visitors to take a virtual tour of the museum's highlights ensuring that they can view such artifacts as Luzia, a skeleton that dates back over 12,000 years and is believed to be one of the oldest in the Americas (Marshall, 2018). The three-dimensional simulations allow the user to fully understand the historical event in a way that would have been difficult using physical descriptions.

Conclusions

The paper presented an analysis of digital characters and their growing use in applications to preserve culture. Based on the review that followed the specific elements of digital characters, the importance and significant contribution of digital characters in cultural heritage applications are undeniable. It is critical for designers to understand the broad range of techniques and uses for digital characters and the implications for the user experience and their applications.

This information is important as it will ensure designers create digital characters that enhance the user experience. This aspect is even more critical for those types of culture that cannot be seen which are not represented as much in the current applications. There is still a long way to go when it comes to the availability of development platforms as well as tools to make the right digital characters for the right historical context.

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