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AUGMENTED REALITY AS A TOOL FOR ARTISTIC DISSEMINATION AT THE HIDALGO ARTS CENTER

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Abstract: Augmented reality is one of the new technologies with the most expansion in various fields ranging from entertainment to knowledge. Its use has served as a tool for dissemination and interaction between virtual environments and the physical world, consequently, its popularity among adolescents. In this text, a mobile application based on augmented reality is developed that has the purpose of disseminating and explaining the meaning of all the paintings that make up the Mural that is located at the entrance of the Center for the Arts of the State of Hidalgo, in Mexico. Despite being a public place with a lot of people, few know the meaning of the paintings found in the mural, which reflect part of the history of the State of Hidalgo. The application generates a dissemination tool in a creative, innovative and dynamic way, where users are able to scan the panels through their mobile device to project the digital models and animations for manipulation and audiovisual reproduction. As a consequence, interest in artistic work, as well as in the history and culture of the region, increased, mainly among students of all levels. In addition to mentioning the importance of incorporating new technologies in the arts and history for better dissemination and understanding among the population.

Keywords: Mobile application, Arts Center, 3D Modeling, Mural, Augmented reality.

INTRODUCTION

Currently, everything is constantly evolving and increasingly depending on information technologies. Most people have various electronic devices to facilitate their daily tasks. These devices are increasingly more sophisticated and carry out an infinite number of processes through various technological resources that improve the user experience and perception of the world, highlighting innovative technologies such as augmented reality.

According to Pérez et al (2021), augmented reality is a technology that has a physical and tangible environment that allows virtual and real objects to be combined through technological devices, with information stored in a computer process, this in order to modify the user's physical perception. In other words, augmented reality consists of the combination of the real world with the virtual one through physical devices, improving communication and the psycho-visual experience. Being a technological process in which the combination of digital information and physical information in real time is facilitated through intelligent mechanisms, mainly the smartphone and tablets (Cabero et al., 2019). Therefore, it is an ideal tool to be used in various areas to form an interactive link between the user and the final product, highlighting that it can promote and publicize valuable information within the field of arts.

From the position of Conde (2020), the introduction of augmented reality allows adding information of interest to a tourist destination, in addition to contributing to increasing the attraction and increasing the number of visitors to an area. Applications with historical-heritage-artistic themes contain certain common denominators that constitute the constant characteristics of applications of this nature: the cultural approach, having images as the most relevant and effective resource, and using discourse about the historical past or artistic heritage, which has a descriptive format and is usually always very general. Applications referring to the visual arts do not usually use comparison methods with other similar works, but for the most part there is a predominance of merely informative discourses, dedicating little space to true and real interactions (Santacana Mestre et al., 2018).

From the above, the importance of continuing with the development of new

technologies such as augmented reality for artistic dissemination (Torres, 2011). Its use and relevant exploitation are key to establishing more personal and dynamic interactions between users and the works that they want to exhibit or disseminate in the social sector. Achieving an improvement in the reception and understanding of information, as it becomes a more genuine and natural process, since users stop being passive recipients of information and become protagonists, in addition to generating greater interest and attractiveness in the work.

Therefore, this project applies augmented reality to the mural of the Arts Center of the State of Hidalgo, Mexico, to represent certain elements with 3D models and animations, in order to highlight their meaning and cultural importance, in order to generate an application that Allow user interaction with the mural.

The Hidalgo Arts Center is a complex of areas that offers fully functional facilities and spaces for the correct development of the artistic field through processes of initiation, specialization, production and circulation, taking into account different academic areas such as music, theater and literature, dance and visual arts. In the need to continue promoting and disseminating the importance of culture and the artistic field of the Hidalgo region, the Center for the Arts seeks to develop a revolutionary alternative that provides the population with a dynamic and entertaining tool that captures their attention and immerses them. to a new experience where they can learn something more about their state and culture, using technological tools that provide a new perspective and interpretation. The main function of the creation of a visual product applied to augmented reality that can be manipulated by users is to reform the methods of disseminating information and the services offered to the public, so

that it has a greater impact on the recipient. Likewise, it aims to analyze the effect that new technologies have on new generations, and how a link is established between traditional methods of expression and digital tools such as applications on smart devices.

MATERIAL AND METHODS

The Arts Center is a former convent dedicated to Saint Francis of Assisi, built in 1596 by Franciscan friars, so it has influences from Franciscan architecture as illustrated in figure 1a. Currently it is the most important headquarters of artistic education in the State of Hidalgo. The enclosure has a mural at the entrance, shown in figure 1b, which does not have an official name, although it is known as "Foundation of Tula, the Colony, the Independence, the Revolution and the Transformation of the Mezquital Valley". (Escorza & Vera, 2014).

Figure 1. a) Hidalgo Arts Center, b) Mural.

The mural is distributed on three walls at the top and consists of 6 panels that are displayed in Figure 2 (Escorza & Vera, 2014):

- Panel 1 – Foundation of Tula: contains elements such as the Atlante of Tula, Teocalli of Tlahuizcalpantecuhtli, watercolors by Jorge R. Acosta, Chac mool, Ce Ácatl Topiltzin Quetzalcóatl, indigenous people growing maguey, Chimalli in the representation of Cuauhtémoc and monolith of the feathered snake.

- Panel 2 – The conquest and colonization: it has elements such as the Convent of San Nicolás Tolentino, which is located in Actopan, Hidalgo; graphic representations of concepts such as miscegenation and colonization, the extraction of minerals and indigenous labor.

- Panel 3 – Independence: historical figures representative of the independence movement, symbolic flags and banners of the time and elements representative of struggle and freedom can be seen.

- Panel 4 – Reform and Revolution: the components are the historical figures and the echoes of the cry of the representation of freedom with the Phrygian cap, an element found in the shield of the State of Hidalgo.

- Panel 5 - Post-revolutionary Mexico: there are elements such as the backstrap loom from the Mezquital Valley with a spinning wheel and a Hñahñu woman, a family from the Mezquital Valley and agricultural workers.

- Panel 6 - Contemporary Mexico: contains elements such as Man and the Atomic Age, monuments to independence, Benito Juárez and the revolution in Pachuca, Polytechnic School, Factories, industrial complex of Ciudad Sahagún and fruits of education, health and work.

Currently, the Hidalgo Arts Center is established as a space for public and cultural services with a traditional communication and dissemination system. It is considered that the attractions of the place, independent of its courses and workshops, are its facilities and functional spaces, since the architecture and aesthetics are characteristic of the campus. However, in today's daily life, technology plays an essential role for the communication and expression of society, which is why the use of new technologies for the propagation of information is strictly necessary.

Figure 2. Panels that make up the Mural.

Since augmented reality allows the real world to be combined with the virtual one, it is possible to affirm that within the artistic-cultural field the possibilities of using augmented reality are multiple, and that through technology it can be codified and presented in a way coherent, alluding to the art-science binomial recurring throughout history (Torres, 2013)

The central idea of this work is to develop an audiovisual product, using technology specialized in 3D production, as a specific representation of the selected elements of the mural, which can be applied in augmented reality and properly used by intelligent devices through an application, for comfortable use. of the public and the team that works at the Arts Center, as a tool of dissemination and interaction.

The first thing to do was select the elements of the mural for representation in augmented

reality, in some a movement that is developed with animation and 3D simulation, in such a way that all the elements objectively mean something. The chosen 3D models can be divided into two types:

- Organic modeling: the elements chosen to work in the zbrush program are part of the paintings related to the Atlantean of Tula, the torch and the echoes of the scream. Since relief and organic shapes are very important in these models, the software features allow you to use customizable brushes to shape, texture and paint virtual clay in a real-time environment that provides instant feedback, allowing you to create irregular shapes from curves.

- Geometric modeling: refers to hard surfaces such as solid geometric shapes, characterized by their composition through Boolean operations such as union, subtraction, intersection, among others. All modeling programs have primitive figures to work from, such as spheres, cubes, cones, cylinders, planes, disks or Plato solids. The program used is Maya, to model elements such as minerals, flags, atoms, convents, etc.

Once the 3D models have been made, we proceed to obtain the UV maps of each of them, this to generate the necessary textures, which are made in the Substance 3D painter program. Then the animation or simulation stage begins, using the motion paths technique, a tool that allows you to define a specific route by drawing a curve that is the path that the object travels.
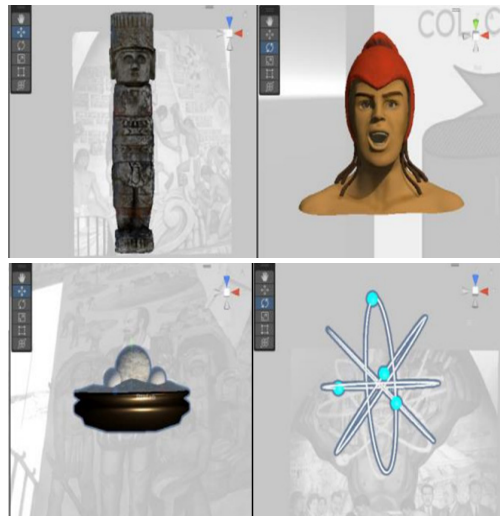
Figure 3 shows some of the 3D models made.

Figure 3. 3D modeling of elements of the Mural.

Once the modeling and texturing of all the elements has been completed, as well as the animation of some of them, we proceed to integrate all of them using the Unity program. In the mural, the areas of each panel that contain the information of the created models were chosen, in order to take real photographs that are used in the creation of targets in the Vuforia program for the correlation between the model, the target and the camera scanner. Subsequently, the models were imported into Unity through coding that allows you to visualize and manipulate the appearance they have in the mobile application interface. The programming process becomes key to establishing the operation of the elements within the application, these manipulations include their display, movement, rotation, scale, audio playback, panel management, changing scenes and other related functions. Once the necessary configurations have been made, the application prototype is generated, which can be seen in Figure 4.

Figure 4. Mobile application interface prototype.

RESULTS

Finally, the necessary tests are carried out to identify errors and correct the final product. With the prototype ready in an.apk, the test application is installed on an Android device for its operation on the mural, as shown in Figure 5, where it is perceptible how the models are projected, in addition to being able to make the choice of individual icons for displaying a specific model depending on the selected panel. Although the application is located on the Arts Center's devices so that visitors can use it, a QR code is also displayed so that the public can download it on their mobile devices.
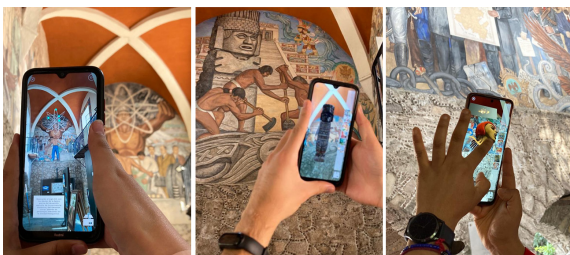

Figure 5. Operation of the mobile application on the Mural.

Having the application installed on different mobile devices, it was shown to workers at the arts center, students and visitors to find out their opinion. Questionnaires were given to all of them before and after using the application to find out to what extent it had served them and how they liked it. In total, 50 people were questioned, of which 30 are women and 20

men, all of them in the age range of 20 to 45 years. Some of the questions and answers are presented in Table 1.

	Yes	No	Maybe
Pre-test			
Have you looked closely at the mural at the entrance?	46	2	2
Do you know the meaning of the mural paintings?	10	32	8
Do you know what augmented reality is?	34	14	2
Post-test			
Did the app help you understand the meaning of the mural?	41	4	5
Was the app easy to use and manipulate?	47	1	2
Do you consider it correct to apply this type of technology to works of art for their dissemination?	34	3	13

Table 1. Input and output questions

This proves that the mobile application is useful for both Arts Center workers and the general public to obtain valuable information about the mural. The use of technology is increasing daily, in addition to being used by many people of all ages. So its use must not be limited to entertainment only. Areas of daily life must be covered, preferably focused on children and adolescents, since they are the people who use the cell phone the most, and these types of tools can provide them with knowledge in an entertaining and novel way.

DISCUSSION AND CONCLUSIONS

The contribution of augmented reality to the world of the arts is different from that of other technologies, since here the user does not remain fixed in an entire scenario created digitally by computer, losing the notion of everything that surrounds him, but rather the virtual model In 3D it is inserted on the physical work creating an interaction with both, and even manipulating the virtual one as if it were the real one.

Considering the objective of creating an augmented reality application as a tool for artistic dissemination, it can be concluded that the product delivered is presented as an innovative alternative that helps the dissemination of the mural and that is of interest to the people who frequent the Centro de las Arts of Hidalgo, being within the reach of any individual. 3D models and animations were made of various elements that cover the 6 panels that make up the mural, so that users can follow the sequence of the story described in the paintings, all with the help of texts and audios that the mobile application also contains. The tool was liked by the people to whom it was shown, indicating that it is an innovative way to learn and disseminate things about artistic works that are present in everyday life.

This new appreciation of artistic works through their digital peers offers multiple possibilities of interaction and dissemination for the user, but also for the artist, since their works will be in both the real and virtual worlds, jumping from one to the other. another and acquiring a materiality that, although fictitious, makes it break the borders of the cybernetic world. It is necessary to make known the contribution of technologies such as virtual reality in artistic aspects, since the trend is that the collaboration of both will grow over the years. In addition, it preserves works digitally for future generations through easy access to information.

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