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Using-Virtual Reality Techniques in Education to Achieve Physical and Intangible Heritage for Historical Buildings

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Abstract-The main objective of the research is to use virtual reality to serve the heritage environment and to build a complete and correct image of the architectural heritage through virtual reality techniques as a mechanism of documentation, preservation, and utilization of virtual reality techniques in the educational process of students in university education and schools, preservation of heritage, the importance of heritage buildings, and the value of values and raise the awareness of the community and benefit from them economically. It was, therefore, necessary to use virtual reality to help preserve the historical heritage and community awareness using the descriptive approach in the theoretical part where the reality is identified and explain the importance and how to use it when reviving the heritage buildings and study the methods used to implement the analytical and applied method through the presentation of models This technique was used to revitalize its historic buildings.

Keywords: Virtual reality; University education; Preservation; Heritage; Heritage buildings; Identity and Heritage values.

I. INTRODUCTION

One of the biggest problems facing the heritage buildings and historical areas at present is the destruction of historic buildings to accommodate the new high-rise buildings and residential buildings and the lack of awareness of the importance of these buildings and the destruction works that occur to them and how to preserve and document them from Through the use of modern technologies and linking them to what is studied in universities where the virtual reality changes how we see the world and our interaction with him through which the individual can pass experiences that may not be learned in reality assumption Many factors such as risk, or the high cost or lack of time or recognize cultures and regions became archeological, not present. This technique is based on a combination of imagination and reality by creating imaginative virtual living environments capable of representing real reality and providing the individual with the ability to interact with it. This technique is used in many areas such as medicine, engineering, architecture, military training, judiciary, and education.

The use of virtual reality in education allows students and professionals to learn through practical application. As a result, learning based on VR techniques becomes more efficient in transferring knowledge and is more capable of retaining it than traditional teaching methods to see how education changes through virtual reality and enhanced reality. Through this, heritage is documented and preserved, and the development of knowledge of heritage and the emphasis on

the importance of heritage buildings and the value of values raise the awareness of the community and economic benefit.

The research aims to document the physical and intangible heritage and preserve it by taking advantage of virtual reality techniques to serve the heritage environment and to construct a complete and correct mental image of the architectural heritage in university education to preserve the heritage as a mechanism of documentation and preservation through the presence of theoretical materials taught in universities related to heritage and history. The history and architecture of ancient cities are referred to as historical and archaeological sites, studied theoretically through the illustrations of these areas and the advent of virtual reality techniques.

The research aims at developing these materials and using training activities helped to integrate the historical heritage, the local socio-cultural and save it and publish through virtual reality through data archival collection and data mining, photography, multimedia models, and digital to build a database of data used in the field of virtual reality buildings heritage and historical sites and heritage preservation because of instability. This is done by assembling the elements of the heritage. Heritage is either material (buildings, vessels, manuscripts, etc.) or moral (culture, customs, traditions, etc.) as shown in figure 1.

The preservation of cultural heritage is the legacy of the material and intangible possessions belonging to a group or community that has been inherited from previous generations and has been and continues to be present for generations to come.

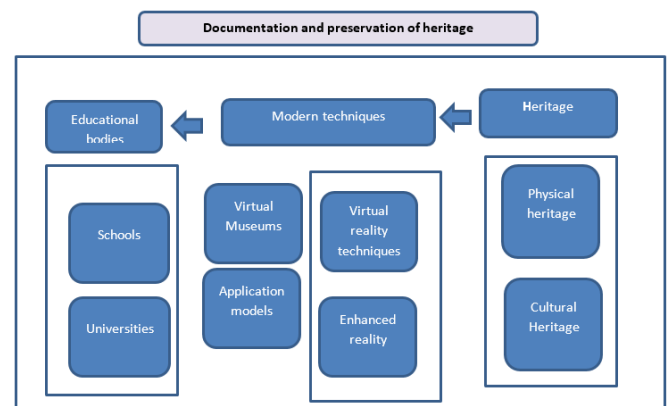


Figure 1: A diagram showing how to document and preserve the heritage

II. METHODOLOGY

The formulation of the curriculum depends on linking virtual reality techniques and applying them to the universities' scientific content and educational materials to document the

heritage and historical buildings to formulate a new interactive educational system that helps link and preserve the intangible heritage and historical buildings. The methodology consists of two basic stages as shown in figure 2. Each stage has a set of steps as follows in the next subsections.

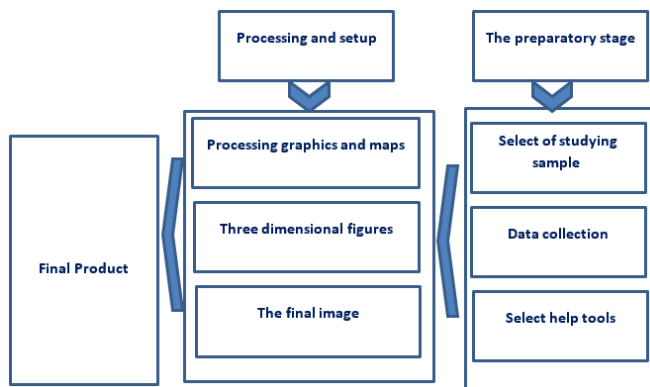


Figure 2: A diagram showing the methodology of the study

1. Preparatory Stage

This phase includes several steps:

First: defining the study

The case study is chosen through the courses of the subjects, whether in university or pre-university education, which contains a description of the curriculum on the teaching of historical and heritage buildings. For example, university education is provided in the departments of university buildings, teaching the history and theory of architecture and the history of city planning.

Second: preparatory stages

This stage is one of the most important preparatory stages. It is a collection of information on the origin status regardless of the changes throughout history. This phase includes several studies:

A. *Studying the historical data* is the study of the descriptions of Rahala and the men of history and oral information and the historical stages in which the impact and impact on the establishment.

B. *Study the composition of the building* from inside and out, which is the preparation of all plans and horizontal projections and facades and sections and the details old or modern, in addition to doing geometric work and photography and analysis of these images.

C. *Study the perimeter of the building*, which is to study the original and local fabric of the building's surroundings.

Third: identifying aids

All utilities are selected based on their availability and flexibility. The tools here are software, communication methods, and simulations to ensure that the different software and technologies are compatible and that the user interface meets all its needs to explore different parts of the project.

2. PREPARATION STAGE

First: processing graphics and maps

The collection of maps and 3D models, including specific geographical information using remote sensing technology,

allows easy integration with any mapping application program to determine geographical locations of historical and historical areas and collect historical documents through different historical periods compiled by computer scientists and artists.

Second: Three-Dimensional Dimensions

3D modeling and digital modeling of historical and heritage sites and elements where many elements, buildings, urban areas, and historical sites are scanned and reconstructed for study, display, and exploration purposes.

Third: the final image

One of the tools used to obtain the final image is the photogrammetric technique, through which a precise digital geometrical reconstruction of the original origin can be obtained, as well as the possibility of recording important information relating to the characteristics of the architectural and structural elements of the architectural elements such as colors, Degree of damage, and others; it is considered a photogrammetric is a means of enhancing the work and activities of maintenance, preservation and restoration. The use of digital imaging to record and document urban heritage offers a wide range of possibilities through information collection methods such as semimetric camera, digital camera, digital stereo camera systems, monoscopic or stereoscopic reconstruction, Orthophotos) and models with realistic termination materials.

III. PRODUCT

This stage results from several steps in processing the data obtained in the preliminary stage to produce a source that interactively allows access to that information. After obtaining all the data required for the work of the educational program and its inclusion as a tool of teaching materials of history is not to replace the existing teaching, through the virtual reality to help better understand the students through the application model.

This model is based on people studying the place and location. The area is not just a historical place, but it is a way to enhance memory and experience. This is what we need to achieve. We must talk about history for future generations and build their experiences through true historical information. Examples are applied to that technique.

The project of virtual visualization in the university education of cultural heritage in Egypt.

There are some partners in this project namely Ain Shams University (the main partner and responsible for the project) - Nile University - Alexandria University - Damanhur University - South Valley University - Bibliotheca Alexandrina - Ministry of Antiquities - Alexandria Archeology Association - Nottingham University - University of Democritus, Greece.

The project aims to build three-dimensional digital models of nine Egyptian archaeological sites for university education by the Egyptian universities participating in the project. These digital models will be presented in virtual reality through 3D glasses in special halls equipped with modern technology funded by the project.

The benefit of this project lies in several aspects:

-Archiving and raising the field of 9 Egyptian archaeological sites, which helps to preserve those areas with high historical

value, including 4 in Alexandria, to allow Egyptian students to visit these sites and see them in detail in the virtual reality that will be designed and implemented without visiting the site, time, effort, and cost to students. This also helps ease the archaeological sites difficult to visit with many students, supporting the Egyptian universities participating in high-tech digitized units to display the 3D models in virtual reality. Raising and building the capacity of faculty members and students in the participating Egyptian universities and employees in the project partners to use the modern equipment for lifting the field of archeology and the development of virtual reality models.

Data Presentation

- Training young researchers from Egyptian institutes and universities to use virtual reality technology to preserve of human heritage.

- Applications of virtual reality technology in the field of heritage protection and community and tourism development

- The various virtual reality applications, especially in some archaeological places such as Sultan Mosque, Al-Moez Street, Beit Al-Suhaimi, and Al-Khayamiyah Market. Applications of virtual reality technology contributes to preserving human heritage and marketing Islamic monuments for educational purposes.

The first project: Sultan Hassan Mosque

The project aims to develop a creative and mixed environment that will engage the international public with the wonders, size and history of Sultan Hassan Mosque, through enhanced reality 360 videos/imaging, allowing the electronic interface to move the gate from room to room.

Second Project: Al Khayamiyah Market, Bab Zouwaila

This project aims to effectively reconstruct the site to allow local shops to market their projects online through photorealistic models of existing shops but historical. This project can benefit from many historical paintings on the carpet trade in Cairo in the Middle Ages.

Third Project: The default cloning of tubular bath environments

This project aims to reproduce the bathtub and its experiments in practice and allow people to travel through its areas and experience the historic baths in Cairo.

Fourth Project: El Moez Street Virtual Tour

A virtual tour of Al Moez Street with authentic educational experiences attracts their minds, hearts and bodies. The use of virtual reality, enhanced reality, and 360 educational videos will help students learn more about this remarkable open-air museum, which contains many historic buildings ranging from the era of Amr ibn al-Aas to the period of Toulon, Fatimid, Ayyubid, Mamluk, and Ottoman. Cultural N Electronic Network Online Binding up Interoperable Usable Multimedia: "CENOBIUM".

There is a web-based application for study and presentation that includes a collection of Roman monasteries from the Mediterranean (specifically Montréal, Aosta, Chavallo); this application is called (Cultural N Electronic Network Online Binding up Interoperable Usable Multimedia: "CENOBIUM". It includes a collection of Roman monasteries from the Mediterranean monuments, and 3D models related to these monasteries can be explored and compared in an integrated ways a web-based application for study and

presentation and (specifically Montréal, Aosta, Chavallo). Images as shown in figure 3 .

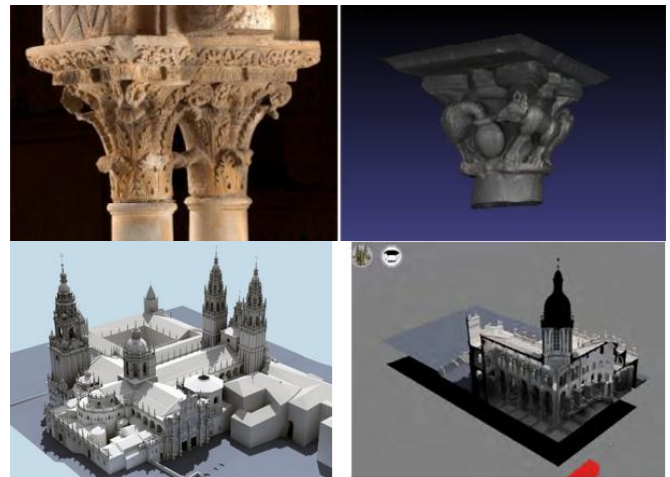


Figure 3: Images from the CENOBIUM VM



Figure 4: Cathedral of Santiago de Compostela VM of the Santiago de Compostela Cathedral

One of the main goals of education is that a virtual museum offers the effects that are far from each other and thus allows direct comparisons, VM (Virtual Museum) of Santiago de Compostela 3 Cathedral as shown in figure 4, a reconstructed environment where the user interacts with a three-dimensional model of the cathedral; it can explore the main building elements and stylistic details. The museum was installed based on a multitouch system where the user interacts with his hands on the screen with a virtual 3D model of the Santiago de Compostela Cathedral. At the same time, the user can access specific information related to in the first approach, and the user enters the environment and the ancient city of Santiago de Compostela in three dimensions that are geographically defined as a place where the various pilgrimage routes converge. The user can access a detailed three-dimensional model of the cathedral to see the main elements of the building and stylistic details. The visitor interacts with his hands and the virtual model of the cathedral where he can explore and analyze it in different ways such as zoom, zoom, rotate, and section at any level in real-time. This project won the 2011 3D Architecture Awards in the Real-Time Presentation category, and the 2013 CG Architects organized 3D Awards, one of the most prestigious international awards in architectural visualization.

1- Virtual Museum VM The museum was developed in 2006 by the World Heli Foundation

(The Ancient Agora of Athens'4 VM), This shows the highlights of ancient Athens, the region that was a place for political gatherings and business transactions in Ancient Greece, a place of administration and justice, and ultimately a

religious and intellectual center. VM is the result of accurate and scientific re-documentation of scientists' relevant places and life from the Hellenic World Foundation, thus creating the original digital image and documenting the political and cultural life of Athenian democracy. They can study the architectural details of the buildings and landscape from many perspectives; by participating in virtual interactive activities, they can also experience and explore the arts and daily life from the fifth century BC to the third century AD. From the possible tours, which are: "Interactive Tour" Agora of Ancient Athens can be visited, by setting the right time, through three periods: classical wages (about 400 BC), Hellenistic period (about 150 BC), and Roman agora 150 m). This virtual collection also includes other elements of the living environment of that period and original music to give a comprehensive view of life at those times. As shown in Figure 5, living bodies are represented in their original habits and documented characteristics.



Figure 5: Forms of elements living in the virtual environment

2-The Regolini-Galassi tomb digitized

Highly innovative technologies have been used in the latest virtual machines, allowing different types of interaction along with simple "visibility". This is the case, for example, of Etruscanning5, a European project (Framework of Culture 2007) and the installation of virtual reality (VR) dedicated to the digital reconstruction of the Etruscan regalini Gallasi cemetery in Cerveteri, which was discovered intact in 1836. Inside the VR installation, restoring unusual things for morgue equipment - saved today in the Atari-Gregorian section of the Vatican Museums

The cemetery, obtained through a laser scanner, was rebuilt, probably after the Etruscan period (half-seventh century BC), after its closure. However, the most innovative application component is the interaction model based on natural interfaces, which means that the user moves within the 3D space only through his / her body movements; the public can explore the virtual tomb near the artifacts and listen to the contents of the narrative of the voices of the prestigious Etruscan figures buried inside that were allocated these valuables. All this is possible to move in space before projection, most simply and naturally. The user walks on a real map of the tomb, attached to the ground, some of which are referred to as "hot spots". As he moves from one hotspot to another, he/she moves into the virtual space, digs into the graveyard, near objects, and tells stories, Figure 6.

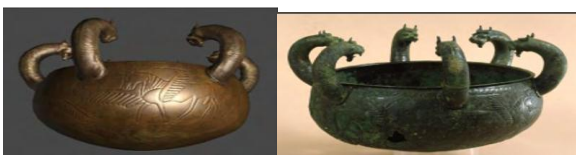


Figure 6: Example of reconstructed pottery vs. original

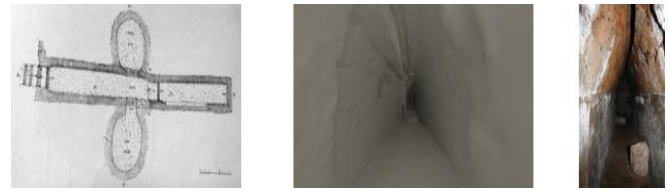


Figure 7: The current state of a waiting room

The current state of a waiting room from the tomb A longitudinal display of the 3D model of the RG cemetery (laser survey - ground plan of the tomb. Project reconstruction of the palace of Hisham ibn Abdul Malik based on the perception of the world of archeology Robert Hamilton using virtual reality technology, As shown in figure 7.

Hisham ibn Abd al-Malik Palace in the Palestinian city of Jericho, 5 km to the north and in the middle of a desert area, the palace was built by the Umayyad caliph Hisham ibn Abd al-Malik (743-724 AD), the seat of the Umayyad state. Buildings, bathrooms, mosques, and halls are full of antique columns. Mosaics, ornaments, and ornaments are wonderful examples of ancient Islamic art and architecture that had survived despite the violent earthquake that devastated the area and destroyed the palace's buildings before it was completed, experts and archaeologists say.

Experts and engineers from the Birzeit school of Engineering in Palestine assisted experts in virtual reality technology by implementing Hamilton's vision of a virtual environmental model within the system available at the University, funded by the World Bank and the European Representative, and through the Quality and Quality Unit of the Ministry of Education, Figure 8.



Figure 8: Lift and painting of facades and drawings of minors and models

The objective of the project is to develop the academic and scientific level in archaeological projects, especially for engineering students, as this project in virtual reality technology opens the horizons in the field of virtual reality work, raising the academic level and making perceptions of any future designs suitable for the environment and humans in Palestine. Hisham will avoid the problems and obstacles that affect the environment to find the appropriate solutions for the best perceptions for reconstruction, as conservation of heritage is one of the important applications in the field of virtual reality, which helps to document, view, study, and understanding Mo The heritage of civilization is achieved through its superiority over traditional means of show and display.

It is found that the project in its virtual structure far exceeded the description written in Hamilton's vision, as details were reached in the virtual environment that was not explained by the vision (Figure 9). After seeing the project's virtual environment, many of them understood each part of it. The

tour of the project on the ground seeing and understanding it through the virtual environment is fun and useful as the presentation shows details that are not known to the visitor and cannot be explained in writing. For example, the original star site on the ground and reconstructed on the top of the second floor of the palace, the Ministry of Tourism and Antiquities has commissioned the same entity that has managed the virtual environment of the palace to create virtual models for archaeological projects in Palestine to achieve the same objectives of promotion, illustration, and education, and to date, the places for fear of fraud. Sabil Rifaiya in Gaza City.



Figure 9: The remains of the Hisham ibn Abd al-Malik palace in the city of Jericho in Palestine

IV. CONCLUSIONS

Through the models presented, we find that the virtual reality environment can be produced for buildings and archaeological areas, which helps develop the educational process through which it works to document the cultural and material heritage.

Virtual Heritage is one of the first steps to assist in the restoration and preservation of the archaeological building. It also helps document the archaeological origin and spread it through the various communication networks. The scientific research base is being expanded to make it available to those interested and researchers in this field worldwide.

To apply this study practically to existing installations that no longer exist requires the use of many disciplines in the field of architecture and surveying, as well as specialists in the science of history, photography, and 3D modeling and programmers, and must have sufficient financial budget.

In the development of information and communication technology, the technology evolves, and the tools change. The change will be in the service of the researcher, the community, and the user. However, the methodology used provides a more information-intensive and flexible situation. Technological development will increase the speed of implementation of these projects and reduce their cost. Will serve the Working Group on Virtual Heritage Technologies.

Recommendations

Given the importance of cultural, scientific, and cultural heritage areas, it is necessary to cooperate between all state institutions and researchers to promote awareness of the importance of archaeological sites to protect them from tampering. The scientific research system must open wider fields and horizons for those studies, including appropriate funding, as well as the availability of modern technologies to study and solve the problems of archaeological areas, which suffered neglect in previous times due to the lack of maturity in social and institutional awareness and lack of technology.

The importance of removing barriers and obstacles between the authorities responsible for archaeological sites and between research centers and universities. The importance of supporting and sustaining bilateral and multilateral discussions in favor of protecting heritage and increasing the scientific, technical, and financial benefits of these historic areas, expanding the use of virtual reality technologies.

The use of virtual heritage techniques through an integrated project includes all the archaeological buildings taught in universities as step-in support of conservation operations and linking them to the databases of the relevant international institutions in this field. The research and analysis base can be increased by applying virtual heritage techniques to the scattered buildings.

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