

# Towards a More Effective Way of Presenting Virtual Reality Museums Exhibits

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Keywords: Virtual Reality Museums, VR Systems, Visualization, Modeling.

Abstract: In this work, we present the design, development and comparison of two immersive applications with the use of Virtual Reality CAVE technology: a virtual museum following the traditional paradigm for the museum exhibit placement and a virtual museum where no spatial restrictions exist. Our goal is to identify the most effective method of arranging museum exhibits when no constraints are present. Additionally we will present the significance of the folklore museum in cyprus. Since this would affect the design process.

## 1 INTRODUCTION

Currently in traditional museum spaces, the exhibits are arranged according to their theme, era or area of origin. For many years, this has been accepted as the suitable method for displaying museum exhibits. However, this placement is restricted in most occasions by the spatial constraints of each museum room or building.

On the other hand, no such restrictions are imposed in a virtual space i.e. in a virtual museum.

According to the initial term “virtual museum” that was first devised by Tschritzis and Gibbs in 1991, a virtual museum does not necessarily require the use of virtual reality technologies. In this paper, the term “virtual museum” is used to describe a virtual museum that uses virtual reality technologies.

Two decades since the invention of VR technologies VR CAVE, can be still considered as the most reliable technology for virtual reality<sup>1</sup>.

The reliability and high quality immersion of the VR CAVE technology, is the main reason for its selection for the design and presentation of a folklore virtual museum.

In the same way as in any museum, where the exhibits refer to a different era, in a folklore museum it would be rather difficult to experience each exhibit with a simple verbal description.

As we now live in a global society, discovering and maintaining one’s traditional identity could contribute to the intellectual evolution of one’s culture. This kind of knowledge and understanding could potentially result to mutual respect and further integration amongst ethnic groups. This could strengthen a healthy relationship with our origins and the origins of others, and offer understanding that could help eliminate racist tendencies and help cultivate values, such as respect for the environment and our fellow man.

The introduction of tradition to the field of digital arts could potentially lead to its global recognition and contribution; in a more “direct” world, such as the one the internet and modern means of communication provided today. Differences and similarities of one’s traditional identity with other ethnic groups, could initiate discussions or offer a platform that can assist future research and development of new knowledge. Ideally, the unlimited verbal and intellectual wealth, drawn from research or interaction, with the support of today’s digital media could help better understand ourselves and other culture.

This research aims to bring out a new form for a folkloric museum in Cyprus, using the virtual reality technology and exploring its potentials as a new approach to how museum exhibits can be experienced. This approach exists in respect to the

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<sup>1</sup>In 1992, CAVE, the first IPT (Immersive Projection Technology) was invented at the University of Illinois as the most sophisticated VR system at that time. The virtual world generated by IPT is of high quality and is also very stable because the IPT consists of already commercialized components such as stereo projectors, high-end graphics workstations.... This high-quality environment enables us to apply VR technology to more serious applications such as museum exhibits. In fact, recently, the use of VR technology in museum exhibits has become one of its most important application fields. (Tschritzis and Gibbs, 1991)

traditional concept of a museum and aims to create new additions in the ways that users experience a museum exhibit.

According to UNESCO's Constitution "...ignorance of each other's ways and lives has been a common cause, throughout the history of mankind, of that suspicion and mistrust between the peoples of the world through which their differences have all too often broken into war."(UNESCO Report). The digital format can allow the museum to be promoted abroad, transforming it from a national – local to an international museum.

In the following sections the design for the development of this project are being analyzed. Section 2 summarizes the state of the act knowledge in the area of virtual museums by presenting brief overview on research done on existing virtual museums. Section 3 presents the overview structure of the system and Section 4 presents the design and developing procedure of the virtual museums. Section 5 analyses the evaluation process, and Section 6 describes the conclusions so far.

## 2 RELATED WORK

Over the past decades there has been rapid a development of digital technology and computers graphics. Virtual reality has taken a special place in the museum area and virtual reality systems already exist in some museums. This is nevertheless an exciting area of research that has not been fully explored. Following are some examples of insights given from the development of relevant projects.

In the article "Learning in virtual museums" the aim was the design and evaluation of a virtual museum recreating an existing museum with an end purpose to identify its learning opportunities. The design of the museum succeeded in creating a pleasant experience for users but the learning benefits were not as prominent (Mpitros et al.).

Lidunn Mosaker in her article "Visualizing historical knowledge using virtual reality technology" discusses virtual reality reconstructions of historical sites. The article examines whether visualization reducing the authenticity of historical sites. In addition the article explores the impact of user expectations concerning their experience with the virtual reality. The users felt they were in a certain space but distinguished it from the real museum experience. Visitors where aware of the virtual world not being real but where willing to believe in its reality (Mosaker, 2001).

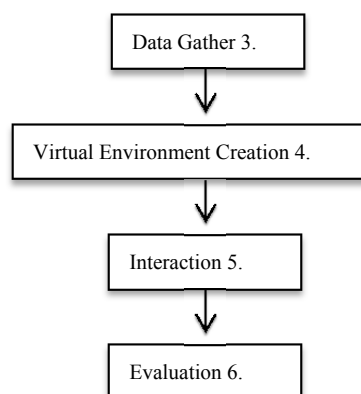
According to the article "Real exhibitions in a virtual museum", the designer has to develop an intuitive, consistent, user-friendly, stimulating virtual environment, with rigid hardware, able to withstand heavy, everyday use (Lepouras et al., 2004). This paper presents the findings gathered from creating a multi-thematic virtual museum that its end users where visitors of real world museums.

In the paper "Virtual Museums for all: Employing Game Technology for Edutainment", is suggested that the use of 3D game technologies for the purpose of developing virtual affordable is easy to use and creates pleasing virtual environments. 3D game technologies offer sufficient quality for the majority of the uses of a virtual museum with the extra advantage of the reduced need for development and system resources (Lepouras and Vassilakis, 2004).

In the article "Total Displacement: Exhibiting Folklore and the Boundaries of Museum Space" the author discusses two ways of creating an open-air folk museum. The exhibits can be moved from their original environments and relocated on a constructed site; or they can be kept at their original places as exhibits. The author concludes that, by broadening the theoretical method and recognized, can not be completed the design and implementation of the folklore museum (Savaş, 2011).

## 3 SYSTEM OVERVIEW

So far has been gathered enough Reference material for the application design. Following this stage the virtual spaces of the traditional and proposed virtual museum will be designed and modelled. Pilot evaluations can be done as soon as the overall concept is designed along with sufficient material. The final outcomes will be tested with experts and potential users.



## 4 DATA GATHER

During the research phase all the photographic material relating to the exhibits along with verbal information is being gathered. This allows spherical understanding for each object that will be placed in the museum. Photographic materials along with the experience of the actual objects that are still around are the stepping-stones for the modelling of the objects that will be placed in the museum.

## 5 VIRTUAL ENVIRONMENT CREATION

As the project is still in progress, the work developed so far includes part of the digital environments and some of the exhibits (Figure 1).



Figure 1: View of the current work.

The software used for the development of the application is EON studio, a product that has been marketed since 1999 (<http://www.eonreality.com>). This software supports the operation of VR Cave and allows 3D authoring for the developing interactive 3D applications (Figure 2).



Figure 2: EON studio on a VR Cave system.

Below there is a description of certain exhibits that have been modeled, in which the user will have the ability to interact with them.



Figure 3.



Figure 4.



Figure 5.



Figure 6.

Loom “Argaleios”: a machine used for weaving and is made of wood. The purpose of the loom is to hold constant the vertical threads of the fabric, facilitating the horizontal threads knitting (Figure 3).

Spinning wheel “Anemi”: Manufacture of wood or reeds help in easy reeled (Figure 4).

Threshing tool “Doukani”: plane wood where its lower part had sharp stones. Used for threshing grain. The farmer stood or sat on it, as an animal dragged over cereals (Figure 5).

Hand mill “Sheromili”: Tool used for grinding grain. Consisted of two cylindrical blocks, placed one above the other (Figure 6).

### 5.1 “Traditional ” Virtual Museum – Spatial Restrictions are Kept

An important part of the research for the development of this project included regular visits and recording of the exhibits at the folklore museums of Cyprus. Since this project aims to create a different virtual museum experience it cannot be a representation of an existing museum. Under the guidance of experts from the relevant government carriers, which are responsible for the care and layout of today’s folklore museums we will attempt to create a virtual museum, that goes beyond the comparison with existing “real life” museums. Categories and themes for the exhibits have already been recorded and help create the paths towards the completion of this research project. Some examples include categories such as: dichori (δίχωρη) “two rooms” bedroom, living room, weaving hall, kitchen, farm - livestock tools, such as Threshing tool “Doukani” and Hand mill (Figure 8-9), wine cellar.



Figure 7: “Traditional” Virtual museum – Top view.



Figure 8: Hand mill in “Traditional” Virtual museum.

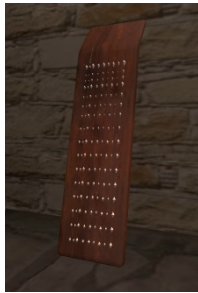


Figure 9: Threshing tool in “Traditional” Virtual museum.

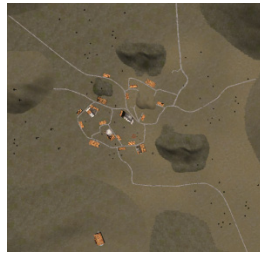


Figure 10: “Real life” Virtual museum – Top view.

## 5.2 “Real Life” Virtual Museum – No Spatial Restrictions

After designing and testing the "traditional" virtual museum the findings and the conclusions will be used for the explorations of possible solutions for the design of the “Real life” virtual museum (Figure 10). The exhibits that have been used for the “traditional” virtual museum will be organized and presented in the spaces where they were used before they became museum exhibits. As the items are located in their original environment (Figure 11), the user can experience them and interact in ways that in the modern era does not support, as most of the exhibits are not currently being used.

The “Real life” virtual museum will be set in a model Village in Cyprus at an era around the middle of the nineteenth and the beginning of the twentieth century, at a time before the introduction of modern technology to the island. The virtual space allows the designer to use time, as part of the information and not as a rigid rule in the design process. Some of the concepts that are arising from this research project have potentials for further insights, in the field of virtual design and can give answers or create more questions by the end of this project.



Figure 11: Loom and Spinning wheel in “Real life” Virtual museum.

## 6 INTERACTION

At this stage arbitrary trials are being done to determine the navigations style and ways of interaction that could be used in the development of the virtual folklore museum (Figure 12).



Figure 12: View of the current navigation style.

## 7 EVALUATION METHOD

Pilot evaluations can be done as soon as the project is designed (both virtual museum spaces). This will provide feedback for final changes and “tuning” of the virtual museum. The final evaluation will be conducted by testing the outcome with user groups that include ordinary users and experts such as folklorist, curators and historians.

The evaluation process can offer understanding on the ways that people use to navigate and interact within the virtual museum and how interfaces and object placement can affect the virtual behaviour.

We will also attempt to evaluate, how and if the users through these applications obtain new knowledge

After a tour in both virtual museums following a common scenario, the users will be asked to complete a questionnaire that will help evaluate their overall experience (Figure 13).

Scenario: the users are given a short amount of time to become accustomed to using the application. Then they have to locate a number of specific objects (ex. grind flour tool, wheat milling grape tool.) and interact with them. The same guides and constraints will be given for both applications. After the completion of the virtual visit, the users along with answering the questioner will have to assess which of the two virtual museums offered better information on the objects and the era they represent.

The evaluation can give insights relating to the users' navigation habits and interaction desires in such virtual environments and their interfaces.

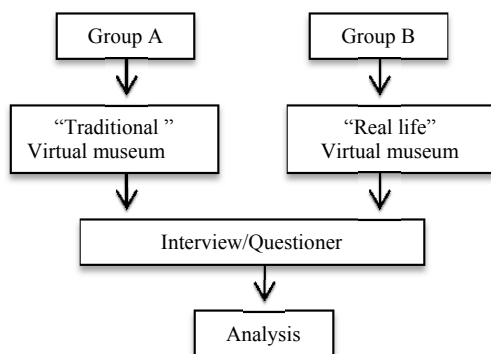


Figure 13.

#### Questioner - Basic questions

- Are you a connoisseur of Cyprus folklore?
- How often do you come across with the Cypriot folklore in your everyday life?
- Do you believe that knowledge and also the maintenance of folklore of is important?
- Do you like visiting museums?
- How often do you visit museums?
- Which kind of museums do you prefer to visit?
- How would you describe your relationship with technology?
- What is your opinion on the use of technology in museums?
- Do you know the term virtual reality?
- Can you mention your most important VR experiences?
- What is your opinion for the use of VR technology in museums
- How would you describe your tour in the museum?
- Do you think that the design of the museum gave you the opportunity to move with freedom in the application or do you think that there were restriction.
- Do you believe that the contact you have with the following exhibits, helped you to understand more about

their use? Loom, Spinning wheel, Threshing tool and Hand mill

## 8 CONCLUSIONS

The quest for the best way to present in the virtual space this kind of exhibits created the need for the development of this research project. As mentioned above, this is a project still in progress. Nevertheless the results so far indicate the positive prospects of the research being done.

Upon completing this project, the end goal is to create new perspectives in the design of virtual museums and how knowledge of folk culture can be preserved.

## ACKNOWLEDGEMENTS

This work is part of the IPE/NEKYP/0311/02 "VR CAVE" project (<http://www.vrcave.com.cy>) and is financially supported by the Cyprus Research Promotion Foundation and the European Structural Funds.

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