VIRTUE — A Virtual Reality Museum Experience

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ABSTRACT

The digitization of museum exhibits has raised the question of how to make these data accessible, particularly in light of the ever growing collections being available. In this demo, we present the VIRTUE system which allows curators to easily set up virtual museum exhibitions of static and dynamic 2D (paintings, photographs, videos, etc.) and 3D artifacts. Visitors may navigate through the virtual rooms, inspect the artifacts and interact with them in novel ways. Participants will be able to use the system by creating their own exhibitions, which they tour as a visitor.

CCS CONCEPTS

• **Human-centered computing** → *Virtual reality*; • **Applied computing** → *Media arts.*

KEYWORDS

Virtual Reality, Museology

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1 INTRODUCTION

With the ever-advancing availability of digitized museum artifacts, the question of how to make the vast collection of exhibits accessible and explorable –beyond what museums traditionally offer via their websites and exposed databases– has gained more and more attention in recent years. This development is accompanied by virtual reality (VR) technology becoming a commodity and by advances in available frameworks to provide a realistic digital immersion. VR applications have so far been mainly geared towards gaming, industrial or medical applications, but only seldomly towards the field of cultural heritage (e.g., [1]). In this demo, we leverage VR technology for providing a virtual museum experience. The VIRTUE (VIRTUal Exhibition hall) system is a generic, customizable virtual reality system in which curators can easily create multi-modal, virtual 3D exhibitions that visitors can navigate through to enjoy the exhibits on display.

The VIRTUE system offers –compared to a traditional museum– unlimited exhibition space for display. The data model of the system is generic enough to accommodate any type of exhibition, which can simply be set up using a web-based UI serving as a back-end to the VR part of the system.

Obviously, from a curator's point of view, the use of VR proves to be of great benefit (see also [5]): First, digital artifacts do not age and are not subject to decay in the digital space – a fact that is particularly important for light-sensitive objects. Second, instead of having a vast number of objects residing in archives due to limitations in exhibition space, the whole collection can be permanently exhibited in the virtual space, where there are no such restrictions. Moreover, in a virtual setting, museum curators may experiment with various arrangements and use the same artifact for different exhibitions at the same time. A digital artifact may as well be shared globally and made accessible at no additional costs. This allows to combine artifacts which are physically stored in different geographically and/or organizationally separated museums.

2 THE VIRTUE SYSTEM

VIRTUE is designed as a modular and flexible system for creating customized virtual reality exhibitions. It allows to exhibit artifacts through an unlimited number of rooms, which together form an exhibition. Currently, the system supports both static and dynamic 2D objects (e.g., paintings, videos, etc.) and 3D objects (e.g., digitized sculptures) which can be placed within the rooms. In the system's

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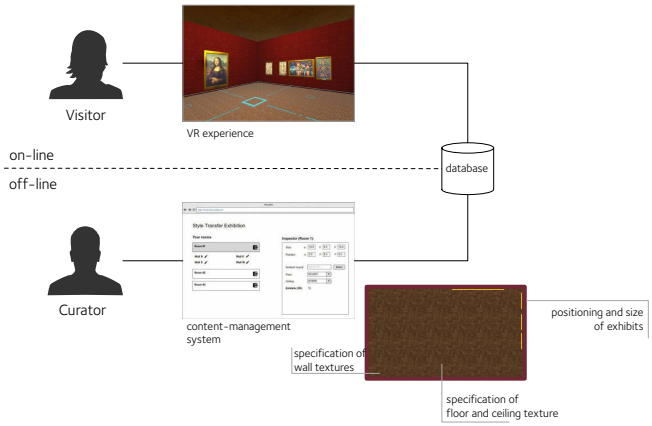

Figure 1: Overview of system architecture.

view (see Figure 1), we distinguish, similar to [3, 6], two perspectives in VIRTUE: a curator's perspective and a visitor's perspective.

In the *curator's perspective*, i.e., the content-management system, curators have the possibility to design and customize exhibition spaces. The exhibitions are stored in a central database system that is responsible for storing both the digitized artifact and the corresponding metadata.

For setting up an exhibition, curators may first adapt the exhibition rooms to their needs by selecting the texture of the walls, the floor and the ceiling; for a more immersive experience, the lighting conditions and sounds can be adjusted as well. Given the virtuality of the museum, an unlimited number of rooms can be created. The rooms are connected by teleport points, which allow visitors to move between the rooms and which allow for a topical arrangement of the rooms.

From the *visitor's perspective*, a visitor may navigate both virtually and physically through the rooms created by a curator. The VR perspective provides both visual and auditory impressions based on the museum layout as stored in the database. For the navigation through the exhibition, users may step through the real room or use the teleporting functionality (e.g., for moving over larger distances or for moving to a separate room). A screenshot of the VR view is given in Figure 1.

The back-end of the VIRTUE system is a web application written in Java. For the storage of exhibitions, artifacts and the corresponding metadata, we use MongoDB[1]. For the VR experience, we make use of Unity[2] with the SteamVR Plugin[3] deployed on a HTC Vive. The code has been released open source on GitHub both for the front-end[4] and the back-end[5].

3 DEMONSTRATION

Participants will be able to take two roles within the demo: On the one hand, the back-end web application may be used to adjust and modify the exhibition, e.g., by adjusting the room layouts and take over the role of a curator to set up a full exhibition. In the role of the visitor, participants will be able to navigate through the exhibition and see the applied changes.

[1]https://www.mongodb.com
[2]https://unity3d.com
[3]https://assetstore.unity.com/packages/tools/integration/steamvr-plugin-32647
[4]https://github.com/dbisUnibas/virtual-exhibition-manager
[5]https://github.com/dbisUnibas/virtual-exhibition-presenter

Figure 2: Screenshot of the VR view.

4 FUTURE WORK

In our future work, we plan to follow the ideas of [2] and automatically place artifacts within the room, e.g., based on the visual or semantic similarity of artifacts. Moreover, we foresee a stronger interaction of both curators and visitors with the system, e.g., by being able to place objects within the 3D space. Finally, combining the virtual display with content-based retrieval techniques as available, for instance, in vitrivr [4] for searching within collections of multimedia may prove to be useful for exploring the large amounts of data available.

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REFERENCES

[1] Marcello Carrozzino and Massimo Bergamasco. 2010. Beyond Virtual Museums: Experiencing Immersive Virtual Reality in Real Museums. *Journal of Cultural Heritage* 11, 4 (2010), 452–458.
[2] Masaki Hayashi, Steven Bachelder, and Masayuki Nakajima. 2016. Automatic Generation of Personal Virtual Museum. In *Proceedings of the International Conference on Cyberworlds (CW)*. IEEE, Chongqing, China, 219–222.
[3] Chairi Kiourt, Anestis Koutsoudis, and George Pavlidis. 2016. DynaMus: A fully dynamic 3D Virtual Museum Framework. *Journal of Cultural Heritage* 22 (2016), 984–991.
[4] Luca Rossetto, Ivan Giangreco, Claudiu Tănase, and Heiko Schuldt. 2016. vitrivr: A flexible retrieval stack supporting multiple query modes for searching in multimedia collections. In *Proceedings of the ACM International Conference on Multimedia (ACM MM)*. ACM, Amsterdam, The Netherlands, 1183–1186.
[5] Sylaiou Styliani, Liarokapis Fotis, Kotsakis Kostas, and Patias Petros. 2009. Virtual Museums, a Survey and some Issues for Consideration. *Journal of Cultural Heritage* 10, 4 (2009), 520–528.
[6] Rafal Wojciechowski, Krzysztof Walczak, Martin White, and Wojciech Cellary. 2004. Building Virtual and Augmented Reality Museum Exhibitions. In *Proceedigs of the International Conference on 3D Web Technology (Web3D)*. ACM, Monterey, CA, USA, 135–144.