Interaction Styles in a Multi-Modal Virtual Museum

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Abstract
Virtual Reality is used for creating immersive experiences with rich interactions in many application domains, from video games, simulations, and training, to cultural heritage and educational applications. Taking advantage of this technology, the experience in traditional museums can be enhanced with digital content, the museum or their collections can be replicated for remote visitors, or entirely new virtual museums can be created. In this paper, a demo of a multi-modal virtual museum is presented and interaction discussed from the point of view of a consumer and a virtual museum creator.

CSS Concepts: Human-centered computing → Interaction design → Interaction design process and methods

Keywords: Virtual Museums, Interaction, Natural Interaction, Cultural Heritage

1. Introduction and Background Work
Museums have long been used to present Cultural Heritage artefacts to the public. With the limited physical space and requirement for being physically present [HGLS22], the degree to which a user can interact with artefacts or visit exhibits is severely limited. To overcome these limitations, new technologies can be used to create virtual museums (VMs) and present cultural heritage content in a digital format due to their role as complicated communication systems, with ties to narrative, interaction and immersion [Pes14]. Furthermore, the enhanced interaction offered by the technology can have a positive effect on user experience and engagement with the content and aim to improve the visitor’s experience [BCMR21]. However, the interaction and user experience of VM creators should be equally considered. This has led to consumers moving from passively interacting with museums, to being active participants in their museum experiences, known as “Active Visiting” [NP19]. By utilising technology such as Virtual/Augmented/Mixed Reality (collectively known as eXtended Reality, or XR), hand tracking, speech recognition and other means of interaction [LK10], traditional museum exhibits can be greatly enhanced and the interactions become more immersive, natural and exciting to use [BPF*18] whilst also removing the need for physical input devices and allowing for interfaces that go beyond the traditional WIMP approach [PPR*13]. Finally, to overcome the lack of tactile feedback in VR applications, passive haptic feedback and tangible user interfaces can be successfully utilised [HGLS22].

In this work in progress, a multi-modal VM based on the first half of the Stuart era in Britain (1603-1649) has been developed, using a variety of methods of interaction. The main goal was to explore these interaction styles and challenges with developing such an application, while focusing on the immersive experience. Designing interactions is absolutely vital, as the average user may not have much experience with virtual reality or multi-modal experiences. Therefore, the interactions need to be easy to learn and ideally close to real-world interactions.

2. Consumer Interaction in the Stuart Era Virtual Museum
The developed VM has three different modes of interaction: Standard Mode(S) - the museum is controlled with an Xbox gamepad and viewed on a monitor; Virtual Reality (VR) - the museum is experienced using a Virtual Reality (VR) headset, controlled with
Another challenge comes in the form of the reliability of the devices used to allow for said interaction. At the lower end of the spectrum in the *Standard Mode*, the gamepad itself is generally a reliable input device. However, as we move towards input methods that are more complex, other issues become more likely to occur, such as the tracking with the VR headset, the VR controllers or the hand tracking. These not functioning as intended would seriously impede the application and user experience. In addition, it could be the time consuming to solve the issue, which is not ideal if this application were to be deployed to an institution like a museum.

3. Creators’ Interaction and Co-creation

Creating interactions and experiences for consumers (e.g. museum visitors) is very different to creating them for creators, such as (virtual) museum curators. Consumers are mostly worried about consuming the content, whereas the creators need to not only design interactions and experiences for consumers having the end-user’s experiences in mind, but must also be able to interact with authoring tools while having good user experience themselves. These introduce a new range of interaction questions. What interactions are key for allowing creators to build virtual experiences? What would be required to provide creators the confidence to build the experiences? How useful XR authoring tools are to curators, what kinds of experiences could they build with such tools, and to what degree of exhibition creation independence can be feasibly achieved?

Some work has been conducted in this field, both aimed towards end users authoring their own VMs (VR and Non-VR) using knowledge graphs and linked open data [MPSV22] and towards curators authoring their own tangible interactive exhibitions [NP19]. One of the primary issues and concerns of technology-based authoring tools is the confidence of the end user, in this case, the museum curator. During the MeSCH project, Cultural Heritage professionals expressed their concerns regarding their technological abilities but were excited at the prospect of experimenting with the MeSCH platform [NP19]. From this, we can clearly see there is an interest in tools for creators but the interactions would need to be chosen and developed with care, especially if this tool were to be developed as an XR authoring tool. Interactions designed as counterparts to real-world interactions, such as pointing at an area to place an exhibit, may prove beneficial for users who are not confident in their own technology skills. In an XR authoring environment, this could have the potential to speed up the prototyping or creation workflow, whilst making the interaction for creators much simpler to use.

4. Conclusions and Future Work

In this paper, we presented a work in progress on creating a multi-modal VM focusing on various interaction styles for the consumer. In addition, we discussed some limitations of the existing CH authoring tools and the important aspects to consider when designing novel XR authoring tools.

In the future, we plan to conduct a user study on usability and UX for the developed VM. Based on these results and the existing findings, we will propose a set of interaction techniques to be used in XR authoring tool for VM curation.
References


