

Sodeisha Sculptural Ceramics: Digitalization and VR Interaction

A Digital Heritage Approach

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ABSTRACT

This demonstration presents the development of a virtual reality (VR) research project for the VR interaction and digitization of “Sodeisha Sculptural Ceramics”, a transmedia approach showcases photogrammetry scanned Japanese ceramic artworks in an educational and public VR exhibition setting. The early prototype has involved the photogrammetry scanning of 10 sculptural ceramic works of art. These works were created by the innovative Japanese post-war artist group, known as ‘Sodeisha’. Newcastle Art Gallery holds one of the largest collections of Sodeisha ceramics outside of Japan and recently featured the collection in a large-scale exhibition titled SODEISHA: connected to Australia from March – May 2019. The audience used controllers to interact with objects in a virtual environment, with the option of seeing a pair of VR hands or full VR arms.

CCS CONCEPTS

• Human-centered computing~Virtual reality • Human-centered computing~Mixed / augmented reality

KEYWORDS

Virtual Reality, User Experience, Ceramics, Digital Heritage

ACM Reference format:

Zi Siang See, Una Rey, Faye Neilson, Michael Cuneo, Alexander Barnes-Keoghan, Luke O'Donnell, Donovan Jones, Lizbeth Goodman and Sarah Johnson. 2019. Sodeisha Sculptural Ceramics: Digitalization and VR Interaction: A Digital Heritage Approach. In *Proceedings of VRCAI '19: The 17th International Conference on Virtual-Reality Continuum and its Applications in Industry (VRCAI '19), November 14-16, 2019, Brisbane, QLD, Australia*. ACM, New York, NY, USA, 2 pages. <https://doi.org/10.1145/3359997.3365741>

1 Introduction and Background

Extended reality technologies have been extensively used in the past to create interactive exhibition experiences [Kenderdine 2013][Ciurea et al. 2014][Frasca et al. 2014]. This paper describes a novel use case for VR in creating an enhanced, interactive and educational experience for visualizing art gallery and cultural heritage content. There are currently over 50 Sodeisha ceramic works stored in the collection of Newcastle Art Gallery (Australia), but it is impossible to display all of these important pieces throughout the year. Moreover, in an exhibition setting, viewers are commonly not allowed to get too close to the fragile artworks and touching them is strictly not permitted. The main contribution of the project is to provide an extended reality role-playing experience for users to interact with the virtual space and ‘handle’ the ceramic objects, working as a curator.

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VRCAI '19, November 14-16, 2019, Brisbane, QLD, Australia

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ACM ISBN 978-1-4503-7002-8/19/11.

<https://doi.org/10.1145/3359997.3365741>

2 Approach

We present an early VR prototype that works within a public exhibition or education setting. Figure 1 shows the Sodeisha ceramic artworks being digitized using high dynamic range (HDR) photogrammetry. To enhance realism in VR, a gloss meter was used to gauge the reflective properties of the scans (intended to be turned into reflectance maps). As a result, members of the public could experience the digitized ceramics in a purpose-built virtual environment, as shown in figure 2.

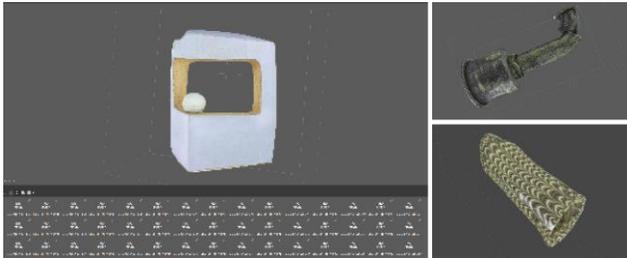


Figure 1: Photogrammetry 3D scanning of Sodeisha objects



Figure 2: User Experience in VR

A VR experience with six degrees of freedom was made possible with the introduction of room-scale-enabled head mount displays (HMD). However, the user experience (UX) and criteria for hyper-realistic VR in the cultural heritage context requires further study in terms of method and apparatus and interaction design. In this prototype demonstration, two interaction options of VR hands were provided, as seen in figure 3. In the first condition (C1), users could visualize a pair of VR hands (palms only), managed by their controllers. The second condition (C2) was the same, except using a pair of VR-enabled full-arms, resembling the full-length arms of a person. The forearms in VR are simulated along with the movements of the controller. The simulation enhances how the arms are moved and how they bend to feel natural to the user's arm movements and dynamic position. The virtual environment is experienced using Samsung Odyssey WMR and HTC Vive Pro (resolution of 2880 x 1600) with room-scale locomotion capability, allowing users to walk around freely in a controlled 2m x 2m setting. During the pilot project introduction, users/visitors who participated in this project expressed that “this is very easy to work in VR with the pair of hands”, and “I hope we can have different pair of hands for different genders/age”. For the next step of the study, we plan to make a comparison of the VR hands

and full arms in relation to improved VR user experience, to better understand the perceived usefulness and ease-of-use. In addition, we are working on a monochrome version for users with epilepsy. One computer graphics problem was pixelation in VR display that seems to degrade visual experience viewing the virtual environment with heavy foliage (figure 4). To solve this, we customized a stereo-based anti-aliasing solution for improving this situation in VR.



Figure 3: VR hands (palms) and full VR arms (with limbs)



Figure 4: VR exhibition environment with dynamic foliage

3 Discussion and Implication

This is an ongoing research into best practices of using extended reality for improving visitors' experience of art galleries and museums. The project will incorporate inclusive design elements that fit the expectations of different users, especially considering customized needs for VR users with disabilities or limited accessibilities. In the future, the study will also experiment with a hybrid approach of exhibition techniques, which would allow users to touch the artworks by combining virtual/haptic elements and solid replica copies of the ceramics.

ACKNOWLEDGMENTS

This collaborative “Rapid Grant project” was undertaken by the School of Creative Industries (University of Newcastle, Australia) and the Newcastle Art Gallery. We thank Manisha Amin from Center for Inclusive Design and Wooi Har Ooi for various input, and Paul Tschirgi in solving various challenges.

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