

Fashion Beneath the Skin - a Fashion Exhibition Experience in Social Virtual Reality

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Figure 1: The user experience (1, 2) and user journey (3-8) of the "Fashion Beneath the Skin" social VR exhibition.

ABSTRACT

Social VR allows users to interact with each other and explore virtual spaces together. This demo presents a social VR fashion museum, where visitors engage with fashion artefacts. The experience spans across three different spaces designed for various goals. This application, created following a human-centred approach, explores how the visitors interact with each other and the exhibits, considering their 3D volumetric representation and changing environmental context throughout the experience.

Index Terms: Social Virtual Reality, fashion preservation, virtual exhibition design, immersive technology, pointclouds.

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1 INTRODUCTION

Over the years the museum's role was constantly broadening. It came from being focused solely on artefacts' preservation, to be visitor-oriented - putting their efforts to attract and satisfy the audience. Nowadays, museums face challenges in fulfilling their evolving roles and digital technologies start to appear as a helpful tool [4]. This demo shows an example of social Virtual Reality usage, one of such technologies, to create the historical fashion exhibition. The benefits of this approach are wide. Firstly, virtual exhibitions are available to visitors from anywhere in the world. Individuals interested in art works located far away from them do not need to travel anymore - they can visit the exhibition remotely, from their home. This makes the museum's collection much more accessible to a broader audience. At the same time this approach broadens visitor-exhibit interactions and enables more engaging information presentation. While talking about museum experiences it is important to remember about the social aspect. Some researchers argue that the social component in the museum visit is even more important than any other factor [1]. Social presence increases immersion [2], improves learning [6], boosts well-being [7], increases engagement and helps to interact with the exhibits [5]. All those qualities are moved to the virtual world by implementing the interaction between the participants in social Virtual Reality (VR). The social interaction in VR often has an even bigger impact on participants than the one in real life [3] and can be introduced in novel, interesting ways to encourage visitors to engage with one another. Finally, social VR exhibition allows presenting to the audience ob-

jects that could not be seen otherwise. Very old, fragile or toxic exhibits can be digitalized and preserved for many generations to come, while the original, physical objects are kept in archives as long as possible for a future research. This way, museums can fulfil their two most important tasks - education and sparking interest in the historical objects, and preservation of the artefacts.

2 TECHNOLOGY

The social VR Fashion Exhibition was implemented using Unity and then, to improve the sociality of the experience, integrated with VR2Gather. VR2Gather is a Unity package that allows the usage of photorealistic representation of the users. As shown in Figure 1 (1, 2) the participants are captured with multiple RGB-D cameras, based on which the system creates their 3D representations as pointclouds that are encoded, transmitted, decoded and synchronised to be shown live in the experience. This way, the participants can see each other in a virtual museum looking almost the same as they do in real life - the only significant difference are the VR headsets on their heads, as presented in Figure 1 (4, 6, 7). Instead of relying on a central cloud-based game engine, while using VR2Gather each participant runs a local copy of the application. Communication and synchronisation is handled through *Orchestrator* - a central instance that manages the forwarding of control messages, point cloud streams and conversational audio between the participants. The orchestrator also helps to synchronize the experience between participants, by allowing to find the offset between local system time (NTP based) and orchestrator system time, as well as handles the creation and advertisement of sessions. For some actions in the experience, coordination is very important. To ensure this coordination, one application instance is designated as the master. Actions that need to be coordinated are always done first on this instance. This ensures, that in case one of the visitors changes something in the environment (e.g. clicks the button), the result of their action is visible to all of the participants [8].

3 USER EXPERIENCE

The experience, presented in Figure 1 (3-8) starts in the training zone (3). The audio guide welcomes the visitors as they enter the space. They learn how to move around the space and use the virtual buttons to interact with exhibits. Then they explore the first room - a virtual replica of the Netherlands Institute of Sound and Vision museum. They first encounter a virtual mirror (4), in which they can see a reflection of their virtual bodies. Then they are taught how to start the multimedia elements of the experience (audio and video) - each of the participants need to stand on assigned to them platform. Upon succeeding in this task, they are presented with an introduction video explaining what they are about to see and how they should navigate through the exhibition. Finally, they approach an example exhibit, where they can practice interacting with the objects. Using buttons, they can rotate the exhibits, change their size - make them bigger or smaller, and reset them to their original size and position. When the visitors are ready, each of them click one button and they are transported to the second room. The second room is a historical space built to look like a 19th century house (5, 6). In this room, the visitors explore most of the exhibits, coming from 18th and 19th century. The objects are the scans of actual pieces coming from Dutch museums, that cannot be shown on a physical exhibition anymore due to their fragility or toxicity. The scans are made using photogrammetry, hence being an ideal representation of the actual objects, including elements like stitches, fabric structure or material imperfections. The visitors can interact with the objects, and play a video about each of them. After visiting the historical room, the participants click the teleportation buttons and are moved to the out-of-real-world space (7, 8).

This space is designed to look surreal with a long platform hanged in the air among high trees (7). The visitors need to cross from one side of the platform to the other to find the last exhibit - the Reform Gown from 20th century, solving two tasks on their way (8). To do that, they need skills and information learnt in the previously visited rooms.

4 APPLICATION IN RESEARCH

The social VR fashion exhibition allows observing and investigating new ideas and models for museums. It shows new insights into how to best show the exhibits, provide the information in an interesting way and introduce interaction with artefacts and between visitors. The interactions in virtual space differ from the ones normally seen in museums - people are more comfortable to play around, try out their ideas and socialize with strangers. The interesting part is that the difference in the visual design of each room also seem to influence how some participants interact with each other. The environmental context is another big research direction this demo allows to investigate. The order and appearance of the exhibition spaces in the experience is not random - it follows an idea of *contextual build-up*, in which the environment gradually evolves from being similar to the existing, physical space into an out-of-real-world setting. This is expected to make the transition from real to virtual world smoother and less shocking to the visitors. Additionally, the environmental context has a potential to influence visitors' learning and experience, which can also be observed based on this demo.

5 CONCLUSION

The demo showcases the results of research investigating how to best design the fashion museum exhibition in social VR. It presents the ways to make the interactions interesting, but easy for the visitors to grasp, to present information in an engaging way and to make users curious about the exhibits. Also the benefits of the natural interactions introduced by pointclouds, and the difference in behaviour of participants in differently designed environments can be observed in the demo.

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REFERENCES

- [1] S. Debenedetti. Investigating the role of companions in the art museum experience. *International Journal of Arts Management*, pp. 52–63, 2003. 1
- [2] M. Kang and U. Gretzel. Effects of podcast tours on tourist experiences in a national park. *Tourism Management*, 33(2):440–455, 2012. 1
- [3] Q. T. Le, A. Pedro, and C. S. Park. A social virtual reality based construction safety education system for experiential learning. *Journal of Intelligent & Robotic Systems*, 79:487–506, 2015. 1
- [4] J. M. Mas and A. Monfort. From the social museum to the digital social museum. *ADResearch: Revista Internacional de Investigación En Comunicación*, (24):8–25, 2021. 1
- [5] J. Minkiewicz, J. Evans, and K. Bridson. How do consumers co-create their experiences? an exploration in the heritage sector. *Journal of marketing management*, 30(1-2):30–59, 2014. 1
- [6] L. Nisiotis, L. Alboul, and M. Beer. A prototype that fuses virtual reality, robots, and social networks to create a new cyber-physical-social eco-society system for cultural heritage. *Sustainability*, 12(2):645, 2020. 1
- [7] J. Sun, K. Harris, and S. Vazire. Is well-being associated with the quantity and quality of social interactions? *Journal of Personality and Social Psychology*, 119(6):1478, 2020. 1
- [8] I. Viola, J. Jansen, S. Subramanyam, I. Reimat, and P. Cesar. Vr2gather: A collaborative social vr system for adaptive multi-party real-time communication. *IEEE MultiMedia*, 2023. 2