

Exploring the Effects of Interactivity on User Experiences in an Interactive VR Fashion Show

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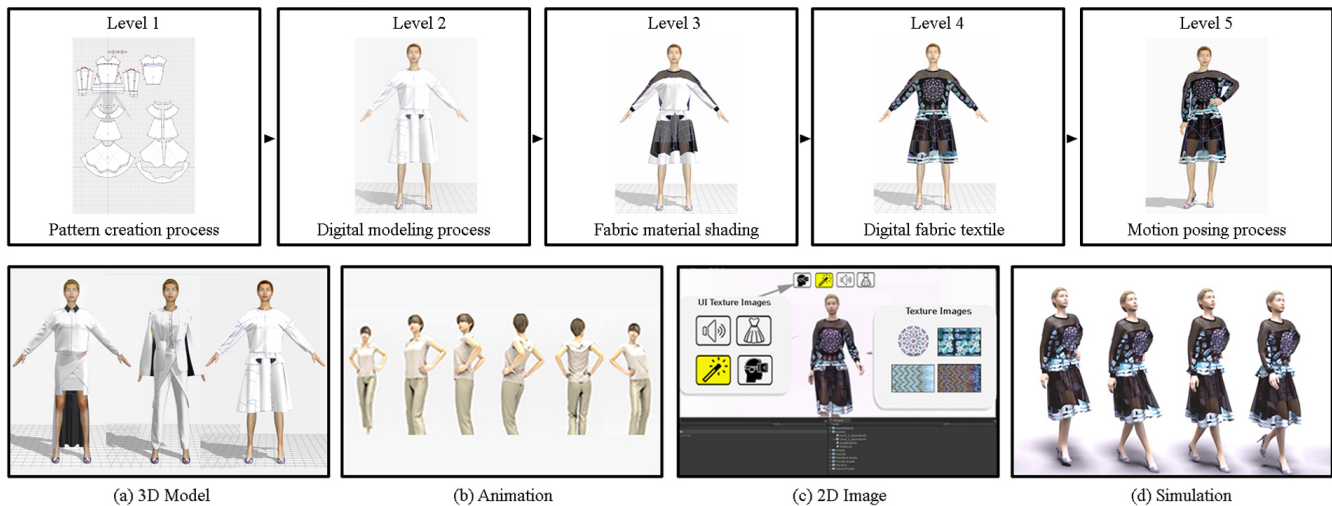


Figure 1: Design Process of Our Interactive VR Fashion Show

ABSTRACT

In this paper we explore how different interaction types (POV, cloth, visual effects, and background music) can influence the user experiences in terms of interest, immersion, fun, and ease of use. To this end, we design an interactive virtual reality fashion show system with a pipeline approach and develop it using Unity3D game engine and HTC Vive HMD. A pilot study with 12 participants shows that the four interaction types can positively affect the user experiences.

CCS CONCEPTS

• **Human-centered computing** → **Virtual reality**.

KEYWORDS

VR, fashion show, interactivity, user experiences

ACM Reference Format:

Duck-Ki Ahn and Byung-Chull Bae. 2020. Exploring the Effects of Interactivity on User Experiences in an Interactive VR Fashion Show. In *Special*

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SIGGRAPH '20 Posters, August 17, 2020, Virtual Event, USA

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ACM ISBN 978-1-4503-7973-1/20/08.

<https://doi.org/10.1145/3388770.3407441>

Interest Group on Computer Graphics and Interactive Techniques Conference Posters (SIGGRAPH '20 Posters), August 17, 2020, ACM, New York, NY, USA, 2 pages. <https://doi.org/10.1145/3388770.3407441>

1 INTRODUCTION

Traditional fashion shows have changed through a variety of digital platforms such as 3D virtual environments, Virtual Reality (VR), and interactive VR. These various types of digital fashion shows with different platforms require proper evaluations of user experiences for the potential utilization of commercialization. The evaluation process of the user experiences, however, demands time and cost, including the production of digital costumes, the conversion or adaptation to VR devices, and the preparation process to design interaction elements.

Due to its “immersive” features, virtual reality is emerging as an engaging platform in the fashion and garment industry [CHENG 2017][Jung et al. 2019]. Specifically, Gao *et al.*[Gao et al. 2018] developed a virtual fashion show system with an HTC Vive headset. In their system, users are allowed to interact with the system in several ways - including perspectives, the shape of the stage, lighting, music, and model switching. Similarly to Gao *et al.*'s study, we present our design and development of an interactive VR fashion show, mainly focusing on the effects of four interaction elements in a VR fashion show.

2 DESIGN AND IMPLEMENTATION

2.1 Design of Digital Clothing

In digital clothing, natural clothing production can be realized through the simulation process of polygon transformation of digital clothing resulting from physical collisions with virtual avatars, which induces the natural expression of wrinkles ranging from digital clothing to thickness, shrinkage, and adhesion to create a realistic visual representation. The production of virtual clothing is based on the clothing manufacturing process centering on the fabric properties such as thickness, weight, and color-specific components. In particular, we employ a pipeline process consisting of five levels - pattern, modeling, shading, texturing, and posing - as shown in the top five pictures in Figure 1. These five levels can serve as verification steps before being applied to a VR game engine.

2.2 Interaction Elements

As interaction elements, we employ 4 factors - POV (Point of View), cloth, visual effect, and music.

- **The change of camera perspective** can allow HMD (Head Mounted Display)-wearing users to manipulate the direction and location of their eyes around digital fashion shows in the virtual reality environment. The change of perspectives include four directions (front, left, right, and rear) as well as zoom in or out in real-time. While these changes can positively affect the users' sense of immersion by inducing both fun and interest, design consideration for the reduction of possible motion sickness is necessary.
- Through **the functionality of costume change**, the users can choose or change the costumes of virtual models among three different types of digital costumes.
- Using **the functionality of background effect**, the users can change the brightness and colors of stage lighting and choose different particle effects. Also, with **the feature of background music change**, the users can select different background music during the VR fashion show. While these functionalities may help increasing fun and interest, repetitive uses can harm the users' immersion.

In our prototype system, the four interaction factors are shown with UI at the top of the HMD screen. For example, when the user activates the costume change function by pressing the corresponding button (with the cloth icon), the change of digital clothing is instantly executed during the show in real-time, allowing the user to experience a sense of control through interaction.

2.3 VR Implementation

For the production of the proposed interactive VR fashion show system, we adopt four key procedures. First, the 3D modeling process provides an appropriate input for the Unity3D game engine. Second, the animation process is based on the motion-capturing of a fashion model's runway walking cycle in the real-world. Third, the 2D UI image/texture process provides the production and adaptation of digital image data, including UI images, digital clothing, and tutorials. Finally, the simulation process uses Marvelous Designer, a digital clothing simulation program for the simulation. The four procedures are as shown at the bottom in Figure 1.

2.4 Evaluation

As an evaluation, we conducted a pilot study with 12 undergraduate participants (females:6, males: 6) who are voluntarily recruited. After playing the VR fashion show, the participants were given survey questionnaires asking whether each interaction factor (POV, Cloth, Effect, and Music) had a positive influence on their VR experiences in terms of interest, immersion, fun, and ease of use. Each question was asked with a 5-point Likert scale (1: strongly disagree, 2: disagree, 3: neutral, 4: agree, 5: strongly agree).

Among the four factors, as shown in Table 1, POV (i.e., change of the user's viewpoint) and Cloth (i.e., the change of digital clothing for virtual fashion models) are two dominant interaction types overall. Their mean values are both 4.15. Meanwhile, music (i.e., the change of background music) is the least influencing factor overall (m: 3.77). Based on the statistics in Table 1, POV is the key interaction factor for both interest (m: 4.17) and ease of use (m:4.42); Cloth for immersion (m: 4.0) ; Effect for fun (m:4.33). Overall, *fun* has the highest mean rating (m: 4.21); *immersion* has the lowest (m:3.86).

Table 1: Statistics of Pilot Study Results (Inter.: Interest; Immer.: Immersion; EoU: Ease of Use; SD: Standard Deviation)

Interaction	Inter.	Immer.	Fun	EoU	Mean (SD)
POV	4.17	3.75	4.25	4.42	4.15 (0.247)
Cloth	4.08	4.0	4.17	4.33	4.15 (0.123)
Effect	4.08	3.92	4.33	4.0	4.08 (0.154)
Music	3.5	3.75	4.08	3.75	3.77 (0.206)
Mean(SD)	3.96	3.86	4.21	4.13	4.04 (0.138)

3 CONCLUSION

In this paper, we explored how different interaction types (POV, cloth, visual effects, and background music) can influence the user experiences in terms of interest, immersion, fun, and ease of use. To this end, we designed an interactive virtual fashion show system with a pipeline approach and developed it using Unity3D game engine and HTC Vive HMD. A pilot study shows that the four interaction types can positively affect the user experiences. As future work, we plan to conduct the main study with a larger number of participants.

ACKNOWLEDGMENTS

This work was in part supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Science and ICT (2017R1A2B4010499).

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