Buyers Satisfaction in A Virtual Fitting Room Scenario Based on Realism of Avatar

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ABSTRACT

With the rapid development and wide-spread availability of hand-held market-level 3D scanner, character modeling has recently gained focus in both academia and industry. Virtual shopping applications have been widely-used in e-business. We present our parameter-based human avatar generation system and ongoing work on expanding the virtual shopping to the immersive virtual reality platforms employing natural user interfaces. We discuss ideas to evaluate buyer satisfaction using our system.

Keywords: 3D reconstruction, character modeling, virtual reality, avatar realism.

1 INTRODUCTION

In recent years, character modeling has been extensively discussed in virtual reality and computer graphics. As a typical application of character modeling, virtual shopping has been widely used in e-business to enhance user experience and efficiency.

Virtual shopping is a user-friendly application, which gives users simulated experience of shopping in markets. A typical example is virtual fitting room.

Different from other traditional virtual shopping applications, virtual fitting aims at showing the simulated appearance when consumers try on clothing as well as get the suitable size. That means it must simulate a real consumer in terms of both figure and textural appearance. Recent work has focused on modeling human characters directly from the low quality point cloud of hand-held 3D cameras [6-8].

However, direct character modeling from consumer level scanning devices has several limitations:

1. The reconstructed model may be of low quality even it is smoothed.
2. The animation or fitting pipeline has no prior-knowledge about joints and bones and cannot drive the model directly.
3. We do not have measures of the model, so we cannot search for the suitable size of given clothes.
4. It requires users to hold a pose for a given time, thus inducing user workload.

We present a parameter-based approach for character reconstruction that seeks to overcome these limitations. In addition, after generating the human avatar, we are expanding the virtual fitting room experience into immersive virtual reality environment.

2 SYSTEM DESIGN

In this section we detail the design of the virtual shopping system.

2.1 Design Goals

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Figure 1: Virtual fitting system for traditional display

Our pipeline is designed so that the consumers can only rotate and scan themselves, without keeping poses. Our system then estimates the human measures to generate a valid and drivable human model. The method is to track human joints in thee depth frame of Kinect. Following that, we extract centerlines of each bone connecting pairs of joints. Distances of such centerlines are regarded as metric measures of the users' body. We firstly use distances of such centerlines as length of a bone connecting a pair of joins (shown as the green lines joining two orange nodes in Figure 2). We call such lines bone-line segments. For estimating width, i.e. fatness of a part, we find Euclidean centers of each bone line segment, then measure the perpendicular distance and regard two intersecting points to the whole point cloud as width. To improve robustness, we search such intersecting points in a range of neighborhood as well, rather than just in a single line area.

Next, unlike data-driven methods [1], we pass those measures to our human avatar generator based on the open source designer

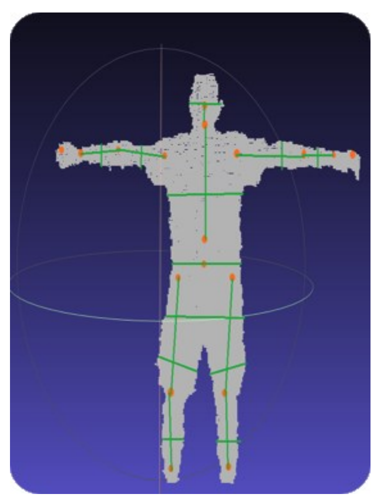


Figure 2: The Parameter Extraction Sample for avatar estimation

Figure 3: User Captured by Kinect:
User poses for front and side view snapshots

makehuman[1]. It is worth mentioning that different from the original version of makehuman, our generator is fully automatic, and only needs to pass the human body measures.

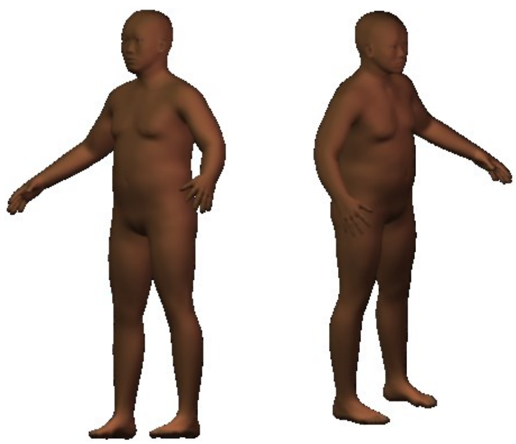


Figure 4: Result: 3D avatar of the user

2.2 Immersive Virtual System

We are currently porting the virtual shopping experience to immersive virtual reality (IVR) systems, such as a CAVE and an oculus rift[2]. IVR systems are able to make users feel "present" in the virtual environment [5], which is the subjective feeling of experiencing part of the virtual world. Prior research has showed that people prefer to be represented by avatars with a closer representation of physical form factors [4].

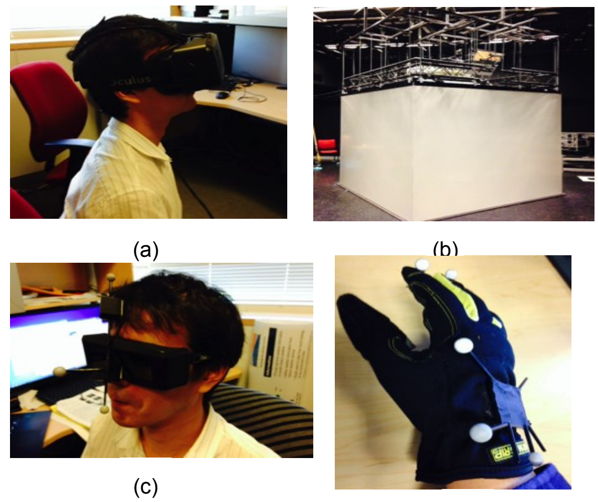
A recent study found no significant connection between the reported sense of presence and the visual fidelity of self-avatars in virtual worlds [2]. However, from the observations of their study participants, the authors felt that there could be some relation, which didn't get exposed in their study. Like they suggested, we want to isolate and study the effects of avatar realism (simulation fidelity) on presence. We want to further explore the factors that may increase customer confidence in buying a dress and find whether the sense of presence affects any or those factors. Also, visual realism of the marketplace can improve realism and further affect buyer satisfaction. We also plan on exploring whether natural user interaction could affect buyer preference.

3 Conclusion and Open Problems

We designed a high-quality human body reconstruction pipeline which generates human avatar model with low user workload. We are working on evaluating the potential of virtual shopping in immersive VR with natural user interaction. For future research, we have a few research questions that we want to explore:

1. How does avatar realism, expressed through its form factor, affect user experience in virtual shopping?
2. Does more natural user interaction (with closer biomechanical and control symmetry to the real world [3]) improve user satisfaction?
3. Can an immersive virtual reality system positively improve users' trend of shopping?

We hypothesize that avatar realism will have a positive effect, but naturalness of the interaction would have no effect on buyers' preference in a virtual shopping experience.



(a) (b) (c) (d)

Figure 5: Potential natural UI
(a): glasses mounted tracking, (b): hand trackers (c): Oculus Rift, (d): Immersive Cabin (aka CAVE) at SBU

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