Types and Applications of 3D/Virtual Technology: The Fashion Industry

Augmented Reality Applied to Virtual Try-On of Apparel

Virtual try-on of apparel through the use of virtual technology has become a new, innovative approach to minimize the risk of purchasing apparel online, in addition to maximizing hedonic or fun benefits of the in-person shopping experience. Augmented reality virtual fitting rooms (VFRs) allow a consumer to try on products and see a live depiction of themselves on a computer monitor, commonly known as a "magic mirror" (Lee & Xu, 2019). The magic mirror superimposes, captures, and tracks motion through a webcam, smartphone camera, or Kinect. This type of VFR gives a more realistic virtual fitting room experience compared to other VFR types, which do not incorporate virtual technology; however, the accuracy of garment simulation is a significant issue with this type of VFR compared to others.

Augmented reality allows for VFRs to be incorporated in both brick-and-mortar stores and in online stores, providing hedonic and utilitarian benefits. Through augmented reality, customers can "try on" products before searching for them on the shelves, thus saving time. From a hedonic perspective, augmented reality allows for a "gamification" of the shopping experience and provides an experience outside of purchasing a physical garment (Lee & Xu, 2019). Both luxury and national brands have incorporated AR in their VFR experiences, including Burberry, Tommy Hilfiger, American Apparel, and Uniqlo. Some retailers even enable customers to use VFR technology at home and simulate a catwalk (Lee & Xu, 2019).

In a study conducted by Baytar *et al.* (2020), virtual try-on with augmented reality was examined to determine if it yields reliable product information compared to a physical try-on. The results found that the perceived fit of the garment through a virtual try-on was comparable to the actual fit when the garment was tried on physically; respondents were able to approximate their size based on a

virtual try-on through AR. Fit was analyzed based on how the garment fit on the neck, hip, abdomen, waist, torso, and shoulders and also how accurately the sleeve openings and the fullness of the garment was conveyed with the use of augmented reality technology (Baytar et al., 2020). The garments used for the virtual try-on were perceived to be tighter in the waist, hip, and abdomen, and looser in the bust compared to the physical garment. Lengths of the hem of the garment and the sleeves were also slightly off compared to a physical try-on when utilizing AR (Baytar et al., 2020).

Interactivity, speed, and the quality of the image AR produces impact the level of information consumers can gain on the perceived fit of a virtual garment (Baytar et al., 2020). Discrepancies of fit between the virtual and physical garment stemmed from a "superimposed, static 2D image" of the virtual dress against the physical body (Baytar et al., 2020, p. 677). Because the virtual garment could not lay on the physical body shape correctly, a discrepancy in fit was observed by the participants. In addition, the actual length of the garment was found to be distorted utilizing AR technology, also due to the fact the garment did not lay correctly on the physical body (Baytar et al., 2020). Performance and aesthetic features, such as style, fabric, coordination with other items, details, touch and feel, weight, overall fit, comfort, and appearance of a garment were perceived to be better on a physical garment compared to a virtual garment. Tactile attributes such as touch and feel, comfort, and weight were perceived to be unsatisfactory regarding virtual apparel try-on with AR technology (Baytar *et al.*, 2020). This study posits a significant weakness of virtual technology in connection with the virtual try-on of apparel. Inaccurately presenting performance and aesthetic features of the garments may lead to an increase in customer returns and lack of trust in virtual technology use in apparel try-on.

Overall, there is room for improvement in AR technology applied to the apparel industry. Baytar *et al*. (2020) proposed that more images of the physical garment be taken from multiple different angles to ensure more accuracy of the depiction of the garment utilizing virtual try-on technology. They also proposed that the images should be adapted to fit multiple different body types, including petite, regular, plus, and tall bodies as well as different body shapes to reduce the discrepancies in evaluating the fit of the garment (Baytar et al., 2020). AR technology is still fairly novel in the apparel industry; therefore, improvement is still necessary for an accurate depiction of fit and style of an actual, physical garment.

3D Body Scanning Technology and Mass Customization

Three-dimensional body scanning technology is an important application to the apparel industry because it has a proven track record of saving time and money. 3D body scanning involves a contactless scanning of the body to obtain measurements utilizing an infrared depth sensing and imaging technology. The outcome of a body scan is a silhouette of the body,

along with the measurements tied to the body. The measurements obtained from the scan can be implemented in the garment prototyping process, including pattern construction, garment draping simulation, and 3D body tracking (Kokoszka, 2018). 3D body scanning technology has the capacity to provide precise measurements within a short period of time, usually around 10 to 15 seconds (Zong & Lee, 2011).

Though 3D scanning technology allows for more efficiency in the apparel industry, it does present itself with some limitations. Some disadvantages of body scanning technology include missing data, color sensitivities, and pose limitations, all of which can affect the reliability and preciseness of the measurement data (Zong & Lee, 2011). Natural shading on the body during the scanning process, including in the crotch and the armpit area, can create holes in the measurement data, therefore extra time is needed to correct these issues as they arise. Advanced modeling software such as Polyworks, Geomagic, and RapidForm are frequently used to correct these holes in the measurement data and ensure more accuracy (Zong & Lee, 2011).

The original goal of 3D body scanning technology was to improve the body measurement process in terms of time and accuracy and to replace the typical tape measure technique. Now, 3D body scanning technology is widely used in the apparel industry for customization purposes. The technology allows for a faster, more efficient customization process, meaning fully customized apparel products can be produced in a timely manner (Zong & Lee, 2011). Furthermore, there are four important characteristics of body scanning technology regarding its application to mass customization: (1) it has the ability to obtain an infinite number of linear and nonlinear measurements of human bodies; (2) the measurements obtained from 3D body scanning technology yield more accurate measurements compared to hand measurements; (3) with the infinite number of measurements, garments can be created for any unique human body; and (4) due to its digital format, 3D body scanning measurements can be directly transferred to CAD software without human intervention, thus saving time and money (Istook & Hwang, 2000). These characteristics allow for mass customization to be done effectively and efficiently, while simultaneously decreasing error and cost.

Based on what you just read, answer the following questions in a 2-3 page paper to be handed in:

1. How do VFRs provide both hedonic (fun) and utilitarian (functional) benefits when shopping for apparel? What type of benefit do you think is the most important in the apparel context? Why? Provide your reasoning with specific examples.

2. Based on the above reading, identify two ways in which AR technology can be improved in the VFR context. What are some other ways the technology can be improved to ensure the accuracy of fit? Provide specific examples.

3. Imagine you are an apparel retailer thinking of incorporating AR technology to provide a VFR experience. What are some limitations you would need to consider? Do you think these limitations might outweigh the benefits? Why or why not?

4. Use a 'magic mirror' offered by an online fashion brand and describe the process. Do you think the experience resonated with the findings of the reading provided? In particular do you think the VFR you experienced needs to improve to provide greater accuracy for diverse body sizes and shapes?

5. How does 3D body scanning technology help companies improve their efficiency?

6. 3D body scanning can be particularly useful for developing accurate fits in certain cases – e.g., in an ageing body, though the measurements remain the same, there are modifications in the body shape. Illustrate this or a similar benefit of 3D body scanning through additional readings and sketch/images.

7. Search the internet and find an apparel retailer that utilizes body scanning technology.
    a. Describe ways in which the retailer uses body scanning technology in their establishment.
    b. Based on the retailer's use of this technology, what are some of the resulting benefits?

8. Do you think 3D body scanning technology could fully replace traditional hands-on measurement? Why or why not? (**Note:** Consider the information in this article and your own person experience).

Competency targeted: critical decision-making

References:

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