Categorization of Existing 3D Apparel Modeling Approaches from a Development Pathway Perspective

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Introduction

As additive manufacturing (AM) or 3D Printing (3DP) technology develops, more and more attempts have been made to introduce it into the apparel industry. In the process, 3D apparel modeling technology will play an essential role. Three D apparel modeling refers to the technology which is used to build a 3D digital model and to drive the product manufacturing process. So far, there have been a few kinds of 3D apparel modeling approaches. Some of them have matured as a part of commercial software, while others are still developing as academic concepts. According to the literature review, most researchers have classified the 3D apparel modeling approaches from the perspectives of operating features, such as input forms like 2D pattern input, sketching input, etc. (Liu, Zhang, & Yuen, 2010). This kind of classification which focuses on particular technical problems could usually be done quite professionally and comprehensively, but lacks a global view of the development pathway (DP). The DP of a technology not only shows the relationship between its present and past status, but also the relationship between itself and technologies in other fields. Users can choose the approaches more appropriately based on their own knowledge background and R & D personnel can choose their research direction more accurately by clearly understanding the resources they can utilize.

Methodology

For this study, 3D apparel modeling approaches were classified into three groups of DP. The category defined as DP1 utilized existing non-apparel 3D modeling approaches that are mature. The DP2 category was based on real garment making technologies. The DP3 category included brand-new 3D modeling technologies or methods.

Results

The 3D apparel modeling approaches were classified from the perspective of development pathways. DP1 was identified as virtual sewing, which is a 2D-based to 3D apparel modelling approach. It works for sewing digital 2D patterns into garments in the virtual environment. It is the most widely accepted 3D apparel modeling approach and has reached the level of commercial utilization. The representative software includes CLO 3D, GERBER 3D, V-

Stitcher and Optitex, etc. Its greatest advantage is that the operating process is almost the same as the real garment sewing process, which makes it easy to understand for users in apparel industry and able to realize almost all kinds of apparel product. The drawback is that it requires professional pattern making and sewing knowledge.

DP2, independent direct modeling, refers to building the apparel model without considering the relationship to the human body by using the 3D modeling approaches which have been widely used in other industries. These approaches have been used in the mechanical engineering and graphic design industries, such as mesh-based modeling and curve-based modeling. Its greatest advantage is that the technologies on which it relies started much earlier than any 3D apparel modeling approach. It has matured so well that it can meet almost any needs in 3D apparel modeling. In addition, the 2D pattern making step is unnecessary with this method. The disadvantage is that the modeling workflow is quite unfamiliar to the user in the apparel industry. Additionally, neglect of the interaction with the human body increases the difficulty to achieve excellent fit of garment model.

DP3, virtual human body-based direct modeling, is based on the ease value which reflects the relationship between the human body and the garment model. Usually, the surface of the 3D garment model is generated automatically by connecting the key contours of the garment which are obtained according to the equivalents of human body taking the ease model into account (Zhang, Innami, Kim, & Takatera, 2015). The advantages are obvious. First, the 2D pattern making step is not required before 3D modeling. Second, it solves the problem of fit from the source. The negative is that it is hard to do detail editing, such as in collars or pleats. This approach is still in the academic experimental level.

Conclusion

Every DP mentioned above has its own advantage and disadvantages. Generally, for the three DPs, the more existing sources can be utilized, the more difficult for user to use. On the other hand, the more convenient it is, the more effort R & D personnel need to take for further development. Which DP most appropriate for a given situation depends on the particular needs and research and development investment that is allowed.

References

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