3D Pattern Development of Tight-fitting Dress for an Asymmetrical Body

Yeonhee Jeong, Soyoung Kim, Kyunghi Hong
Chungnam National University

This paper was supported by the Korea Science and Engineering Foundation under contract No. R01-2003-000-10423-0

I. Introduction

Development of tight-fitting clothing pattern from 3D human data has been a subject of interest, since demand in clothing fit for those of various body types is increasing. In addition, tight-fitting pattern generated directly from the 3D scan data could be also used as a basic pattern for diverse clothing application. Although we could find some commercial software dealing with 2D pattern development from the measurements extracted from the 3D scan data, most of the pattern making are based on the conventional methods of 2D pattern making, which is difficult to reflect the curved surface of abnormal body accurately enough. A few commercial 2D patterns directly developed from the 3D scan data contain ease on the pattern or the deformation of the fabrics, and yet verification of the pattern developed has not been reported yet.

Recently, Jung et al. (2005) proposed a step by step method of 2D pattern development from the 3D scan data with the view points of apparel construction. On the continuum of this methodology, in this paper, 2D dress pattern development of an asymmetrical female body using the 3D scan data was carried out.

II. Method

The 3D scan data of an asymmetrical female body with tilted pelvis and natural breast shape was obtained using Vivid 910 (Konica Minolta Sensing, Japan) as shown in Figure 1.
감성적 드레스 패턴 제작 과정

left: 3D scan data of the original body  middle and right: drawing design line and regional segmentation of 3D scan data

Fig. IFemale body with tilted pelvic and asymmetrical breast used in this study

The surface of the body was then segmented into several parts using RapidForm 2004. The segmented lines on the body could be merged into a larger surface afterwards or could be used as design lines as it is. To develop a 2D pattern from this 3D image, triangle simplification (Garland, 1999) was used to reduce the 3D scan data points, while maintaining the original 3D shape. The Runge-Kutta method was applied to make the segmented triangular patches in a 2D plane from 3D space. As an example, steps of obtaining the part of dress pattern were illustrated in Figure 2. As a next step, vertexes of triangular patches were connected to the neighboring ones until the entire triangles within the segmented lines were merged into one block using the program as proposed in the previous study (Jeong et al., 2005).

Fig. 2 Steps of obtaining the part of dress pattern using triangle simplification, Runge-Kutta method and software developed in this study
A basic pattern was then obtained by trimming the outline of the blocks to get the final curve by the Yuka pattern making program. Using the processes mentioned, a 2D basic pattern could be created from the 3D scan data as shown in Figure 3.

Fig. 3 2D pattern development by attaching triangular patches from the 3D surface of woman’s body and basic torso patterns for tight-fitting dress

III. Results
The tight-fitting dress for an asymmetrical female body was made using the torso pattern developed with the lower dress as shown in Figure 4.
Fig. 4 The tight-fitting dress for an asymmetrical female body

Total surface area between 3D manikin and the 2D pattern developed was compared in Table 1. Difference in surface area was below 0.1%. Fit of the dress was examined using 3D space distribution images between the body surface and the dress for the validation of the method developed in this study. Despite of its asymmetrical shape with curved surface, dress was well fitted to the figure.

Table 1. Surface area between the original 3D scan data and 2D pattern directly developed from 3D data

<table>
<thead>
<tr>
<th></th>
<th>Bust</th>
<th>Torso (L4)</th>
<th>Torso (L3)</th>
<th>Torso (L2)</th>
<th>Torso (L1)</th>
<th>Torso (R1)</th>
<th>Torso (R2)</th>
<th>Torso (R3)</th>
<th>Torso (R4)</th>
<th>Bust (Right)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3D scan</td>
<td>209.40</td>
<td>210.46</td>
<td>249.54</td>
<td>219.91</td>
<td>114.23</td>
<td>283.19</td>
<td>115.11</td>
<td>256.89</td>
<td>216.25</td>
<td>200.39</td>
</tr>
<tr>
<td>data (cm²)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2D pattern</td>
<td>203.79</td>
<td>188.09</td>
<td>254.29</td>
<td>212.69</td>
<td>119.34</td>
<td>289.77</td>
<td>125.96</td>
<td>254.48</td>
<td>219.50</td>
<td>212.86</td>
</tr>
<tr>
<td>(cm²)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difference</td>
<td>5.61</td>
<td>-22.37</td>
<td>-4.75</td>
<td>7.22</td>
<td>-5.11</td>
<td>-6.58</td>
<td>-10.85</td>
<td>2.41</td>
<td>-3.25</td>
<td>-12.47</td>
</tr>
<tr>
<td>(cm² %)</td>
<td>(0.03)</td>
<td>(-0.11)</td>
<td>(-0.02)</td>
<td>(0.03)</td>
<td>(-0.04)</td>
<td>(-0.02)</td>
<td>(-0.09)</td>
<td>(0.01)</td>
<td>(-0.02)</td>
<td>(-0.06)</td>
</tr>
</tbody>
</table>

IV. Conclusion and Implications

The proposed method of 2D pattern development from the 3D body surface was adequate even for the asymmetrical body. Further applications of the various tight-fitting pattern development of abnormal body would be possible using this semi-automatic method.

References
