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# Development of Classification Method of the Flattened Body Surface Figures for the Mass Customization of Men's Formal Jacket

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# Development of Classification Method of the Flattened Body Surface Figures for the Mass Customization of Men's Formal Jacket

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## 1. Purpose of the study

The purpose of this study is to develop a new body shape classification method using variables measured on the flattened figures of men's body surface. It is designed to reflect the concrete characteristics of the men's formal jacket patterns so that it becomes easy to be utilized for the mass customization of men's formal jacket.

## 2. Method

**1) Data and subjects:** 152 subjects were selected from 1,548 3D body scan figures of the Size Korea 2005. Subjects were classified into 4 lateral body shape types of 'straight', 'lean back', 'bend forward' and 'sway back' by the 10 experts in clothing ergonomics with the agreement of 65% and above. An average agreement was 77.2% .

**2) Flattening of the body surface and size measurement:** Flattening reference points and cutting planes were positioned constructing 3 panels of 'front', 'side' and' 'back'. It reflects the position of body panels of the men's formal jackets. A flattening software named 'Upper Body Surface Analyzer' was developed and 19 variables were measured on the flattened figures of the subjects automatically by this software.

**3) Factor extraction & flattened figure type classification:** 19 variables were put into the factor analysis to extract the shape factors of flattened figures and the subjects were classified by k-means clustering.

**4) Estimation model for flattened figure types:** Logistic regression model was developed to anticipate the body surface development figure type.

## 3. Result

### 1) Flattening of the body surface and size measurement

Flattened body surface figures of 152 subjects were obtained and 19 angles and 2 size differences were measured by 'Upper Body Analyzer ver 1.0'. The measured sizes were entered into the factor analysis.

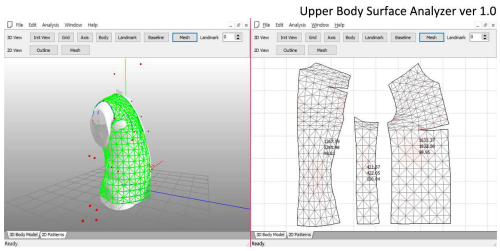



Figure 1. Flattening of body surface

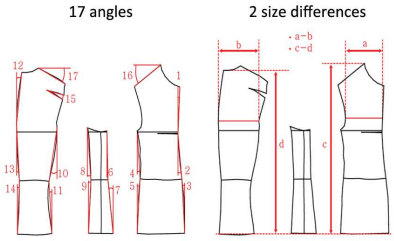


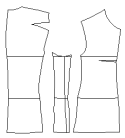
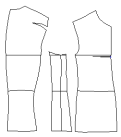
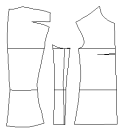
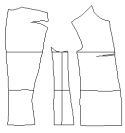
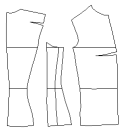

Figure 2. Size measurements of variables

### 2) Factor extraction & flattened figure type classification

Table 1. Result of factor analysis

| Factors | Eigenvalue | Variance explained(%) | Measurement items | |
|---|---|---|---|---|
| | | | Angle | Size-difference |
| 1: Width and protrusion of hip | 3.2 | 16.99 | 2, 5, 6, 11, 14 | |
| 2: Anteroposterior position of hip | 3.1 | 16.26 | 4, 7, 9, 10 | |
| 3: Bending of shoulder | 2.8 | 14.53 | 8, 13, 15 | a-b |
| 4: Protrusion of chest | 2.3 | 12.32 | 1, 3, 16 | |
| 5: Sway back | 2.3 | 12.08 | 12, 17 | c-d |

Table 1. Classification of flattened figures by k-means clustering

| Type | Type1: straight | Type2: sway back | Type3: bend-forward | Type4: lean-back b | Type 5: lean-back I |
|---|---|---|---|---|---|
| Flattened figures |  |  |  |  |  |

### 3) Estimation model for the flattened body surface figure types

An estimation model for the flattened body surface figure types was developed using logistic regression analysis. The agreements between logistic regression model and k-means clustering were 90.8% on average.

### 4. Conclusion

It became possible to anticipate the specific shapes of flattened body surface figures of the random subjects using the results of this study. It could be applied to the mass customization system and will make it easy to offer the jacket patterns tailored to the individual consumer's body shapes.