VIRTUAL MADE-TO-MEASURE GARMENT DESIGN

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Summary

The Department of Polymer Engineering of Budapest University of Technology and Economics, along with the researchers of the Department of Information Engineering of the Faculty of Mechanical Engineering have been working on the development of a 3D designing system for apparel industry. In this article we introduce two methods of virtual made-to-measure pattern design: one is by generating flat patterns using individual body measurements, the other method is by projecting the 3D garment surface created on the virtual human body and obtaining the planar base patterns. Through our research we compare the results obtained with both methods and draw conclusions regarding the applicability of each in specific cases.

1 INTRODUCTION

The computerized design and visualization of garments still constitutes a research subject because of the diversity of the human body and the special characteristics of textiles.

Garments are confectioned of 2D flat textiles, of which details are cut, then assembled (sewing, sticking, jointing) in order to tailor the 3D garments. From the geometrical point of view their „mission" is to follow the surface of the human body, either loosely or tightly, but this is such a free-form which can not be laid flat. Garment confection requires a method for defining the shape of flat patterns. Nowadays in the apparel industry such designing methods are being used, which are based on the most frequent average proportions of the human body and its main measures [1], [2] in order to obtain the garment patterns. But experience shows that people's body proportions in some way or other always differ from the average [3], that is the garments confectioned with the above mentioned methods fit properly only to very few people. In traditional practice this is solved with try-on, that is after cutting garments are adjusted to the body constitution of the customer. This is not possible in the case of mass-made clothes, a different method is required to guarantee fitting. That is exactly one of the most principal aims of the 3D designing system for apparel industry.

2 THE 3D DESIGNING SYSTEM FOR APPAREL INDUSTRY

The Department of Polymer Engineering of the Budapest University of Technology and Economics along with the researchers of the Department of Information Engineering are presently developing a 3D designing system for apparel industry. Our work is sponsored by the research applications of the Ministry of Education FKFP 0028/2000 and ALK-00257/2002, as well as by the OTKA T-42775.

In this 3D designing system we optically establish the individual measures of the human body in full details, and so we automatically generate on the computer the body model

of the customer, suitable in measures and proportions for the precision demands of apparel industry.

For pattern modeling of body-fit garments, based on individual body models, we have started the development of two methods. In one of these methods we generate the flat patterns of garments similarly to traditional designing methods, but taking into consideration the individual body measurements and proportions. In the other method we start from a 3D garment surface generated with the help of the human body created in the 3D designing system, and after its planar projection we design base patterns. Through our research we compare the results obtained from both methods and we examine which method in which designing situation is most optimally applicable.

2.1 Pattern design from planar design

In one of the methods we proceed from plane to space. As from the computerized body model any of the body measurements can be easily determined, we are developing a pattern designing method, based on the model of traditional pattern design methods, and using direct body measurements, which follows entirely the measurements and proportions of the human body.

With the help of 3D technique we create the base garments on the individual body model, in this particular case the surface of a base skirt (fig. 1).

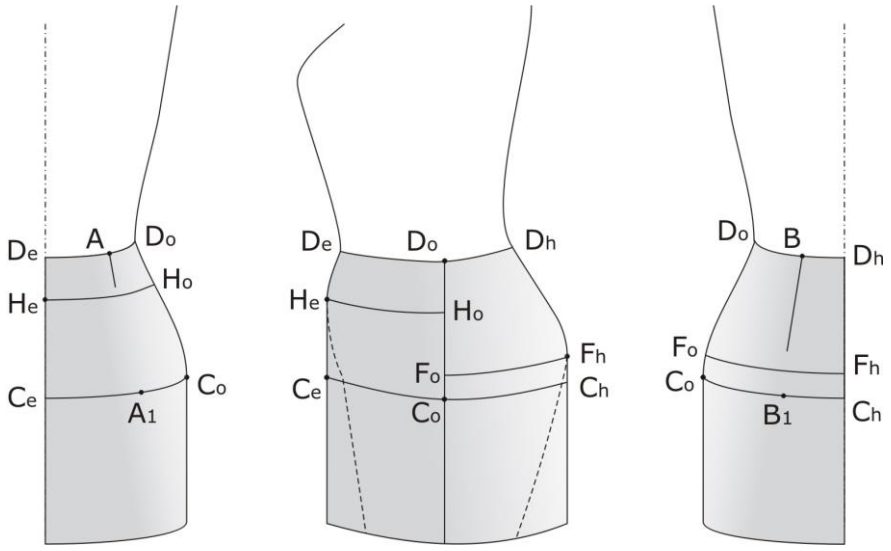

Fig. 1 The surface of the base skirt

The made-to-measure pattern design method is build-up in such manner that the resulted pattern (fig. 2) follows the surface of the skirt in the most accurate way. On the skirt shown in the figure any measure can be taken (height, width, depth), furthermore the length of the curves defined on its surface. Through the pattern design method we measure the length of the curves defined in the horizontal cross-sections of the waistline, abdomen, bottom and hip line, between the front line and the side line, respectively between the side line and the back line (fig. 3). But for the completion of the pattern design further data is necessary. The position and the depth of shape-seams on the front and the back are not known.

This information is obtained based on the supposition that the shape-seam crosses the curves of the waistline and hip line cross-sections in that particular point where the bending function reaches the maximum. Based on this the depth of shape-seams can also be calculated. The course of the pattern design is as follows:

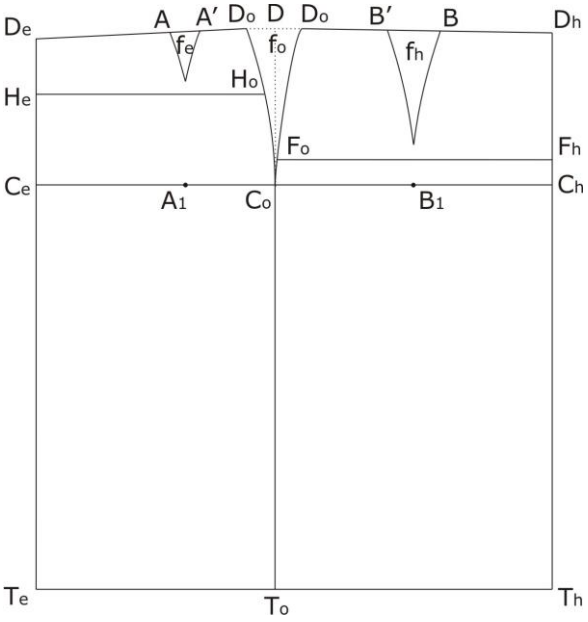

Fig. 2 Made-to-measure skirt pattern design

C_e - C_o - C_h	hip line
D_h - C_h - T_h	back line
T_e – T_o – T_h	knee line
C_oD_o	hip height at the side line
$DT_o \perp C_oC_h$	side line
D_hF_h	bottom height
D_hC_h	hip height at the back
C_hC_o	back width
F_hF_o	back width at the bottom level
$B_1 \in C_oC_h$	point with max. blending

$B_1B \perp$ tangent of C_oC_h curve in B_1

$B_1C_h = BD_h + f_h / 2 \rightarrow f_h$

$B_1C_o = B'D_o + f_h / 2 + f_o / 2 \rightarrow f_o$

D_e – C_e - T_e	front line
D_eH_e	abdomen height
D_eC_e	hip height at the front
C_eC_o	front width
H_eH_o	front width at the abdomen level
$A_1 \in C_eC_o$	point with max. blending

$A_1A \perp$ tangent of C_eC_o curve in A_1

$C_eA_1 = D_eA + f_e / 2 \rightarrow f_e$

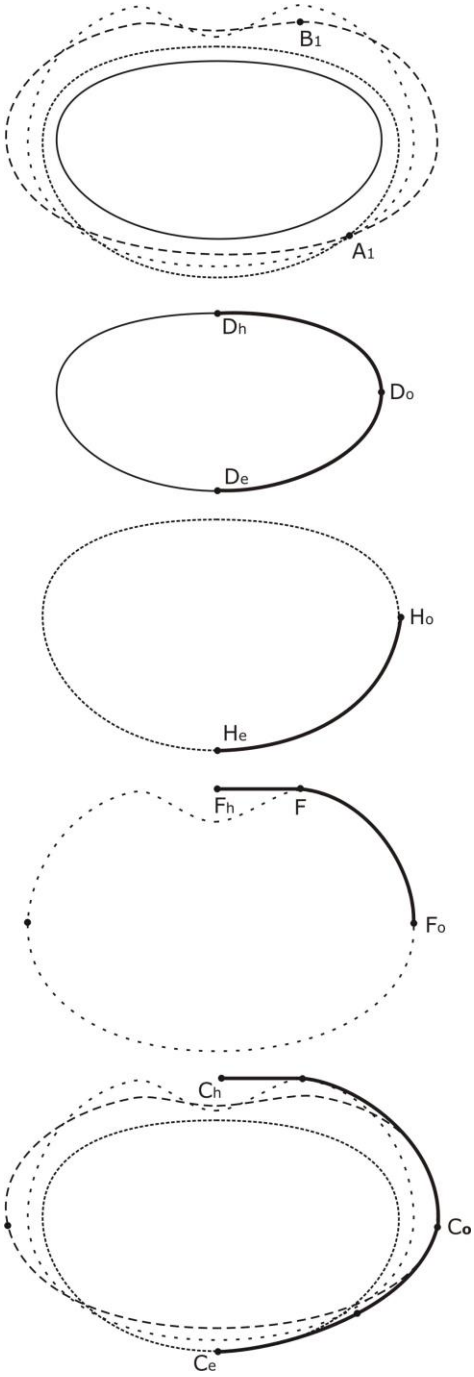

Fig. 3 Cross-sections and measured curves

2.2 Pattern design from spatial garment surface

Together with the researchers of the Department of Information Engineering the elaboration of another method for the designing of made-to-measure patterns in the 3D designing system is currently under development.

In this method the proceeding goes from space to plane. Even if the body, and so the direct surface of the body model can not be projected, it is not a problem, because we do not need the direct surface of the body. With the help of 3D technique and starting from the surface of the body model the prospective garment surface is generated, which can be

projected using numerical methods and applying the technical experience of garment design. The projected surface serves as the base pattern for garment design (fig. 4).

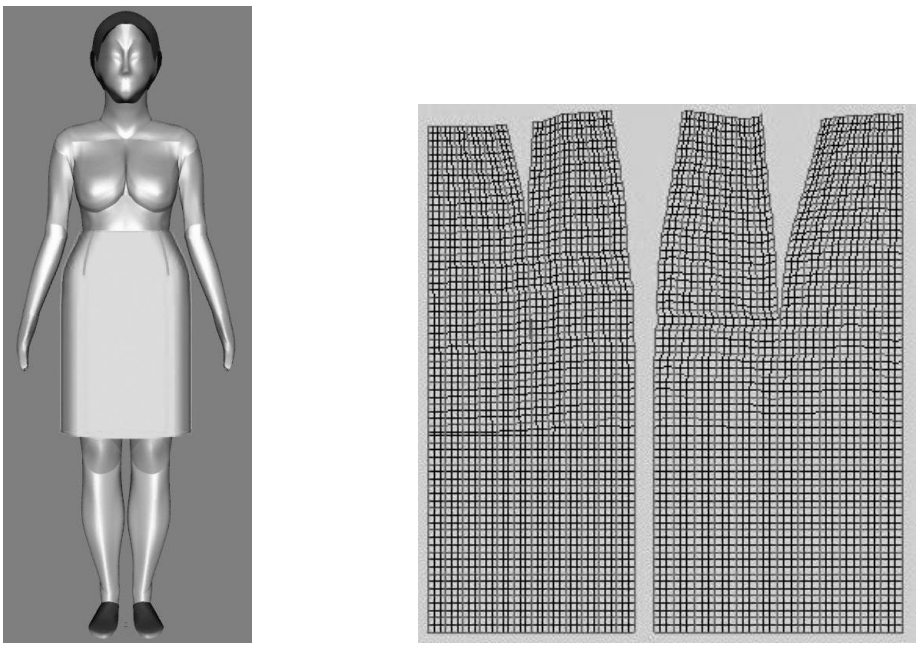

Fig. 4 3D surface of the skirt and its planar projection, the base pattern

3 CONCLUSIONS

The research in course, carried out together with the researchers of the Department of Information Engineering proves the applicability of patterns obtained both from planar pattern design, and from projecting the surface of the garment.

Automatically generated virtual patterns obtained from planar pattern design can be applied in case we want to automatically adapt an already existing garment design to the individual measures of the customer. Virtual patterns obtained from the projection of the garment surface can be applied in case a new garment design is created especially for a customer.

Acknowledgement

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