New 3D to 2D design method of clothing for teenagers

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REZUMAT – ABSTRACT

O nouă metodă de realizare a tiparelor 2D din produsul 3D pentru articolele de îmbrăcăminte ale adolescenților

Adolescența reprezintă o perioadă de tranziție și presupune atât modificări la nivel fizic, cât și modificări la nivel de comportament și personalitate. Produsele pentru adolescenți se caracterizează printr-o mare varietate de forme și stiluri. O mare parte din stilul de îmbrăcăminte al adolescenților este reprezentat de produse adaptate corpului, deci este foarte important să se stabilească o potrivire bună între ele. În prezent, un produs de îmbrăcăminte poate fi dezvoltat cu ajutorul instrumentelor performante existente, cum ar fi software-ul de proiectare a tiparelor, scanarea 3D pentru achiziția datelor antropometrice și software-ul de simulare, modelare și ajustare 2D/3D. Totuși, acestea nu sunt suficiente pentru dezvoltarea de produse de înaltă performanță, decât atunci când sunt implicate cunoștințele și experiența unui specialist inginer/cercetător și a unui stilist.

Lucrarea prezintă noua metodă de proiectare a tiparelor 2D din produsul 3D a unor produse vestimentare pentru adolescenți având la bază datele 3D antropometrice actuale din standardul antropometric elaborat de către INCDTP. Metoda inovativă de realizare a tiparelor de bază 2D din produsul 3D utilizează ca instrumente modulele 3D Flattening, 3D Simulations ale programului Optitex PDS și oferă proiectantului avantajul vizualizării preliminare a formei produsului și a corespondenței acestora cu dimensiunile corpului. Simularea 3D și modelarea virtuală a produselor vestimentare pentru adolescenți este o metodologie pentru verificarea corespondenței corp-produs și rectificarea eventualelor neconcordanțe. Simularea și modelarea 3D se face direct pe manechinul parametrizat cu valorile antropometrice din standard și cu proprietățile și aspectul materialului utilizat.

Cuvinte-cheie: îmbrăcăminte pentru adolescenți, proiectarea tiparelor, simulare 3D, standard antropometric

New 3D to 2D design method of clothing for teenagers

Adolescence is a transition period and involves physical changes and also changes in behavior and personality. Products for teenagers are characterized by a wide variety of shapes and styles. A large proportion in the teenagers clothing style is represented by body-adjusted products, so it's very important to establish a good match between them. Nowadays, a clothing product can be developed with existing performance tools such as pattern design software, 3D scanning for anthropometric data acquisition and 2D/3D simulation, modelling and fitting software. However, these are not enough for the development of high-performance products, unless the knowledge and experience of a engineer/ researcher specialist and stylist is involved.

The paper presents the new 3D to 2D design method of clothing for teenagers, based on current anthropometric 3D data from the anthropometric standard developed by INCDTP. The innovative design method for obtaining the 2D basic patterns from the 3D product uses as tools the 3D Flattening module of the Optitex PDS, and offers the pattern designer the advantage of previewing the shape of the product and its correspondence with body size. The module is newly developed by the Optitex PDS software, existing in INCDTP endowment.

Another innovation is to replace the classic grading of patterns, for different sizes and configurations, with the modeling of the mannequin by replacing standardized anthropometric dimensions. The markings remain in the position corresponding to the anthropometric points, moving proportionally with the replaced anthropometric dimensions.

Keywords: teenagers' clothing, patterns design, 3D simulation, anthropometric standard

INTRODUCTION

Adolescence is the period of biological, psychological and social transition from puberty to maturity. The age range at which this transition occurs is slightly different from one individual to another and depends on several factors: sex (girls generally become teenagers before boys), socio-cultural background etc. The World Health Organization defines adolescence as being the period between 10 and 19 years, but in many Western countries it is considered that adolescence begins between 11 and 13 years for girls, 12–14 years for boys, and ends around the age of 19–21 years for both sexes. This transition period involves physical changes and also changes in behavior and personality.

At this age, compared to childhood, clothing becomes an instrument of communication with others, a way of expressing the personality and, last but not least, an attempt to define the style. It is also a way to highlight the silhouette that is undergoing major transformations during this period.

Products for teenagers are characterized by a wide variety of shapes and styles. The teenager is always fashionable, easily influenced by the whims of fashion, but equally easy to give up after a period of time, which is why the clothing manufacturers and retailers have great interest for this category of clients. At 14–15 years old, young people experience different styles and after this period to shape their personality and to go to the adult stage.

The development of clothing products for this age category is made by characterizing the anthropo-morphological changes that have a significant evolution [1].

A large proportion in the teenagers clothing style is represented by body-adjusted products, so it's very important to establish a good match between them. Nowadays, a clothing product can be developed with existing performance tools such as performance design software, 3D scanning for anthropometric data acquisition and 2D/3D simulation, modeling and fitting software. However, these are not enough for the development of high-performance products, unless the knowledge and experience of an engi-neer/researcher specialist and stylist is involved.

ANALYSIS OF ANTHROPOMETRIC DATA OBTAINED BY 3D SCANNING

Teenagers clothing product development is based on anthropometric data found in SR 13546/2012 developed by the National Research and Development Institute for Textiles and Leather [2–4]. This includes dimensional characteristics taken by 3D body scanning of Romanian teenagers, by age groups. Of 150 measurements resulted from 3D body scanning, 44 dimensional characteristics that provide information needed for clothing designers and pattern makers for sizing patterns and clothing were selected.

The main size for size designation of teenagers clothing is body height. This choice corresponds with European standards for teenagers clothing size designation, thus achieving harmonization.

The standardized heights of Romanian teenagers aged 14–19 years are:
• girls: 152; 158; 164; 170 cm;
• boys: 158; 164; 170; 176; 182 cm.

Interdimensional range value for the main dimension, body height is 6 cm. The secondary standardized dimensions of the body corresponding to each height as main size were calculated statistically.

INNOVATIVE DESIGN METHOD FOR OBTAINING THE 2D PATTERNS FROM THE 3D PRODUCT

An innovative method for obtaining basic patterns for adolescent clothing is the method of developing 2D patterns from the 3D product. The method consists in processing the flattened surfaces of a 3D product and is using the 3D Flattener-Form-fitting design module. The module is newly developed by the Optitex PDS software, existing in INCDTP endowment.

Using the specific features, the pattern designer's knowledge and its creativity, the surface of the 3D object can be transformed, respectively the human body on which the contour of the desired product is drawn in 2D pieces, resulting in an exact correspondence between the size of the pattern and the body dimensions. Another advantage of the new method consists in the direct visualization on the body of the joint lines between the pieces of a product, the shape of the product and the desired length. The 2D surfaces thus obtained are the pattern for a body-adjusted product, of which the basic looseness addition is 0. The new innovative method of developing 2D patterns from the 3D product is a process of transforming the flattened surfaces of the body into the patterns of a product, which is actually positioned to the body at a certain distance, depending on its type and purpose and on the characteristics of the used material.

Another innovation is to replace the classic grading of patterns, for different sizes and configurations, with the modeling of the mannequin by replacing standardized anthropometric dimensions. The markings remain in the position corresponding to the anthropometric points, moving proportionally with the replaced anthropometric dimensions [5].

The method of obtaining the 2D patterns from the 3D product consists of the following steps:

• **Step 1.** Parameterization of the virtual mannequin with the standardized size values for the desired size or real body for the individualized product. Thus, the anthropometric dimensions of length and circumference required for the pattern construction are selected depending on the type of product. In the "Model properties" table of the specialized simulation program, 3D OPTITEX PDS, the values are entered corresponding to the anthropometric dimensions of the anthropometric standard SR 13546: 2012 – Clothing. Body dimensions for children between 6 and 19 years old, developed by INCDTP (figure 1).
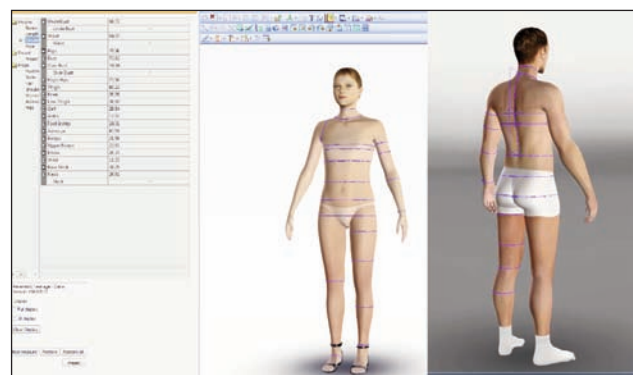

Fig. 1. Parameterization of the virtual mannequin

• **Step 2.** Place the points that define the contour of the desired product on the mannequin using the "Draw Path" function. Depending on the type of the product and its relative location to the support surface, the points corresponding to the main anthropometric points are placed following the markings on

the virtual mannequin and characteristic points of its shape and length.

• **Step 3.** Draw the outline through points in order to obtain a closed contour. The points are joined through contour lines so as to produce 3D surfaces corresponding to the component pieces of the product. These lines change by following the curvature of the body using the "Edit pins" function (figure 2).
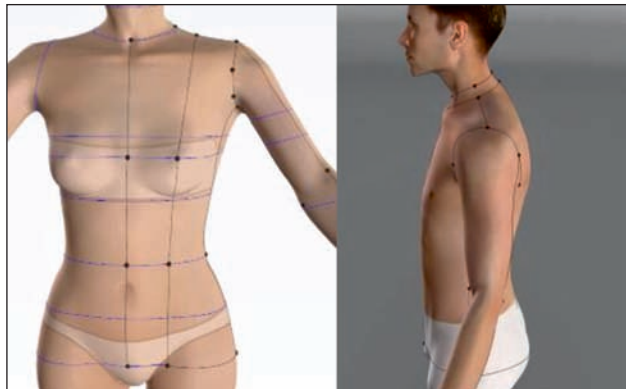

Fig. 2. Drawing the 3D contour of the product through characteristic anthropometric points

• **Step 4.** Flatten 3D surfaces so obtained in 2D surfaces using the "Build Patch" function. This results in the deployable surfaces that are visualized in the Optitex PDS program and where they can be modified using its functions. These surfaces correspond to the shape and dimensions of the body, with markings for the main anthropometric points (figure 3).

Fig. 3. Flatten the surfaces of the 3D product

• **Step 5.** Processing of the 2D surface contour, add product specific additions and obtaining the basic patterns. Depending on the type and silhouette of the product, the specific additions are determined and also the values with which the main segments of the pattern are resized [6–7]. In this process, the position of the main anthropometric points is modified and the contour that passes through these points is processed (figure 4).

Fig. 4. Basic design of the jacket for teenagers

CONCLUSIONS

The newly innovative method, developed and implemented in the research, consists in the realization of the 2D patterns starting from the 3D product, addressed to teenagers of different age groups. The new pattern design method takes into account age-specific requirements, material characteristics, destination of products, and specifically and compulsorily, the new **3D anthropometric dimensions** resulting from the anthropometric survey carried out by INCDTP.

Application of research results will allow the producers and designers of clothing items for teenagers to design products perfectly adapted to their standard sizes as follows:

1. The use of parameters for general characterization of the shape and constructive characteristics of the clothing products for teenagers depending on age category and the destination and the type of product;

2. The use of the necessary 3D anthropometric dimensions and the additions to the development of the design algorithms. The main anthropometric dimension for the determination of the clothing size for teenagers is the body height, the other necessary dimensions being selected from the standard depending on it;

3. The use of the new design method of the 2D patterns starting from the 3D product, which will lead to the development of very precise patterns in a reduced time.

BIBLIOGRAPHY

[1] Babcinetchi, V., *Cercetări în domeniul caracterizării corpului omenesc din punct de vedere antropomorfologic cu aplicații în arta și proiectarea constructivă a vestimentației*, Editura Politehnium, Iasi, 2011, ISBN 978-973-621-383-3

[2] Standard SR 13546/2012. Confecţii. Dimensiunile corpului pentru copii cu varsta cuprinsă între 6 şi 19 ani

[3] Hong, Y., Bruniaux, P., Zhang, J., Liu, K., Dong, M., Chen, Y., *Application of 3D-to-2D garment design for atypical morphology: a design case for physically disabled people with scoliosis*, In: Industria Textila, 2018, 69, 1, pp. 59–64

[4] Rudolf, A., Stjepanovič, Z., Cupar, A., Designing the functional garments for people with physical disabilitiesor kyphosis by using computer simulation techniques, In: Industria Textila, 2019, 70, 2, pp. 182–191

[5] Pintilie, E., Ciubotaru, G., Avădanei, M., *Proiectarea confecţiilor textile asistate de calculator*, 2006, Editura Performantica, Iaşi , ISBN 973-730-259-1

[6] Donnanno, A., *La tecnica dei modelli, Gonne e camicie, Pantaloni e tute*, Editura Ikon editrice, Milano, 2002

[7] Dong, M., Hong, Y., Zhang, J., Liu, K., Wagner, M., Jiang, *A body measurements and sensory evaluation-based classification of lower body shapes for developing customized pants design*, In: Industria Textila, 2018, 69, 2, pp. 111–117

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