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The Usability of 3D Flattening in Design and Pattern Preparation of Tight-Fit Garments

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Abstract

Nowadays aesthetics, comfort and functionality are the most important characteristics of sports garments. To achieve comfort, sports garments are manufactured as combined fractions made of different fabrics providing different characteristics and designs. Preparing patterns which provide the best fit for the tight-fit garments is much harder than the loose fit ones. To find the best fit, many prototypes have to be made, but the manufacturers do not have the necessary time. Thus, 3D Flattening systems provide a way out for the industry, but especially for the sportswear manufacturers.

In this study, firstly, a virtual male model was formed. Afterwards, a fractioned tight-fit male sweatshirt model was designed on this virtual model via Opititex 3D Flattener. As the model was created, the pattern was obtained simultaneously. When the design was completed, 2D patterns were obtained automatically. After virtual stitches and other details were applied, the sweatshirt was dressed on the created male model in order to determine the fit. Eventually, fit of the created design was evaluated.

Keywords: Apparel design, Tight-fit garments, 3D flattening, Computer-aided pattern preparation, Computer-aided design

Vücudu Saran Giysilerin Tasarımında ve Giysi Kalıbı Hazırlığında 3 Boyutlu Açınım Sistemlerinin Kullanılabilirliği

Öz

Günümüzde; estetik görünüm, konfor ve fonksiyonellik spor giyiminin önemli özelliklerini oluşturmaktadır. Giyim konforunun sağlanması için spor giysiler, farklı özellik ve tasarımlarda çeşitli kumaşlar kullanılarak üretilmektedir. Vücuda oturan giysilerin giysi kalıbının doğru ölçülerde hazırlanması, bol giysilere göre daha zordur. Giysinin vücuda uyumunun en iyi olduğu giysi kalıbını belirleyebilmek için birçok prototipin hazırlanması gerekebilmekte ve süreler uzamaktadır. Bu nedenle, 3 boyutlu açınım sistemleri, özellikle spor giyim üreticileri için bir çıkış yolu sağlamaktadır.

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Bu çalışmada öncelikle, bir sanal erkek manken oluşturulmuştur. Ardından, bu sanal model üzerinde Optitex 3 Boyutlu Açınım Sistemi kullanılarak bölüntülü bir sweatshirt modeli tasarlanmıştır. Bu sistem ile sanal manken üzerinde model tasarlandığında, aynı anda giysi kalıpları da hazırlanmaktadır. Tasarım tamamlandığında, 2 boyutlu giysi kalıpları açınım işlemi ile otomatik olarak elde edilmiştir. Daha sonra elde edilen bu 2 boyutlu kalıplar sanal dikiş ile bir araya getirilerek manken üzerinde sanal giydirme işlemi gerçekleştirilmiştir. Çalışma kapsamında tasarlanan modelin vücuda uyumu değerlendirilmiştir.

Anahtar Kelimeler: Giysi Tasarımı, Vücuda oturan giysiler, 3 boyutlu açınım, Bilgisayar destekli kalıp tasarımı, Bilgisayar destekli tasarım

1. INTRODUCTION

Traditional fashion product development is an iterative process, which starts with designers preparing patterns and prototypes based on experiences of similar styles before, trying on the prototype on a dress form for fit evaluation, from which necessary alterations are made and another prototype is prepared. The cycle repeats with a number of trials until a satisfactory fit is achieved [1]. However, results of market research can lead to discarding the design or changing it (in the latter case, another prototype needs to be produced and evaluated). This is a very expensive iterative process for the industry: for any accepted design, many more are discarded and will not go into production [2].

In recent years, the clothing industry has changed due to the industry's increased awareness of fashion and design. As the industry has changed from mass production to mass customization, it has needed to develop new production techniques that provide to individual preferences, particularly apparel fitting that must be incorporated into pattern-making systems. However, while technology may enable mass customization efforts, the processes involved are far from automatic. A significant amount of "behind the scenes" effort is still required in order to provide fit of each garment that might be requested by individual customers [3].

The clothing industry has been using 2D pattern design systems (PDS) to help designers simplify their work for many years, and the industry has recently started to look into 3D features [1]. To improve the efficiency of the garment conception and design phase, a proposed solution is to adopt virtual prototyping techniques. Exploiting 3D virtual garment models would allow the industry to dramatically reduce both the time before going to market and the work costs [2]. Physical simulation would allow designers to visualize the design and drape effect without having to prepare prototype garments [1].

The final shape taken by a garment is often achieved through the incorporation of darts, seams, edges, stiffening pads and local stretch of the fabric. In order to gain credibility, CAD systems should have to functionally handle the level of complexity normally found in garment assemblies combined with a simple interface to specify the constructional detail [4].

Nowadays aesthetics, comfort and functionality are the most important characteristics of sports garments. To achieve comfort, sports garments are manufactured as combined fractions made of different fabrics providing different characteristics and designs. It is an area of expertise to decide where these fractions will be located in order not to disturb the wearer. Preparing patterns which provide the best fit for the tight-fit garments is much harder than the loose fit ones. Therefore, they generally require more prototypes. To be able to see the fit of the garment before preparing a prototype is an important advantage especially for the companies that manufacturing tight-fit garments. Thus, 3D Flattening Systems, which provide i) visualizing designs created as a 2D pattern on a 3D virtual model, ii) showing how changes on the 3D design affect the 2D pattern, iii) "peeling off" parts of a product modeled in 3D and create them as a 2D pattern, have gained more importance [5].

2. METHODS

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In draping technique, pattern is obtained through directly contact of the body and the fabric used is the exact fabric of the garment. Therefore, patterns obtained by draping provide best fit [6]. However, draping is not usable in mass production. Therefore, CAD systems providing virtual fit similar to draping are used.

In this study, firstly, a virtual male model (Figure 1) was formed according to the measurements in Table 1.

Table 1. Naked male model body sizes

Measurements	Values (cm)
Height	180
Chest circumference	105
Under chest circumference	96
Waist circumference	83
Hip circumference	98
Hip depth	17
Knee height	45
Knee circumference	38
Ankle perimeter	22
Inner height	76
Waist height	103
Arm length	61
Elbow circumference	30
Wrist circumference	18
Front height	43
Thigh circumference	57
Calf circumference	39
Biceps circumference	33
Shoulders	44.5
Neck circumference	48

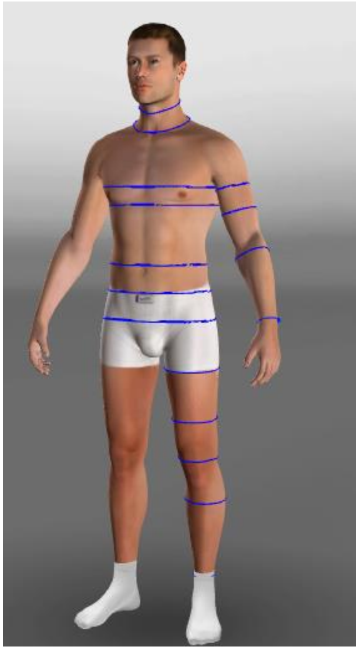

Figure 1. Virtual male model

Afterwards, a fractioned tight-fit male sweatshirt model was designed on this virtual model via Opititex 3D Flattener. As the model was created, the pattern was obtained simultaneously (Figure 2).

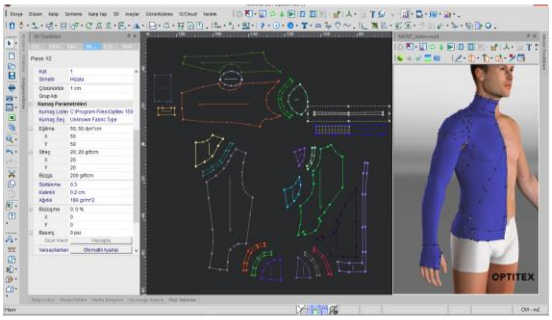

Figure 2. Designing the sweatshirt on the model.

When the design was completed, 2D patterns were obtained automatically by introducing straight line to the system. After virtual stitches and other details were applied, the sweatshirt was dressed on the created male model in order to determine the fit (Figure 3). Details can be seen in Figure 4. Eventually, fit of the created design was evaluated (Figure 5).

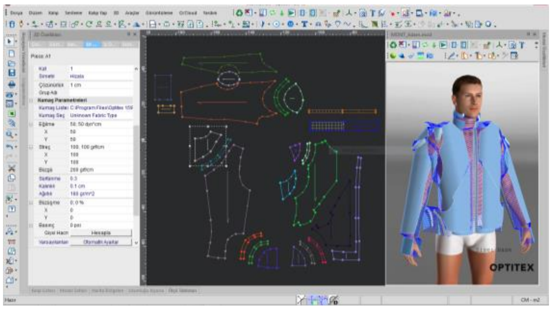

Figure 3. Dressing the created sweatshirt on the model

Figure 4. Details of the created sweatshirt

Figure 5. Front and back views of the dressed sweatshirt

3. CONCLUSION

Fast fashion is a viable trend in fashion industry. Marketing garments fast in an effective and timely way while the fashion trend is still “in” is a must for all the garment manufacturers, as well as for the sportswear manufacturers. However, today’s consumers expect many characteristics from sportswear such as trendy look, functionality and clothing comfort. Therefore, sportswear requires fractioned patterns in order to meet the mentioned expectations. To find the best fit, many prototypes have to be made, but the manufacturers do not have the necessary time. It is important to market the garments in the right time in the right way. Thus, 3D Flattening systems provide a way out for the industry, but especially for the sportswear manufacturers. 3D flattening systems enable to prepare the patterns and at the same time see how the actual garment will behave on the body as in draping technique. In this study, a tight-fit fractioned male sweatshirt was designed on a virtual male model. The patterns were obtained after completing the design. Later, in order to determine the fit, created sweatshirt was dressed on the virtual model and the fit was evaluated. As can be seen in Figure 5, fit of the created design was quite good.

It is possible to reduce the number of prototypes, the time used and the cost by using the flattening systems. Designers see the fit and general look of the garments in the systems and make the necessary changes needed in the design, size or fit in a short time without preparing a prototype. Moreover, time to obtain the patterns is much shorter as the patterns are prepared while the design is formed. On the other hand, downsides of these systems are high cost of investment and the need for an operator with deep pattern knowledge in order to benefit from the advantages of the systems efficiently. Design offices may exploit these systems besides manufacturers. Although 2D pattern design systems have been used in the industry for a long time, 3D flattening systems are relatively new and unknown. Awareness of these systems should be raised.

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