Virtual method of predicting the accuracy of pattern blocks

X Peng1 and V E Kuzmichev2

Department of Clothing Design, Textile Institute, Ivanovo State Polytechnic University, 21, Sheremetev Ave., Ivanovo, Russian Federation

E-mail: 1347507286@qq.com, wkd37@list.ru

Abstract. Main purpose of this study is to develop the virtual method of predicting the misfit based on new obtaining relations between pattern blocks and body features. In our research, digital twin of female body in CLO3D was used. 3D-2D pattern block flattening technology was used to obtain the body prototype of avatar. The ease value of main structural parts for blouse pattern blocks and the proportions of ease value were obtained by respectively overlapping the blouse pattern blocks with the body prototype. Pattern blocks were analyzed and evaluated in terms of the proportions of ease value. New method can be used to analyze and predict the quality of blouse pattern block effectively and improve the efficiency of virtual garment design.

Keyword: virtual try-on, digital twin, blouse, pattern block, misfit, predicting, accuracy, avatar, flattening technology

1. Introduction

With the improvement of people's living standard, people are no longer satisfied with the warmth of clothes, but more concerned with the comfort and fit of clothes. The fit and comfort of clothing depend on the accuracy and quality of the pattern block. At the same time, the structural design of clothing pattern block is an important part of the whole process of clothing design, and the structural design of the pattern block requires professional experience and skills of the patternmaker, and it takes a lot of time to complete the drafting of the pattern block. Therefore, the technical level of the patternmaker greatly determines the correctness of the pattern block and further affects the comfort of the clothing[1]. And then, with the development of 3D virtual-reality technology, there are many manual of pattern block making and some of them aren't good for the customization in virtual reality. In the well-known virtual-reality technologies such as CLO3D, Lectra3D, OptiTex, and V-Stitcher 3D are shown own structural problems, such as shoulder slope is not consistent with human body, unreasonable distribution of ease to bust girth and waist girth, and so on[2]. These problems not only will cause clothing misfit for the customers, but also will cause learning problems for many garment design amateurs or junior garment pattern-makers.

The aim of this research was to create a new method of detecting the blouse pattern block by finding the new relations of sizes of blouse pattern block, on one side, and measurements of avatar, on the other hand.
2. Methods of research

2.1 Blouse pattern blocks

In our research in order to lay the foundation for detecting the pattern block 122 blouse pattern blocks were collected from Chinese manuals and journals. All pattern blocks were drafted in ET CAD system and were classified as X, H, A style[3]. Then blouse patterns were subdivided into slim, regular, and loose types in according to fit. Thus, the blouse pattern block database was obtained.

2.2 Avatar for the experiment

Body type was 160/84A (girth, cm: bust 84, waist 68, girth 90, neck 37, shoulder width 32.6cm, back length 36.2 cm, distance between SNP and SP 9.7cm and between FNP and front waist 33 cm). It were used for obtaining of the avatar by 3D CLO virtual try-on software.

2.3. Prototype of avatar using 3D to 2D pattern block flattening technology

In order to obtain the bodies prototype, we used 3D pattern block making technology in CLO3D software. The 3D avatar surfaces were flattened into 2D garment patterns. The general scheme of the flattening process is: (1) As figure 1 shows, according to the features of the avatar and the shape of garment prototype, the lines of front and back were drawn on the avatar directly. (2) As figure 2 shows, the surface of the garment prototype based on avatar was obtained by using the flattening tool, and the 2D pattern block of the garment prototype after flattening was obtained at the same time[4].

![Figure 1. Structural lines of garment prototype based on avatar](image1)

![Figure 2. Garment prototype based on avatar (a) and flattened 2D pattern blocks (b)](image2)

In order to ensure the accuracy of the flattened 2D pattern block, the lengths of the key structural curves of the 2D pattern blocks after flattening and the main structural curves of the 3D clothing surfaces and the size of each important structural part were compared respectively, such as the lengths
of armhole curves, the length of bust line, and so on. And the test results indicated that the 3D-2D flattening results are precise, which can be used in blouse pattern block checking\cite{5}.

2.4. Predicting the accuracy of blouse pattern blocks

As figure 3 shows, 122 blouse pattern blocks were respectively compared with the garment prototype based on avatar. Secondly, the ease amount of the key parts of the blouse pattern block were obtained by measuring the difference value between the important parts of the blouse pattern blocks and the garment prototype. Thirdly, the proportions between the ease allowance of each important part of blouse pattern blocks with good fit were obtained by using SPSS data analysis software, and the interval of the ease amount in each important part were also obtained at the same time. Based on this, a "avatar-blouse" prediction system for the accuracy of blouse pattern was established to predict the accuracy of pattern blocks.

![Figure 3. The scheme of overlapping blouse pattern blocks and garment prototype](image)

3. Discussion and results

As figures 4 and 5 show, the blouse pattern blocks were compared with the body prototype respectively by using the method showed in the Figure 3. As shown in figure 4, the ease allowance of each important part of blouse pattern blocks were obtained by overlapping blouse pattern blocks with the garment prototype. Then, the proportions of the ease allowance for each key structural part were obtained by computation. And then by comparing the proportions of the ease allowance with the proportions in the "avatar-blouse" prediction system we have established, we found that the proportions of the ease allowance for the blouse pattern block are rational, and the ease allowance of each key structural part is within the range of each allowance. According to the analysis results, we predicted that the blouse pattern blocks are fit. At the same time, as shown in figure 5, the blouse pattern blocks were analyzed by the same way, and we found that the proportions of the ease allowance in shoulder line, neck line and the back part are too large and not consistent with the proportions in the "avatar-blouse" prediction system. Then we predicted that the blouse pattern blocks are misfit. We further used CLO3D virtual try-on software to check the prediction results. By observing the effect of virtual try-on, we found that the shoulder slope of the blouse pattern blocks do not in accordance with the human body, and the ease allowance of neckline is too large, as shown in figure 5. Thus, the rationality and validity of the method for predicting the accuracy of blouse pattern block are further verified.
4. Conclusions and future research

In this study, the body prototype was obtained by using 3D-2D flattening technology. And we obtained the ease allowance of blouse pattern block by overlapping pattern blocks and body prototype. And then we developed the prediction system of “avatar-blouse” to evaluate the blouse pattern blocks based on the proportions and intervals of ease allowance. This approach allows us to predict the accuracy and quality of blouse pattern blocks without making the sample. And then, we can alter misfit problems of the pattern block in terms of prediction results. It will be possible to improve the garment production efficiency and the virtual technology.

References

[1] Kyoungok K, Tsuyoshi O and Masayuki T 2017 Effect of patternmaker’s proficiency on the creation of clothing vol 17, (Poland: AUTEX RES J ) p 120-128

[2] Kuzmichev V, Aleksei M, Evgenii S and Mariia M 2017 Computer reconstruction of 19th century trousers vol 29, (England: International Journal of Clothing Science and Technology) p 594-606

[3] Zhang W B 2010 Pattern making for fashion design (Beijing: China Textile and Apparel Press) pp 68-70

[4] Yang Y C and Zhang W Y 2007 Prototype garment pattern flattening based on individual 3D virtual dummy vol 19, (England: International Journal of Clothing Science and Technology) p 334-348

[5] Kaixuan L, Jianping W, Chun Z and Yan H 2016 Development of upper cycling clothes using 3D-to-2D flattening technology and evaluation of dynamic wear comfort from the aspect of clothing pressure vol 28, (England: International Journal of Clothing Science and Technology) p736-739