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Automatic Generation Method of Different Stand Collar Patterns ⋆

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Abstract

As technology continues to advance, there is a growing interest in personalized customization with diverse styles and a high degree of fit. To address challenges such as long production cycles and high labor and material costs associated with personalized customization, there has been significant research on automatic pattern generation. However, most of these studies focus on relatively single garment styles. Therefore, this paper proposes a method for automatically generating multi-style collar patterns. First, by analyzing the characteristics of stand collar styles, the modules of stand collar are determined, and the control attributes and methods of each module are determined according to the actual needs. Based on this, a modular design method for stand collar is constructed; the neck parameters and stand collar structure are statistically analyzed, and a mapping model between neck parameters and stand collar structure is established; then, the relationship between stand collar modules and paper patterns is analyzed, and a relationship model between numerical control modules and paper pattern parameters is established to achieve the purpose of driving stand collar structure parameters by stand collar styles; then, according to the stand collar structure design method, the key points of the pattern are parameterized, thus realizing the parametric design of the stand collar pattern; finally, using Matlab software, different components are coordinated, and the modular design method and parametric design of stand collar are comprehensively applied to realize the automatic generation of different styles of stand collar patterns. The research shows that the automatic pattern generation method established in this paper can meet the automatic pattern generation of different stand collar styles, and reduce some human and material costs for the pattern making process in the clothing industry.

Keywords: Stand Collar; Garment Modular Design; Parameterized Design; Automatic Pattern Generation

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1 Introduction

The collar is an essential element of the overall modeling of clothing, as it connects the head and the body visually, and reflects the beauty and quality of the garment. Stand collar is a common type of collar, whose appearance directly influences the style and quality of the clothing [1, 2]. To design different Stand collar models, it is necessary to analyze the relationship between the collar structure parameters and the modeling in depth. Moreover, the human neck structure is the basis of the stand collar structure design, and the stand collar structure design should be based on the individual neck structure [3]. The advantage of personalized customization is that it offers diverse styles and high fit, but the slow production cycle is the biggest drawback of customized clothing, and also a major obstacle for the development of personalized clothing [4]. Fortunately, the development of three-dimensional virtual clothing has improved the efficiency of the clothing design process to some extent, and the clothing size customization recommendation based on knowledge discovery and data mining has reduced the error of human body measurement and improved the fit of the clothing [5-8]. However, in personalized clothing customization, the measurement and production of clothing are highly intelligent, but the clothing pattern is still mainly made by manually operating CAD software, lacking intelligence and innovation [9, 10]. Therefore, establishing a system that can automatically generate clothing patterns has important significance and value for personalized clothing customization. At present, the research on stand collar mainly focuses on the influence of stand collar structure parameters on stand collar modeling [11], the relationship between neck modeling and stand collar structure related variables [12], and the correlation between neck circumference, collar height, collar tightness, and neck movement [13], which provide guidance for the modeling design and fit improvement of stand collar. The automatic pattern generation technology of clothing has improved the efficiency of pattern making to some extent, avoided tedious processes, and provided new ideas for the intelligent manufacturing of clothing [14]. The automatic pattern making technology of clothing includes two methods: parametric drawing and artificial intelligence clothing structure design, among which parametric drawing is more suitable for personalized customization [15]. At present, the more mature research in the academic world is to set a series of parameters for a drawing method, and apply geometric constraints or assignment constraints to the paper pattern, and directly generate the corresponding paper pattern, but one geometric constraint or assignment constraint can only correspond to one style, which makes this method have certain limitations [16]. In order to improve the applicability of the style, clothing scholars began to propose a parameterized paper pattern automatic generation model for various clothing styles. Based on geometric constraints or assignment constraints, the parameter setting of style changes is proposed to increase the universality of the paper pattern automatic generation model [17]. However, the parameterized paper pattern automatic generation model still cannot meet the needs of personalized clothing for style diversity. Introducing the clothing modular design method can effectively solve this limitation and enrich the clothing style [18].

This paper proposes a parametric design method for stand collar pattern, and constructs automatic pattern generation for different stand collar styles. The method consists of the following steps: using statistical analysis to establish a mapping model between human neck and stand collar structure parameters; developing a modular design method for stand collar, and creating different stand collar styles by combining different modules; Using the Matlab software to achieve the variety of stand collar design is automatically generated.