

# Acquisition of Plate-making Process Knowledge for Smart Clothing CAD Systems<sup>\*</sup>

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## Abstract

The digital design of the clothing model currently existing in the clothing enterprise is still only an auxiliary tool in the sense of drawing. This type of garment computer-aided design (CAD) systems can not integrate the design principles and knowledge of the clothing professional field, similar design and expert experience into the system, which leads to the need for the plate-making to rely on the personal experience of the pattern maker, and there is a problem of low design efficiency. The intelligent clothing CAD system for tailoring the needs of clothing personalization can solve the defects of traditional CAD by curing the knowledge of clothing layout design. In this paper, through the method of plate-making experiment, the knowledge of garment plate-making process is analyzed and refined, and the garment model design model is constructed by using directed graph. The method of applying the model to smart garment CAD systems is illustrated by an example.

*Keywords:* Intelligent Plate-making; Knowledge Acquisition; Directed Graph

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## 1 Introduction

Although the clothing auxiliary design systems in the traditional sense has been widely used in garment manufacturing enterprises, such systems cannot fully utilize the knowledge in the field, resulting in the inability to realize the reuse of knowledge resources and integration with other design links. Designers still need to a lot of repetitive design work has been carried out, which seriously affects the efficiency of the design of the garment model and the innovative work of the designer. Therefore, people in the clothing profession have conducted different levels of research on knowledge-driven CAD systems, first of all in the field of parametric plate-making technology. Hong Lu [1] used the turning collar as the research object to derive the relationship formula between the lodging amount and the lapel looseness and its changing law, which laid a theoretical foundation for the parametric design of the turning collar. Jie Feng [2] analysed key factors such as roll basic point and collar roll ease and realized the parametric design of a

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rolled collar pattern based on clothing CAD. Yuan-yuan Zhang [3] discussed the principle and the latest technology of digital manufacturing of garment enterprises and obtained digital plate-making techniques for men's suit collars. Li-jun Jiang [4] proposed a three-dimensional model for a collar structure based on the mathematical model of personalized neck features. Feng Feng [5] expounded the design principle of a dynamic garment structure through the conversion of apparel structure diagrams into "directed graphs".

The level of achievement concerning the intelligent clothing plate-making system depends on the accumulation of professional knowledge in the field. Many scholars have also conducted different levels of research on the acquisition of professional apparel knowledge. Chang-peng Hu [6], based on the analysis of suit pattern expert knowledge, used parametric and modular design methods to achieve the intelligent production of the pattern of the suit. Ze-hong Jiang [7], based on customization production, used the method of plate-making experimentation to record the knowledge of men's suit plate-making processes and establish a parameterized relationship model to improve the efficiency of plate-making. Mei-mei Zhao [8] obtained and expressed the knowledge in the process of uniform design based on case design theory and established a knowledge management system, as well as an example database that can be used to calculate and retrieve similar design results. Jin Duan [9], based on the needs of personalized clothing, established a menswear type relationship model through the idea of layered design in order to provide a scientific basis for the establishment of knowledge-driven personalized sizes of male body type in the automatic design and generation of models. Wen-can Zhou [10] constructed clothing field ontology for clothing plate-making knowledge and realized the automatic plate-making of the suit semantic pattern described by the plate maker, which got rid of the dependence on the sample library and plate-making tools and improved the plate-making efficiency.

The existing research results have not been based on the development of intelligent software systems to acquire the process knowledge of garment plate-making. Therefore, this paper proposes a method of knowledge acquisition based on the process of men's suit collar plate-making. This method aims to achieve the acquisition of explicit and implicit knowledge in the process of plate-making and hopes to lay a theoretical foundation for the automation of garment knowledge-based work software.

## **2 Plate-making Process Knowledge**

Software is a tool for knowledge manifestation. The amount of knowledge determines the level of manufacturing and the level of knowledge solidification determines the efficiency of software design. The acquisition and representation of the clothing type design knowledge is the core of the intelligent clothing CAD system that is adapted to the tailor-made production mode of the clothing. Therefore, it is necessary to analyze and summarize the knowledge of the garment plate-making process.

The pattern is a special language of the modern clothing industry, which is the symbol and process parameter basis for the garment design to enter the substantive stage [11]. The knowledge of the garment plate-making process studied in this paper is the process knowledge of pattern design using the design pattern of the prototype pattern and the method of plane drawing. That is, the procedural knowledge of garment plate-making is a description of how to manipulate anthropometric data to achieve the result of garment pattern drawing.