



Research on Application of Computer-Aided Intelligent Manufacturing Technology in Garment Industry Production

Ping Wang^(✉)

College of Art and Design, Guangdong University of Science and Technology, Dongguan, China
28993716@qq.com

Abstract. Based on the current situation of transformation from the computer-aided garment industry to intelligent manufacturing, and taking the application of intelligent manufacturing technology in the garment industry as the mainline, this paper summarizes the development status of computer-aided garment industry production, analyzes and introduces the application research of computer-aided intelligent manufacturing technology in each link. The difficulties of applying intelligent technology to the garment industry are pointed out. Finally, the framework and technical points of application of intelligent garment manufacturing technology are proposed.

Keywords: Intelligent manufacturing · Clothing · Computer-aided design and manufacturing · Clothing industry production

1 Introduction

The rapid development of information technology in today's world has brought new technological assistance to different industries. Garment production, a traditional industry, has also developed rapidly with the help of digital garment technology. Computer technology helps all aspects of the garment industry, such as prenatal design, processing and sales. Finally, all information is collected and collated comprehensively, so that the garment enterprises can maximize the use of resources [1].

As a comprehensive industry, the clothing industry has many considerations such as materials, styles, shapes, colors and crafts, which embodies the aesthetic feeling of clothing and the important role of industrialization in popularizing artistic aesthetic feeling. Its manufacturing process involves many disciplines related to materials, technological processes and technologies that need to be applied. Talking about the application of computer-aided technology in the garment industry, the first computer appeared in the 1940s, and a professor from the Massachusetts Institute of Technology in the 1960s invented the rudiment of CAD (computer aided design) technology. Since then, the computing foundation can do a lot of calculations, process words, and process and display pictures. In the 1970s, the computer-aided system was first applied to Gerber Company in the United States. The computer-aided system includes two functions: grading and

layout, which solved the most important part of garment process design. Then, Britain, Spain, Japan, France, Switzerland and other countries have also introduced computer-aided systems to make clothing industrialized and more efficient. By the end of 1980s, about 45% of garment factories in Europe and America had applied computer-aided technology. Now, the popularity rate of computer-aided technology in China's garment industry is about 15%, which has become a new index to measure the development level of garment enterprises. At the same time, the research scope of computer-aided technology in China is further expanding, and ERP, PDM, MRP and other technologies need to be further applied in actual production [2].

2 The Present Situation of Computer-Aided Garment Industry Production

Development conforms to the improvement of people's economic consumption level and the change of consumption patterns. The garment industry has already begun to change from meeting people's single dressing needs to show people's personalities and expressing their emotions. At present, the computer-aided technologies applied in the garment industry mainly include CAD(computer-aided design), CAPP(computer-aided process planning), CAM (computer-aided manufacturing), And CIMS (computer integrated manufacturing systems), etc. [3].

In addition to being known to all, CAD system can help with style design, more importantly, with the help of this technology, the designer's thoughts and experiences can be well integrated, which can make the layout, grading, layout process design and computer fitting industrialized and streamlined, and make the whole process of clothing industry from design to production and sales more scientific and efficient. But at the same time, at present, the use of CAD only uses an electronic drawing board instead of a brush, and the template can't be automatically generated, so the intelligence of computer-aided technology needs to be further improved.

CAPP system uses the related information in the CAD system to replace the original manual design and drawn process flow chart, process sheet, process analysis table and processing instructions with computers. The production conditions in this transformation process are provided by the CIM system and MIS system, and key information such as material resources and workers' technical level are also entered into these systems to provide support for the CAPP system. At present, the R&D and application of the clothing CAPP system are still in the immature stage, and only a few modules have achieved initial results, such as the process flow chart module, process analysis table and process sheet module. Other functions need to be further studied and tested by experiments [4].

CAM will integrate all the information in CAD and CAPP, and realize the processes of cutting, inspecting cloth and automatic cloth laying through related machines and equipment supported by the computer, besides, it can also transmit information. CIMS collects the information of a series of front-end design processes, manufacturing processes, centralized management systems and other processes through the most advanced digital network technology, and optimizes the garment manufacturing system. Compared with the specific control of the aforementioned technologies, CIMS mainly focuses on grasping macro processes, focusing on maximizing enterprise benefits, realizing intelligence and responding to market that changes faster (Fig. 1).

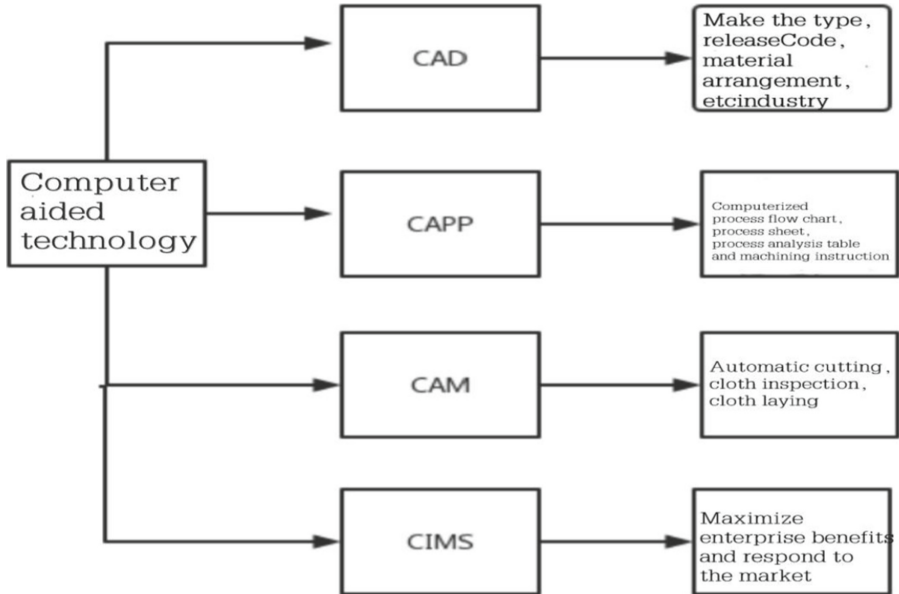


Fig. 1. Main computer auxiliary technology

3 Detailed Application of Computer-Aided Intelligent Manufacturing Technology in All Aspects of Garment Industry Production

3.1 Fashion Design

The application of computer-aided technology in the garment industry has greatly facilitated designers. The clothing industry embodies the requirements for clothing, materials, shapes, styles and colors, and computer-aided technology can unify the aesthetic feeling of art with the efficiency of science and technology.

Graphics processing in computer-aided technology can make sample drawings for clothing design so that designers can complete their artistic ingenuity without the help of paper and pen, and stimulate their creative enthusiasm to the greatest extent. Computer-aided technology can assist the whole design process of clothing industrialization, such as fashion design, printing, sample design, grading and layout subsystem, which greatly promotes the reform process of clothing industrialization. [In the past, designers used to spend a long time designing and creating with pen and paper. Now, designers can learn and absorb all kinds of popular information on the Internet for their use, constantly innovate their ideas, and also communicate directly with customers all over the world to understand their preferences to understand the latest trends, and integrate this trend into their designs. In turn, computer-aided technology will quickly turn designers' design ideas and ideas into reality. Computer-aided technology makes designers' design work faster, more efficient and more creative, and gets rid of the limitation of time and space in drawing with paper and pencil in the past.

Computer-aided technology not only makes the creative design of clothing easier to implement but also makes the modification of design draft more reasonable and efficient. Previously, when producers decided to mass-produce a certain category of clothing, they would comprehensively consider various factors, such as consumer feedback and industry analysis by manufacturers and suppliers, which took a long time. And after this process, the designer has to make major and minor changes to the design draft or even overturn it. If you design with paper and pen as before, it will take more time in the fashion design. Now, with the computer-aided intelligent technology, designers can easily and quickly make changes and can provide more options for clothing manufacturers and suppliers to choose from, which greatly improves the efficiency of clothing design [6].

3.2 Clothing Production Efficiency

The production of a garment often goes through many processes, and computer-aided technology can greatly optimize the workflow, liberate labor in simple overlapping processes and improve work efficiency. Different types of garment industries have to have many identical garment making procedures, especially the conventional leisure garments have the most repetitive work, and if any process is implemented in a different order, it will lead to different results, but if it is manually operated, some mistakes will inevitably occur. However, computer-aided intelligent technology can control risks and reduce mistakes to the minimum probability. People can set up an orderly workflow to develop the production formula that is most suitable for our factory. For example, the garment hanging system makes use of auxiliary tools to enable different workers to get samples for production, improve production efficiency, and manpower can be put into more innovative links [7].

In the specific garment manufacturing process, computer-aided intelligent technology can not only help the cutting and sewing process, but also optimize the specific garment production process and most production processes, and shorten the production cycle. Among them, cutting materials by computer-aided technology can ensure the maximum use of raw materials, and reduce the output of leftover materials, thus not causing excessive waste of raw materials. As for sewing, computer-aided technology has been applied to automatic sewing, buttonhole, buttonhole, upper placket, and zipper machine, which reduces manual errors and improves the overall production efficiency.

In addition, computer-aided technology can also be applied to other management of clothing, such as the management and entry of sales and financial information in enterprise production. With the management of computer-aided technology, the book funds can be better controlled and help to determine the next budget investment.

3.3 Clothing Production Cost

In the past, the garment industry always used the forecasting method to produce, which often caused an inventory backlog due to chasing the fashion trend in a certain period. At the same time, the strong dependence on labor also prevented the industrialization development of clothing. With the help of computer-aided technology, the production process and working procedure of clothing can be optimized, the raw materials can be guaranteed not to be wasted to the maximum extent, and the inventory backlog problem,

which is the biggest headache for clothing manufacturers, can be greatly solved. Now, with the application of computer-aided technology in the garment industry, garment industry practitioners have greatly reduced their production costs and improved the accuracy and accuracy of work.

In the past, the traditional garment industry determined the output, often based on the past production and combined with the current fashion trend to determine the specific output of this batch. No matter how objective the conditions are, the final output determination is based on speculation, so it is not deterministic. If the forecast goes wrong, the cost of regular clothing enterprises will all be lost. In this case, the use of computer-aided intelligent technology to solve the inventory problem becomes just a matter of necessity, and then determines the final profit of the enterprise, which further determines whether the clothing sales end and the supply end have an advantage in the whole market [8].

Computer-aided technology can help to establish a rapid inventory response mechanism, input the inventory quantity into the digital information management system, and enable producers to grasp the existing inventory in time and make timely adjustments. According to the existing reserves and historical inventory analysis, it is convenient for enterprises to control the inventory, effectively reducing the backlog problem, and at the same time, it will give an early warning in time if the inventory is insufficient, which can enable enterprises to regulate and control their macro-production plans.

4 Difficulties in the Application of Computer-Aided Intelligent Manufacturing Technology in Garment Industry Production

At present, although China's garment industry has a large number of computer-aided intelligent technologies to help production, the main application sectors still lie in optimizing specific technological processes and liberating some links with relatively large manual errors, or emphasizing computer-aided intelligent technologies to help manual design and upgrade fabrics, etc., without fully developing the potential of computer-aided intelligent technologies [9].

Ideally, computer-aided skills should not only help designers quickly make clothing models and fill fabrics, but create a free design space and make production highly intelligent to make creative production results.

At present, a prominent difficulty in the implementation of computer-aided technology lies in the field of fashion design. Some experts in Japan have developed a pattern-aided design system by using genetic programming technology (GP), which collects patterns and sizes in clothing production by imitating the chromosome principle of biological inheritance, and deduces patterns that will be welcomed by the market from customers' choices. However, in the actual experiment process, due to the different preferences of style design favored by customers, the response of the finally designed styles in the market is flat. Later, some other experts put forward other methods, such as interactive genetic algorithm (IGA), which relies heavily on the interaction with customers to establish a functional model to evaluate the suitability of styles. However, the pursuit of fitness sacrifices the styles and types of clothing, and at the same time, there is no way to locally modify the designed finished products. In the actual production

of the clothing industry, it is difficult to implement industrialization and scale, and can not effectively promote the design and production of clothing. Therefore, how to better apply computer-aided intelligent technology to garment design is the key to make the garment industry develop better.

5 The Development Direction of the Application of Garment Intelligent Manufacturing Technology

5.1 Application of 3D Technology Nowadays

CAD systems widely used rely on plane graphics. However, with the development of the clothing industry in the new era, dynamic 3D fitting can win better user experience for clothing manufacturers. VR ML technology can rely on a three-dimensional clothing model to visually let people see the effect after wearing clothes. dressing SIM technology in Japan can simulate the flower pattern of two-dimensional drawings and the final effect of upper body color on electronic models through a series of parameters [10].

Three-dimensional dynamic display of simulated clothing is also the development direction of computer-aided technology. In the future, the effect of wearing clothing can be reflected by animation or other forms, so that consumers can get a more intuitive experience.

5.2 Intelligent and Intensive Development

The intelligentization of computer-aided technology is to embed the most advanced subject technologies, such as machine learning, association inspiration and expert system, into the CAD system. The intelligent pattern system allows the pattern maker to quickly input the size to match the most suitable modification of the garment body, collar and sleeves in the system, which can greatly improve the efficiency of proofing. On the other hand, the integrated development of computer technology relies on the technologies such as computer networks and database to gather all the information in the garment production process, such as design data, project plans, sample drawings, etc., to realize the comprehensive application and unified management of individual technologies such as garment CAD, CAPP, cam and ERP.

5.3 Network Communication

The garment industry is highly dependent on the latest fashion information, so whether the information is timely or not determines the profit of the garment industry. Grasping the latest fashion trends and the whole sales situation of the clothing market is very important for manufacturers to plan production and design. Therefore, obtaining the information of the clothing market in time, optimizing transmission speed and responding to the market quickly is the basis for enterprises to survive. Therefore, in the future, computer-aided technology will have a more profound development in clothing information database, remote communication technology and network information collection and processing.

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