

Research on the application status of image recognition technology in textile and clothing field

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Abstract. With the development of the times, computer, information technology gradually penetrated into all walks of life. Textile and clothing design, production, consumption integration of machine vision, graphic image recognition technology development have become a trend. At present, the intelligence degree of the textile and clothing industry has reached an unprecedented new height. In the production and identification of fabrics, the machine vision gradually replaces the manual work, and realizes the automatic and accurate production line. In the design, manufacturing, consumption and other aspects of clothing, image recognition technology has assumed the historical responsibility. Combined with the Internet of things, cloud computing and other technologies, it has improved the production efficiency and achieved intelligent design and production.

1 Introduction

In the Textile Industry "14th Five-Year" Guidance on Science and Technology[1], Fashion and Green Development issued by China National Textile Industry Council, it is clearly pointed out that textile science and technology adheres to innovation-driven development, and actively promotes the research and development and application of key generic technologies and equipment such as intelligent manufacturing and advanced equipment, green manufacturing and advanced textile products, so as to promote the high-quality development of the textile industry. With the continuous improvement of the intelligent level of the textile and clothing field, the integration of computer, information technology and the textile and clothing industry has promoted the process of the intelligent industry. Image recognition technology has gradually become an important tool to obtain and transfer information in this field, such as the identification of fibers and fabrics, textile defects inspection, human body identification, fabric retrieval, clothing style diagram and sample Image recognition, clothing image retrieval and classification, the above aspects are inseparable from the acquisition, analysis, transformation, recognition and other technologies.

The commercial value of fabric image and the public use rate is higher. Both consumers and manufacturers have a need to select fabrics that match their expectations. Fabric image color, texture, shape and other underlying features are relatively simple and clear, easy to be extracted and distinguished by computer. In addition to the retrieval of similar fabrics by comparing fabric images, the computer can also define the

perceptual attributes of some fabrics with obvious characteristics to realize the subjective emotion labeling of fabrics. Such as the analysis of fabric color saturation, contrast, color relationship and texture, pattern, etc. Manually summarize objective indicators into perceptual cognition for fabric retrieval and recommendation.

The key of garment image processing is to extract the target information of garment image from garment image by means of digital image processing technology. Through the effective combination of neural network, support vector machine, deep learning and other methods, clothing image recognition and classification can be realized. Digital image processing technology is used to process clothing images to realize the detection of clothing defects, clothing classification, clothing appearance evaluation, etc. Its significance lies in that the technology makes the acquisition of clothing information no longer limited to the actual clothing, replaces the tedious manual operation, and is more objective and efficient, providing a new method for clothing detection, style recognition, modeling evaluation and so on.

Clothing shopping limited to text retrieval cannot meet the needs of users. Therefore, content-based image retrieval CBIR plays a very important role in clothing sales retrieval and has also been rapidly developed. In recent years, with the development of deep learning, a large number of fabric recognition methods based on neural network learning have appeared.

Image recognition is a technology practice application based on deep learning algorithm[2], its definition can be understood as the use of computer technology for image processing, analysis and

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understanding, in order to identify various forms of targets and objects. With the proposal and application of the concept of deep learning, the technology of using computer technology to analyze and understand graphics and images, and to simulate the way of thinking of people, to extract and classify image information, and to complete recognition has been greatly developed. Image recognition is the process of extracting effective information from the image by simulating human visual function, analyzing and processing the information, and finally forming the standard of detection, measurement and control. The process of image recognition mainly consists of four parts. Firstly, the image acquisition and the pre-processing of the image materials are carried out, then the image segmentation and information extraction are carried out, and finally the recognition and display are carried out. Based on the above steps, the corresponding algorithms and operators are used to identify and display the image data.

After intelligent manufacturing, machine vision technology, Internet of things, cloud computing and other advanced science and technology into the public vision and social life, the textile and garment industry in the production and sales of unprecedented new challenges, technological transformation and upgrading or integration of advanced new technology, to cater to the big data process, organic processing and combination of all kinds of production information data. In the context of technological innovation, it is the general trend to improve production quality and operation efficiency and realize high-quality intelligent production[3].

2 Monitoring function of image recognition technology in textile production process

2.1 Application of machine vision in intelligent spinning process

Through machine vision products instead of human eyes to do measurement and judgment, we call it machine vision, it is mainly to detect the system. The process of machine vision is to use industrial cameras to capture the image of the device we need to be detected. Then the professional image processing software will be used to collect the information into a digital signal, and it is calculated, output results[5].

The process of spinning mainly includes the main processes such as bag catching, flower clearing, carding, combining, roving and spinning. At present, the machine vision detection technology is mainly applied to the non-fiber detection of raw cotton, online detection of carding cotton net, fine yarn processing detection and barrel yarn processing detection and many other key processes. It has not yet involved the process of bag catching, combining and roving.

Machine vision detection technology involves artificial intelligence, neurobiology and other disciplines. In the process of textile production, this technology

mainly uses industrial cameras to obtain real-time image information in the process of production, so as to simulate human visual function. Combined with computer algorithm technology, the image is identified and classified, and the detection data is connected with MES, ERP and other systems to realize real-time data sharing and monitoring, so as to achieve accurate and timely processing of problems in the production process, improve the quality and efficiency of yarn production, reduce the workload of artificial resources, reduce the consumption of artificial resources. The online detection technology based on image recognition was researched and applied earlier in foreign countries. Germany's Trutzschler Company, Switzerland's USTER Company and RIETER Company, etc., took the lead in developing intelligent identification equipment and systems such as isofiber detector, intelligent regulating carding machine and yarn detection system. The carding machine and winding machine developed by Qingdao Hongda Textile Machinery Co., LTD., and the non-fiber sorting machine launched by Beijing Daheng Image Vision Co., LTD., all closely follow the development of machine vision detection and image processing and analysis technology to realize the intelligent real-time detection in the spinning production process, and the key process and real-time data monitoring and judgment of the equipment operation process, in order to achieve high quality Effective combination of production and intelligence. The application of image recognition technology in intelligent spinning production shows that the technology has unique advantages such as non-contact detection, high precision, high efficiency and continuity. It has become an indispensable part in intelligent spinning production and a key condition to guarantee the high quality and efficient intelligent production of intelligent manufacturing and advanced technology equipment.

2.2 Progress in the application of image recognition in fabric defects detection

Fabric defects detection can be divided into process detection and product detection, because the fabric weaving process has the existence of complex process, fast speed, high cost, loom environment danger phenomenon, as well as the diversification of fabric, the complexity of the defects and other conditions, it is not suitable for manual detection in the process. Since the 1980s, foreign countries have carried out research and development on the defects detection system, such as the automatic detection system developed by BARCO (Belgium), EVS (Israel) and USTER (Switzerland), which has become a mature product on the market. At present, after decades of development in the field of fabric defects intelligent detection system research and development, it has fully equipped with the basic functions of defects identification, segmentation, classification and a wide range of applications in production, so that the production efficiency has been rapidly improved, the accuracy and accuracy of discriminating defects has also been basic protection[4].

The image processing method based on machine vision technology can divide the defect detection algorithm into five categories: structural algorithm, statistical method, spectrum analysis method, model method and learning method. The analysis results show that the multi-level detection algorithm usually has better results in practical application [6]. The future development trend will extend and develop towards the direction of timeliness, universality, individuation and precision, so as to realize the predictability of intelligent detection of fabric defects in different directions, different scales and different backgrounds.

3 Application of image recognition technology in clothing design and manufacturing

With the deepening of the research on image recognition technology, its application field is constantly expanding [7]. In the process of garment design and production, human body shape recognition, sample recording, style recognition, automatic cutting and sewing, material arrangement, defect inspection and other links are also applied. The use of embedded control platform, the computer through feature extraction, image segmentation, image matching, clothing design and production of the corresponding links to achieve automatic intelligent management, so that the production process to reduce the workload of staff, and work efficiency and quality have been improved. The outstanding performance is the intelligent cutting and sewing, digital graphics processing, fully automatic discharge technology, intelligent hanging system. Intelligent production of clothing based on machine recognition by learning massive clothing production data and mining the information of intelligent production of clothing, intelligent production of clothing more and more industrial and academic attention through intelligent production, aiming at the characteristics of intelligent and combined with clothing production data, the basic method of intelligent production analysis of clothing based on machine recognition is proposed.

In the field of textile and garment, the graphic recognition system in the process of garment production is mainly composed of two forms: manual recognition and computer vision recognition. The measurement of human body shape and the recognition of garment style drawing and garment pattern drawing are mostly manual recognition. It is completed by the researchers of garment universities and clothing majors. The identification, retrieval, segmentation, classification and labeling of the physical picture of clothing, clothing picture and related images are completed by the researchers of computer identification technology and information identification technology.

Influenced by external conditions such as retrieval efficiency and subjective influence, Human body shape recognition, clothing style map and sample layout recognition, as well as traditional artificial clothing detection, classification and evaluation methods generally have many uncontrollable problems. Therefore,

the application of digital image processing technology in clothing appearance quality detection, clothing style, fabric recognition and classification, and clothing modeling evaluation should be combined to analyze image recognition technology and traditional recognition methods. The paper points out its development trend and application value in the field of clothing.

4 Identification and retrieval of textile and clothing products

At present, with the popularization of the Internet and intelligent electronic products, e-commerce and online shopping have become the inevitable products of social development in the new era[8]. Remote customization of textile and clothing and online purchasing have also become the trend. However, different from other daily necessities, textile and garment products are diversified in color, style, size, fabric and style, which brings difficulties to cloud production and consumption. The image recognition technology arising at the moment brings good news to cloud customization and online consumption of textile and garment.

For a long time, fabric recognition and judgment generally rely on artificial touch and observation to obtain subjective evaluation, the results are easy to be affected by subjective judgment and the experience and physical and mental state of the detection personnel, and the identification efficiency is low and the accuracy is relatively unstable. With the rapid development of the garment industry, the traditional fabric recognition method has been unable to meet the urgent need of the textile industry to pursue low cost labor and high efficiency production [9]. To a large extent, the application of advanced computer image recognition technology to achieve automatic fabric recognition has realized this need. Therefore, in 2002, Lai et al. established KES-FB fabric evaluation system, which comprehensively measured 16 kinds of mechanical properties of fabrics, and then obtained the comprehensive evaluation value of fabrics. In 1998, Fan et al. selected some key characteristic parameters of fabrics based on the physical parameters measured by KES-FB system, and used BP convolutional neural network to realize fabric recognition and evaluation. For the identification and evaluation of fabric, this is undoubtedly an ideal objective evaluation method, but the experimental equipment is expensive, the testing process is tedious, can not achieve a convenient and fast effect. With the rapid development of electronic information technology, the following attempts are made to use image processing method to extract the underlying features of fabric images, and combine fabric attributes to carry out fabric image recognition method, which greatly improves the recognition efficiency and accuracy. Fabric is different from other items because of its anisotropic physical and mechanical properties, and its image texture and shape are slightly different. Therefore, compared with conventional universal images, fabric images have higher similarity, which is difficult to distinguish from a single image recognition. In recent

years, based on the research results, researchers have proposed to identify fabrics through visual properties and tactile detection. Generally, tactile images of fabrics are obtained by using tactile sensors, and the underlying characteristics are obtained. By using training convolutional neural network, parameters of fabric properties and extracted underlying characteristics are learned, so as to construct fabric recognition mode. Through the identification of fabric, the quantitative description and identification of fabric image features are completed, and the problem of automatic identification of fabric image features is solved.

From the technical point of view, the correct identification and analysis of various fabric types and organization structure can provide valuable scientific basis and technical parameter data for fabric design, reference, innovation and imitation. Most of the existing fabric recognition technologies are based on individual fabric feature extraction and recognition. The application of these techniques and methods has made some achievements in theory and practice. But from the function, adaptability and correctness of the existing system, there are still a lot of improvements[10].

From the market point of view, the production of textile industry must revolve around the market. In order to develop new products that better meet the market demand, it is necessary to study and re-innovate existing fabrics at home and abroad. Effective identification and analysis of fabric and its organization is a very important link. The automatic identification and analysis of fabric parameters and structure also provides technical support for learning excellent design ideas from others. To fabricate or improve the produced fabric, it is necessary to analyze the fabric and master the technical data such as the fabric structure and the technical conditions of the machine. It is of great significance for our country to learn foreign advanced fabric design technology and produce textile products suitable for domestic and foreign market.

5 Conclusion

With the proposal of the 14th Five-Year Plan and the vision of China's Intelligent manufacturing 2035, advanced manufacturing technology has become a hot research direction, and the textile and clothing fields are no exception. Computer and information technology are gradually integrated into the design, production, consumption and other links in this field. Computer vision, image recognition, image processing and other related technologies are implanted like bamboo shoots after rain. Textile production quality is an important lifeline for the production and survival of textile enterprises. Mastering efficient and fast production methods is an important factor for the development of enterprises in the front. At present, the research and application of relevant technologies in the textile industry production is mainly focused on automatic detection, defect recognition, defect recognition, fabric recognition, style evaluation, quality assessment, fabric density measurement and automatic identification of

fabric structure, and has made great progress and results. The application prospect of computer image processing and big data analysis technology in textile and garment industry is very broad. If it is further developed and more widely applied, it will bring higher development benefits to the intelligent application level of Chinese textile and garment industry.

Based on the current digital image processing technology in the field of clothing research. Realize the virtual simulation of clothing fabric touch. The construction of intelligent clothing collocation recommendation system is the research focus of realizing intelligence and integration in the field of clothing. Therefore, it is necessary to combine the existing research with the new theory and technology to make the clothing field develop towards a more intelligent and integrated direction.

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