Intelligent development Trend of Traditional Weaving Production Equipment based on IoT and 5G Technology

Jing Liu*
Xijing University, Xi'an, Shaanxi, 710123, China
*Corresponding author: 20170034@xijing.edu.cn

Abstract. Chinese traditional weaving art has also made great progress in the new era, and has been loved by many people at home and abroad. However, due to various constraints, these traditional industries have not been further developed. In this era of rapid development, traditional industries will not shrink back. With the development of IoT and 5g technology, the traditional weaving industry will get a new round of development with the help of new technology. This paper focuses on the intelligent development trend of traditional weaving equipment based on IOT and 5g technology.

Keywords: IoT, 5G, Traditional weaving, Intelligent

1. Introduction
With the development of factory intelligent transformation, IoT as a key support technology connecting people, machines and equipment has been highly valued by enterprises. This demand has greatly stimulated the development of 5g technology and promoted the application of IOT. In the face of complex industrial interconnection requirements, 5g technology needs to adapt to different industrial scenarios and meet most of the connection requirements of the IoT. Therefore, 5g and the IoT are complementary. IoT applications rely on 5g to provide wireless connection solutions for different scenarios. The maturity of 5g technology standard also needs to stimulate and promote IoT application demand.

With the continuous increase of labor costs and the acceleration of the flow of skilled workers, textile companies have increasingly urgent requirements for equipment automation and intelligence. In this context, intelligent manufacturing is becoming the breakthrough and focus of a new round of industrial transformation and upgrading. Looking at the registration trend of China Keqiao International Textile Industry Exhibition in 2020, the exhibition equipment has made great progress in automation and intelligence. For example, the sizing machine to be displayed will be widely used in Internet technology, cloud technology, information processing and other technologies to improve the level of intelligence of the equipment. The automatic threading-in warp equipment that has attracted widespread attention not only uses a large number of non-contact optical detection technologies to realize automatic warping of non-twisted yarns, but also meets the requirements of complex technologies such as color yarn management and warp perforation. At the same time, the man-machine interface and management software are improved, which provides a good equipment foundation for the modern production and management of the weaving workshop.
2. Analysis on the Status Quo of Intelligent Development of Spinning System

The development of the ring spinning system can to a large extent be reflected in its technological innovation. This system adopts the cluster spinning technology, which greatly improves the strength that the production process can withstand, and further improves the spinning and production level of fine special yarns. In addition, there is the full poly spinning technology, which can use a new type of poly spinning process to effectively reduce the hairiness on the surface of the spun yarn, and its uniformity and strength level can be improved. Finally, there are soft spinning technology and embedded composite spinning technology, etc., which can support the production of yarns with a higher level of fineness, and on the basis of improving its production efficiency, it can also improve its products by intelligent means Strength of. In addition, this system has creatively updated its production equipment intelligently. For example, when setting its technical parameters, a computer system is introduced to place the input and output of data under the supervision of the intelligent system, in addition to being equipped with a warning function.

This spinning system can realize the full automation of the spinning production process, and in its spinning process, it uses a capacitive detection instrument, so once a yarn defect occurs, it will automatically correct the yarn in a programmed manner. The spun yarn is cut to ensure the quality of the yarn. The yarn produced by this system not only has excellent strength, but also has tight yarn quality. Compared with the ring spinning system, the yarn produced by it is thicker, but it also has advantages that ring spinning cannot compare. That is, its output is about seven times that of the former. Rotor spinning integrated spinning system the working process of the rotor spinning machine is as follows: After the sliver is fed, the fibers are placed in the circumferential groove with the help of the large draft inside the machine. Next, the fibers are drawn from the rotor through the process of cohesion and arrangement of the circumferential grooves, and then through the processes of kneading and twisting, they are spun into yarns. Finally, it is stored on the roller, and then undergoes a series of detection processes by a photoelectric detector, and finally a high-quality yarn is made. The yarn produced by this spinning system is thicker, and compared to the previous two spinning systems, the woven yarn is more likely to break. But it also has excellent characteristics of wear resistance. It has been widely used in making denim and other fabrics.

3. Application of Smart Technology in Textile Production

Abnormal fiber removal technology: Raw cotton special fiber is a management and technical problem that has plagued textile enterprises for many years, and is closely related to the quality of subsequent products. At present, foreign defibrating intelligent devices can be installed in three links of spinning engineering: The first link is to configure one or two special-shaped units in the cleaning process after the cotton harvester, opener, mixer or cotton machine Fiber identification and removal device, the second step is to configure a special-shaped fiber detection and removal device on the guide frame of the drawing machine. The third link is to expand the automatic yarn clearing function of the winder during the winding process so that it can detect and remove irregular fibers at the same time. The special-shaped fiber cleaning device in the process of cotton cleaning uses air injection to eliminate special-shaped fibers. There are three ways to identify special-shaped fibers: one is to identify special-shaped fibers using the principle of ultrasonic penetration, and the other is to scan the cotton with a CCD high-speed color camera Flow to identify special-shaped fibers. Third, according to the color difference of different reflections of foreign fibers and cotton materials, the use of photoelectric sensors to identify special-shaped fibers has its own advantages, which can be combined with design and comprehensive application to further improve the recognition ability. The special fiber cleaning machine for winder is generally designed according to the principle of spectrum recognition. According to the difference of the gauze projection and reflection signals, identify whether there are different fibers, and drive the cutting machine to remove them. Self-adjusting leveling technology: Auto-leveling technology is a technical measure to control the longitudinal uniformity of the fiber strip. In the form of online control, take the design value of the output fiber line density as a reference value, detect the feed line density or the deviation value of the output line density in real time, and
then change the line speed of the feeder or output element to output the fiber line the linear density remains within the set range. Except for the carding machine, most of the self-leveling devices are installed on the wire drawing machine.

4. Application of Intelligence in Textile Products

Intelligent temperature control textiles: At present, the most mature temperature control fiber is the external air conditioning fiber developed by the American Aerospace Corporation for the moon landing program. The key technology is to polymerize hydrocarbons (HYDROCARBONG wax) microcapsule thermal phase change material in the spinning solution, so that the fiber product can react on the human skin when the ambient temperature changes, and play a buffering role in the temperature change. In addition, the hollow fiber filling method can also fill the hollow part of the fiber with a phase change material to obtain a temperature-regulating fiber. The third method is to coat particles on the surface of the fiber to adjust the temperature, spinning and weaving. The finishing method is to coat the phase change material in the microcapsules, and finish the microcapsules containing the phase change material on the surface of the fabric through a coating or dipping process.

Shape memory smart textiles: through fiber processing or fabric finishing, materials with shape memory functions are introduced into textiles. Under the stimulation of external conditions such as temperature, mechanical force, light, and pH value, the fabric has intelligent shape memory capabilities and a high recovery rate. Its products are called shape memory smart textiles. There are two process routes for obtaining shape memory smart textiles, namely the preparation of shape memory fibers and the finishing of fabrics after shape memory. The preparation of shape memory fibers requires the selection of memory materials such as shape memory alloys, shape memory ceramics, shape memory polymers, and shape memory hydrogels. Memory alloys, memory polymers and memory hydrogels have been used in textiles. Smart antibacterial textiles: Smart antibacterial textiles are textiles that have the function of selectively controlling bacteria. Regardless of whether it is in a static state or an active state, the growth and reproduction of certain microorganisms on the skin surface can be maintained within the normal range. The preparation methods of intelligent antibacterial textiles include: preparation of intelligent antibacterial fibers for textiles and textile finishing. When preparing smart antibacterial fibers, blending silk, composite spinning, grafting modification, etc. can be used, and the smart antibacterial agent can be treated to the surface of the fabric by coating, crosslinking, and direct adsorption.

5. Analysis of the Intelligent Development of the Weaving System

At present, the weaving system of my country's textile industry has achieved unprecedented intelligent development with the efforts of relevant personnel, which is mainly reflected in the following aspects.

First of all, the width of its loom has been greatly improved in recent years. Forty years ago, the width of the loom was only about one meter, but after generations of weavers' research and development and efforts, it has been able to reach a maximum width of six meters. Even many high-level textile companies can build weaving machines with a width of more than eight meters based on certain types of products they specialize in. Secondly, the number of loom shafts has also been increased. Traditional conventional looms generally can only be equipped with one weaving shaft. If it is used in the manufacturing process of ordinary fabrics, it can still handle it. However, many fabrics require at least two weaving shafts to complete production, such as towels and other fabrics. In this case, it is necessary to produce a loom with more than double weaving shafts. As far as the current situation is concerned, as early as many years ago, a loom with six weaving shafts has come out. Now in order to meet the manufacturing needs of higher-level fabrics, weaving has also been able to produce up to 30 weaving shafts. Of the loom. Finally, the progress of the weft insertion system. Although our country's shuttle loom has been invented three thousand years ago, with the development of the times, the shuttleless loom has become more and more popular in the weaving industry. The use of water or air jets to perform textile work can not only meet the needs of different textiles, but also greatly improve the quality of products and meet the needs of customers for different fabrics.
Imagine that in the future intelligent factory with 5g network coverage, when an object fails, it will report the failure to the industrial robot with the highest priority "zero" delay. Under normal circumstances, based on the self-learning experience database, the industrial robot can complete the maintenance work without manual intervention. In another case, if the industrial robot judges the fault, it must be repaired by human.

At this time, even if people are far away from the other end of the earth, they can also remotely control the industrial robots in the weaving factory through a simple VR and remote tactile sensing technology to reach the fault site for maintenance. Industrial robots can synchronize thousands of miles of simulated human motion in real time. At this time, people work in the same place.

5g technology makes it easier for people and industrial robots to deal with more complex scenes. For example, in the case of multiple person collaborative maintenance, even different experts from multiple continents can use VR and remote tactile sensing devices to "gather" at the fault site for the first time. Through the IoT, human and industrial robots, products and raw materials are directly connected to a variety of relevant knowledge and experience databases. In fault diagnosis, human and industrial robots can refer to a lot of experience and professional knowledge to improve the accuracy of problem location.

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