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Retraction

Retracted: Garment Digital Design Method Oriented to the Production Process of Graphene-Modified Nylon Knitted Fabric

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] Z. Zhou, "Garment Digital Design Method Oriented to the Production Process of Graphene-Modified Nylon Knitted Fabric," *Journal of Nanomaterials*, vol. 2022, Article ID 6114483, 13 pages, 2022.

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Research Article

Garment Digital Design Method Oriented to the Production Process of Graphene-Modified Nylon Knitted Fabric

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Graphene is a single-atom-thick layer of carbon atoms, the thinnest material ever discovered. The special single atomic layer structure of graphene makes it have many unique physical and chemical properties, and these excellent properties make graphene have a bright application prospect in the field of composite materials. The use of modern digital production technology to coordinate the management of various production departments of an enterprise can greatly reduce the input of human resources and improve the utilization of materials and equipment resources. In the process of caprolactam monomer polymerization, adding filler is a common method to strengthen and toughen nylon. The main fillers are powder fillers and fibrous materials. In order to make the fillers denatured, the fillers are usually pretreated with a silane coupling agent before modification. This research mainly discusses the digital clothing design method oriented to the production process of graphene-modified nylon knitted fabric. The color of graphene-modified cotton fiber is gray and black. With the increase of graphene content, the color becomes darker. Graphene has become a hotspot in materials science due to its unique two-dimensional crystal structure and excellent mechanical, thermal, and electrical properties. In this paper, the preparation and organic modification of graphene oxide and its application in cast nylon are mainly studied. Therefore, when designing graphene-modified cotton fiber jacquard graphene knitted fabric, the color matching has certain restrictions. The shrinking is to reduce the friction between the fibers through the appropriate concentration of the shrinking agent and improve the stretching and shrinking ability of the wool fiber. The fabric feels plump after shrinking, forming fluff, and improving the warmth retention performance. Due to the different design of the veil material, ground yarn material, and organizational structure of the fabric sample, the basic parameters of the fabric are directly different. Therefore, first perform the width, density, areal density, thickness, and raw material content ratio of the blank sample of the fabric. And wait for testing. In order to realize the digitization of styles, this research has developed a drawing system, which provides a large number of drawing tools to enable designers to draw clothing styles more accurately. The system for digital realization consists of six parts, including desktop environment, drawing tools, linear settings, curve drawing, data storage, and user interface. There are a variety of curves to choose from in computer graphics. The B3 spline curve has become the first choice due to its smoothness, no Runge phenomenon, and few saved data. When the mass fraction of graphene-modified nylon was reduced to 18%, the inhibitory rate of *Staphylococcus aureus* and *Escherichia coli* was still greater than 80%. Nylon/modified graphene oxide nanocomposites with different filler contents were prepared by in situ polymerization with modified graphite oxide as modified filler. The effects of modified graphene oxide on the mechanical properties, wear resistance, and thermal properties of the composites were investigated. This research will promote the development of a customized platform for apparel collaborative management.

1. Introduction

Nylon has the advantages of high strength and good wear resistance and has a wide range of applications in clothing and industrial fields. At present, through the differentiation, higher performance, and multifunctionalization of nylon, it is the trend of nylon development to consolidate and deepen the application of nylon in high-end fields. Graphene is a simple substance formed by the ordered arrangement of carbon on a two-dimensional plane. This unique layered structure enables graphene to have many excellent properties, enabling graphene to be used in various fields. With the continuous development of thermal clothing, the use of new thermal fiber to improve the thermal performance of clothing has become a main development direction. The new graphene-modified fabric is prepared by mixing the graphene and polymer slices to cut the mother particles and then adding the polymer melt spinning fluid. The thermal function of graphene-modified cotton fiber has become a concern.

As the most common material on earth, carbon material is even more wonderful in itself. It is the fundamental material that constitutes the hardest diamond and the softest graphite. Since the appearance of fullerenes and carbon nanotubes, researchers from all over the world have shown great interest in the study of carbon materials. The electrical properties of graphene-modified cotton fiber can reduce the harm of static electricity of woolen products to the human body, while the antibacterial performance is more healthy and hygienic. Relatively speaking, graphene-modified cotton fiber makes the development of multifunctional light knitting fabric have a new exploration direction. In this study, graphene knitted fabrics are more useful by combining with graphene-modified cotton fibers.

These unique properties of graphene make it have a broad application prospect in the fields of field effect devices, sensors, transparent electrodes, photodetectors, solar cells, energy storage devices, polymer composites, nanocomposites, etc. Graphene has a wide range of uses. Bo reported on the design and implementation of multimode optical fiber sensing technology for displacement sensing. Multimode fiber speckle pattern sensor with different core fiber structure is used for sensing spatial information content. The sensor is highly sensitive to the geometry change of the sensing part by using the inner product of the speckle field of multimode fiber. The sensitivity and dynamic range of displacement sensor of heterocore fiber speckle pattern sensor and straight multimode fiber speckle pattern sensor are studied. It is found that the sensitivity of the FSS is as high as 0.1 μm, and the dynamic range is about 3 μm, which is better than the FSS of the straight structure multimode fiber. The dynamic response of noncore FSS displacement was also studied [1]. Liu believes graphene has become a hot topic in the material world. Many applications of graphene have already been produced, including gas sensors, photovoltaics, and field effect transistors. He demonstrated that graphene sheets can be used as an ideal inorganic ingredient to build hybrid polymer hydrogels via supramolecular pathways, which have not yet gained the same popularity as other applications. GO nanosheets were first modified by grafting β-cyclodextrin to chemically transformed graphene (CCG) and then noncovalently functionalized by inclusion complexation of block copolymer Azo-PDMA-B-PNIPam [2]. Modern techniques for using monocrystalline silicon are based on growing high-quality ingots of monocrystalline silicon up to 12 inches in diameter or more. For many applications of graphene, large areas of high-quality (preferably single crystal) materials will be possible. Since it was first grown on copper foil a decade ago, inch-sized single crystal graphene has been achieved. Here, he showed graphene films grown in 20 minutes (5×50) cm^2 size, with >99% ultrahigh oriented grains. This growth is achieved by synthesizing a single crystal Cu(11 11) foil of the size of a meter as the substrate. Graphene islands were epitaxial grown on Cu(11 11) surface. The graphene islands merge seamlessly into graphene films with high single crystallinity and ultrafast growth of graphene films. These achievements were achieved through temperature gradient-driven annealing techniques for the production of single crystal Cu from industrial polycrystalline copper foils and the wonderful effect of continuous oxygen supply from adjacent oxides [3]. Khan presents a novel method for the formation and deposition of copper nanocube-decorated reduced graphene oxide (RGO-CUNCs) nanosheets on indium tin oxide (ITO) electrodes using a very simple method. Cubic copper nanocrystals have been successfully prepared on RGO by chemical reduction at low temperature. He characterized the morphology of the synthesized materials by UV-vis spectroscopy, scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FTIR), and atomic force microscopy (AFM). He found that the CuNCs formed were uniformly and evenly decorated on the RGO nanosheets. This novel ITO/RGO-CUNCs represents a promising platform for future device manufacturing and electrocatalytic applications [4]. Cao believes that van der Waals heterostructures are an emerging class of metamaterials, consisting of vertically stacked two-dimensional building blocks, which provide a huge tool set to design their properties on top of the already rich tunability of two-dimensional materials [5]. Chen studied the binary language multiattribute group decision-making problem for evaluating the design effect of clothing and accessories with incomplete weight information and introduced some basic concepts and operation rules of binary language variables. He established a model based on entropy weight method to determine attribute weight. According to the traditional idea of gray relation analysis (GRA), he determines the optimal alternative by calculating the linguistic degree of each alternative and the gray relation between the positive and negative ideal solutions of binary language. Finally, he gives an illustrative example for evaluating the design effect of clothing and accessories to validate the developed method [6]. According to the current market and research status, there are two types of new fiber: active and passive thermal insulation. The passive thermal fibers are mainly hollow thermal fibers. Many research teams load graphene on textiles through dip rolling, coating, UV curing, and other methods to obtain textiles with far-infrared and antistatic properties, but the durability of the textiles prepared is poor. The graphene surface has no functional groups, so it has limited dispersibility in organic solvents, which severely limits the application prospects of graphene in the preparation of functional materials. Graphene oxide has abundant oxygen-containing functional groups and also has the excellent performance characteristics of graphene.

The exfoliation of graphite oxide in the polymer matrix is a prerequisite for the preparation of nanocomposites with well-dispersed graphite oxide fillers. Therefore, exfoliation treatment of graphite oxide is crucial. At present, solvent-based exfoliation and thermal exfoliation have become the main methods to obtain single-layer graphite oxide. The color of graphene-modified cotton fiber is gray and black. With the increase of graphene content, the color becomes darker. Therefore, when designing graphene-modified cotton fiber jacquard graphene knitted fabric, the color matching has certain restrictions. The shrinking is to reduce the friction between the fibers through the appropriate concentration of the shrinking agent and improve the stretching and shrinking ability of the wool fiber. The fabric feels plump after shrinking, forming fluff, and improving the warmth retention performance. Due to the different design of the veil material, ground yarn material, and organizational structure of the fabric sample, the basic parameters of the fabric are directly different. Therefore, first perform the width, density, areal density, thickness, and raw material content ratio of the blank sample of the fabric. In recent years, seamless knitted fabrics have become the trend of fashion underwear because of their comfort, body sculpting, beauty, fashion, and changing characteristics and are more and more favored by consumers. However, the current seamless knitted fabrics on the market generally use some common materials, and the use of functional fibers is less, so it is difficult to meet people's requirements for healthy and functional clothing fabrics. Graphene composite fiber is a new type of functional fiber, which not only has the conventional characteristics of general fibers but also has far-infrared, antistatic, antiultraviolet, and other properties.

2. Research Methods

2.1. Graphene-Modified Cotton Fiber Jacquard Knitted Fabric Design

2.1.1. Product Weaving Process. The graphene composite fiber is applied to the field of seamless knitting, and the seamless knitted product obtained can not only reflect its inherent comfort and beauty but also endow it with far-infrared, antistatic, antiultraviolet, and other characteristics. The color of graphene-modified cotton fiber is gray and black. With the increase of graphene content, the color becomes darker. Therefore, when designing graphene-modified cotton fiber jacquard graphene knitted fabric, the color matching has certain restrictions. In addition to the white, gray, and black combination of the above-mentioned plain products, in order to have a certain breakthrough in color, a combination of gray and pink is used, and black tops are used to wrap the pattern. The gray yarn is a graphene-based top, and the pink yarn is a conventional top. The graphene-based top is a graphene-based polyester top, and the conventional top uses a mixed top of 60% wool and 40% acrylic. The jacquard pattern and jacquard machine are shown in Figure 1. The main pattern color of the jacquard knitted fabric is red, the edging is black, and the background is gray. The jacquard pattern is shown in Figure 1(a). As a textile tool, the jacquard machine is an important invention in ancient China. Ordinary looms can only weave plain weave fabrics, and fabrics with complex patterns can only be woven by jacquard looms.

The equipment used is a computer jacquard antiair blower artificial fur machine, as shown in Figure 1(b). This machine is a stepper motor controlled top feeding circular knitting machine. It can be used for jacquard and plain color. The pattern capacity is more than 8 million pixels. When designing jacquard fabrics, it can be used for fixed-point jacquard according to various parts of the human body. The artificial fur machine has 18 routes, the machine number is E6, the needle diameter is 27 inches, the total number of needles is 1184, the rated speed is 35 r/min, and the number of knitting colors is 2-8, which is the top of the machine. The number of carding devices, the large cylinder carding head can card the fiber length range of 38~200 mm, the small cylinder carding head can card the fiber length range of 26~127 mm. The positive blowing device is installed on the sinker triangle seat platform, and its main function is to blow the top fiber straight and smooth through the high-pressure fan to weave a plush fabric. On this basis, an antiblowing device is added, which is installed on the edge of the suction hood, and its main function is to blow the top fiber into the knitting needles and knit to form a flat graphene knitted fabric.

The calculated weights form a set of weighted numbers:

$$\beta = \frac{1}{n-1}\sum_{i=1}^{n}(x-x_1)^2 + \frac{1}{n+1}\sum_{i=1}^{n}(y-y_1)^2, \tag{1}$$

$$\overline{\phi} = \sqrt{\phi}. \tag{2}$$

For numerical attributes, the similarity calculation method is

$$\mathrm{sim}(f_1, f_2) = 1 - \frac{|f_1 - f_2|}{1 + |f_1 - f_2|}. \tag{3}$$

Further give the following similarity calculation formula:

$$\mathrm{sim}(f_1, f_2) = \frac{1}{1 + |f_1 - f_2|}. \tag{4}$$

The similarity is as follows:

$$\mathrm{sim}(X_0, X_1) = \frac{\mathrm{count}(x_0, x_1)}{\mathrm{count}(x_0) + \mathrm{count}(x_1)}. \tag{5}$$

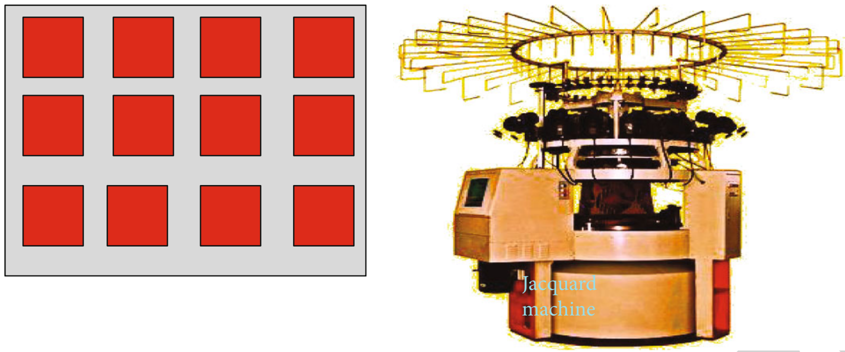
Among them, $\mathrm{count}(x_0)$ is the number of fabric elements [7].

Obtain the preferential membership degree matrix r [8, 9]:

$$r_{i,j} = \frac{\left(x_{i,j} - x_{\min}\right)}{\left(x_{i,j} - x_{\max}\right)}. \tag{6}$$

The similarity of fabric nodes can be calculated using the following formula [10]:

$$\mathrm{sim}(f_1, f_2) = \frac{\sum_{k=1}^{l} s(f_1, f_2)}{z}. \tag{7}$$



(a) Jacquard pattern (b) Computer jacquard antihair faux fur machine

Figure 1: Jacquard type and jacquard machine.

Multiply the weight of the attribute w_i by the above formula [11]:

$$\mathrm{sim}(f_1, f_2) = \frac{\sum_{k=1}^{l} s w_i (f_1, f_2)}{z w_i}. \quad (8)$$

From the definition of cubic spline function, the i-th segment spline function can be expressed as [12, 13]

$$y(x) = \left[(x_1 - x_t)^2, (x_1 - x_t)^3, 1\right] \begin{bmatrix} \frac{2}{h} & \frac{2}{h^2} & \frac{1}{h^3} \\ \frac{2}{h} & 0 & \frac{2}{h} \\ \frac{1}{h^3} & \frac{2}{h^2} & 0 \end{bmatrix}. \quad (9)$$

You can use the condition that the second derivative of the front and back two curve segments is continuous at the type value point to list an equation [14]:

$$\beta m + 2m + \chi m = C. \quad (10)$$

Among them, $\beta = 1/h$.

Need to construct three interpolated cubic splines on the parameter U [15]:

$$\begin{aligned} x &= x(U), \\ y &= y(U), \\ z &= z(U). \end{aligned} \quad (11)$$

The cumulative chord length corresponding to the given value point P is [16]

$$S = \sum_{j=1}^{k} \left| P_j - P_i \right| = \sum_{j=1}^{k} \sqrt{(x - x_i)^2 + (y - y_i)^2}, \quad (12)$$

$$Q(m, n) = Q(m, n) + K(m, n) N(m, n). \quad (13)$$

Take the scale factor at the above feature size as [17]

$$S(m, n) = N(m, n) r * t(m, n). \quad (14)$$

N is the number and S is the area.

Import the pattern into the Design Star artificial fur design system, and set the corresponding flower width and height. This pattern has a flower width of 1184 and a flower height of 210. After the import is successful, carefully check the details of the pattern, such as different colors and misalignment. The colors are arranged in the order of feeding, which are gray tops, pink tops, and black tops. During the feeding process, the gray bottom is fed with graphene-based polyester gray tops, the red part is fed with pink wool and acrylic blended tops, and the black part is fed with black wool and acrylic blended tops. At this time, the system will automatically calculate the ratio of excellent yarns, which is gray, respectively, tops : pink tops : black tops are 43.8% : 27.8% : 28.4%.

After processing the pattern diagram, export the pattern diagram (BMP format), the wool feeding program (WM format), and the needle selection program (XZ format) from the system and import them to the U disk. Copy the three files and transfer them to the control panel. Set the rotation speed to 25 r/min. When the number of cycles (the number of cycles is the total number of yarns plus 1) is 4, the total number of revolutions Z is set to 11318 [18, 19].

$$Z = \left(\frac{x_m}{0.0254}\right) \times \frac{Z_m}{x_L}. \quad (15)$$

Among them, x_m is the number of meters under the cloth. x_L is the number of loops. Z_m is longitudinal density [20].

Calculation of elastic elongation [21]:

$$S = \frac{D_2 - D_1}{D_1} \times 100\%. \quad (16)$$

Air permeability T calculation [22]:

$$T = \frac{Q}{A} \times 167. \quad (17)$$

Q represents the average airflow, and A represents the study area [23].

Moisture permeability calculation [24]:

$$WV = \frac{\Delta m}{A \cdot t}. \quad (18)$$

2.1.2. Product Finishing Process. The general finishing process after the forward and reverse blowing graphene knitted fabric off the machine is gray cloth ⟶ shrinking ⟶ washing ⟶ dehydration ⟶ opening ⟶ shaping ⟶ shearing ⟶ steaming ⟶ finished product.

Shrinking is to reduce the friction between the fibers through the appropriate concentration of the shrinking agent and improve the stretching and shrinking ability of the wool fiber. The fabric feels plump after shrinking, forming fluff, and improving the warmth retention performance. This product uses a weakly acidic surfactant with a pH between 5.5 and 6.0 and calcium chloride with a concentration of 5%. Calcium chloride improves the separation of wool fibers and prevents excessive felting of wool fibers, thereby obtaining better shrinkage. With acid shrinking, the shrinking effect is better when the temperature is higher, so the temperature is set to 42°C.

The setting equipment is a hot air setting machine with a setting speed of 13 m/min, a steam pressure of 4 kg/cm^2, a cloth drop speed of 12.2 m/min, and a post-overfeeding speed and a cold water roll speed of 12.4 m/min.

Shearing adopts the method of moving cloth forward and round knife forward rotation, and the rotation speed of the round knife is set to 1000 rpm/min. Shearing makes the surface of the fabric more uniform and has a better gloss.

The steaming equipment is XHL-1900 continuous steaming machine, the steaming temperature is set to 130°C, and the speed is 20 m/min.

2.2. Finishing Process of Graphene-Modified Cotton Fiber Knitted Fabric

2.2.1. Experimental Fabric Design. Design a thin graphene knitted fabric with wool, polyester, and nylon in raw materials. The two sides of the fabric formed by the double-sided structure can show different properties and styles through different materials, and the fabric is richer and has a certain fluffy feeling. Four ways are 55dtex nylon filaments, 5 ways are blended yarns of 20% wool and 80% polyester, and 6 ways are 55ditex graphene-modified nylon filaments. The knitting result of the thin knitted fabric is shown in Figure 2. The equipment is E 40 double-sided circular knitting machine.

2.2.2. Finishing Process Design. Boiling it can make the thin woolen cloth smooth and dense, stiff, smooth, and elastic. The setting is to stabilize the performance of polyester and nylon filaments, thereby improving the dimensional stability of thin wool. The effect of steaming on the structure and style of thin woolen cloth is similar to the cooking process, which makes the woolen cloth smoother and the body bones more elastic. Therefore, the postfinishing process of formulating thin knitted fabrics is gray cloth ⟶ cooking ⟶ dehydration ⟶ opening ⟶ wet inspection ⟶ shaping ⟶ shearing ⟶ steaming ⟶ finished product.

(1) Cook It. In order to make the fabric smooth and compact and obtain a crisp feel, it is necessary to carry out the cooking process. The cooking process parameters are set to a temperature of 90 degrees Celsius and a time of 50 minutes, and softener is added when the temperature is slowly cooled to below 40 degrees Celsius by adding cold water.

(2) Finalize. In order to make the surface of the fabric smooth and prevent the fabric from wrinkling, it is necessary to shape and finish the sample. The shaping process parameters are temperature 160 degrees Celsius, speed 30 m/min, and width 160 cm.

(3) Steaming. Steaming is to improve the stability and flatness of the cloth surface, while improving the gloss and feel of the cloth surface. Because the fabric is light and dense, in order to improve the feel of the fabric as much as possible, the feeding speed should be reduced. The setting parameters of the steaming process are temperature 170 degrees Celsius, speed 5 m/min, and tension 80 N.

2.3. Basic Parameter Test of Rough Sample. The structural parameters of the fabric have a certain influence on the wearability of the fabric. Due to the different design of the veil material, ground yarn material, and organizational structure of the fabric sample, the basic parameters of the fabric are directly different. Therefore, first perform the width, density, areal density, thickness, and raw material content ratio of the blank sample of the fabric. Then, wait for testing. The basic parameters of the blank sample are shown in Table 1.

(1) Fabric density test: place the sample flat on the table without stretching or widening. The Y51IB fabric density mirror was used to measure the longitudinal density and lateral density of different samples from the warp and weft directions of the sample. The unit is circle/cm

(2) Fabric thickness test: the YG(B)141D digital fabric thickness meter with an accuracy of 0.01 mm is used, and the standard used is GB/T 3820-1997 "Determination of Thickness of Textiles and Textile Products"

(3) Fabric surface density test: a FA1004 electronic balance with an accuracy of 0.0001 g is used to weigh the mass of the sample. The experimental procedure is in accordance with FZ/T 70010-2006 "Determination of the Dry Weight of Knitted Fabrics in Square Meters"

(4) Spandex content test: the veil, ground yarn, and spandex are detached from the fabric manually and

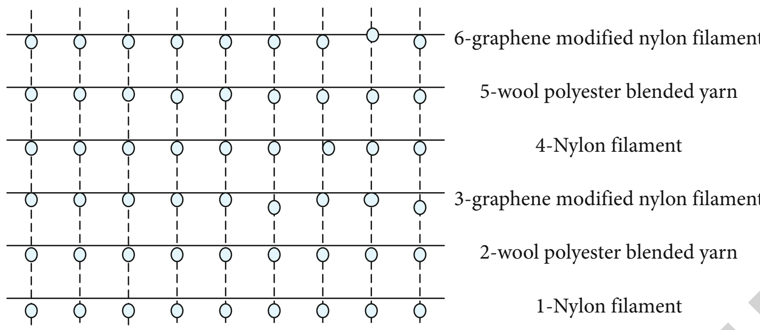


Figure 2: Knitting results for thin knit woolen fabric.

Table 1: Basic parameters of the blank test samples.

Sample number	Areal density (g/m^2)	Thickness (mm) 0.829	Spandex content (%) 5.87	Width (m) 0.228
#1	256.20	2.222	5.72	0.225
#2	285.97	2.422	6.25	0.225
#3	226.89	2.272	6.22	0.220
#4	206.27	0.882	6.22	0.220
#6	262.54	2.202	5.64	0.226
#7	277.57	2.252	5.82	0.228
#8	282.52	2.472	5.92	0.220
#9	225.26	0.864	6.22	0.225

then dried and cooled before being weighed. Finally, calculate the spandex content Q:

$$Q = \frac{P}{M + N + P} \times 100\%. \quad (19)$$

M is the veil, N is the ground yarn, and P is the spandex.

If the total time used to produce a suit jacket is T_1, the total time used for each machine position is

$$T = \frac{T_1}{N}. \quad (20)$$

2.4. Digitization of Clothing Styles. There are many commonly used drawing software, such as Photoshop, Adobeimage, and AutoCAD. In order to realize the digitization of styles, this research has developed a drawing system, which provides a large number of drawing tools so that designers can more accurately complete the drawing of clothing styles. After the styles are drawn, they will be stored in the library for recall. This can not only improve the efficiency of designing clothing but also save the designed clothing according to the parts, so as to provide nonprofessional designers for selection, splicing, modification, and other recreation. The digital processing plan of clothing is shown in Figure 3.

2.4.1. Basic System Environment. Hardware environment is Pentium 4 PC, color laser printer.

Software environment is Win2000 Server operating platform, Microsoft SQL Server 2000 database management system.

Development tools are Microsoft Visual c++6.0, Access 2000, Adobe Photoshop, CorelDRAW.

For users and fashion designers, there are mainly the following requirements:

(1) Each clothing style is uniformly divided into collars, pieces, sleeves, pants, or skirts. Designers must strictly follow this order when drawing styles

(2) The software should provide designers with enough drawing tools so that they can input clothing styles more accurately, including the elimination tool and the tool to get the mirror image of the drawing about the axis of symmetry of the screen

(3) After the designer finishes drawing a garment part, he must save it before he can continue drawing the next part. After saving a part, the part will be displayed in gray, indicating that the part has not been placed

(4) When inputting detailed points and lines, the software provides the designer with abbreviated display of each detail for his selection

2.4.2. Curve and Its Storage Method. There are a variety of curves to choose from in computer graphics, and B3 spline is preferred due to its smoothness everywhere, no lattice phenomenon, and less data.

In the course of the work, the junction of the curve is uncertain, so the chain table is used to store the curve.

2.4.3. Digital Realization. The system for digital realization consists of six parts, including desktop environment, drawing tools, linear settings, curve drawing, data storage, and user interface.

Among them, the desktop environment module contains two classes: COMyBitmap and CWorkEnviroment. The former is a simple encapsulation of the functions of the CBit map class. It can display a bitmap with a transparent background. In the graphics input system, the ClyBit map class is used to display the entry and other details of the clothing as a template for drawing clothing. The latter saves all the

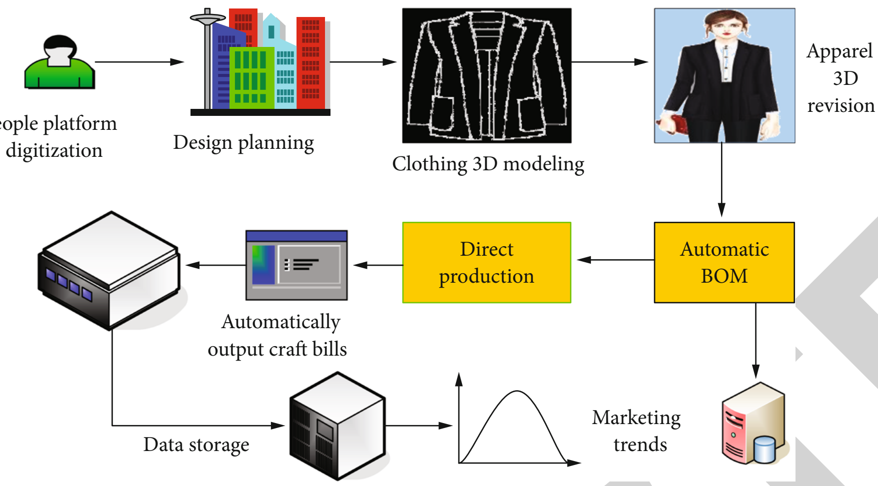


Figure 3: Clothing digital processing scheme.

environment parameters of the desktop, including the color of the current brush, the display ratio, and the height and width of the desktop.

The database has established three tables for each part, which are used to store the information of the points on the curve, the information of the curve, and the information of the parts.

When saving clothing parts, select the point selection tool, click the node or line with the right mouse button to display its number, and, at the same time, you can save the details of the selected point and line. This is an important step in the digitization of clothing styles. The correct and detailed definition of key points or lines is the basis for intelligent transformation of clothing. Figure 4 shows the digital intelligent design of clothing.

3. Results

Without instructions, the customer will study the details according to his selected style or sample style. The production process sheet is a guiding document for the workshop workers to process and make garments. Therefore, these contents need to be recorded in the customer-specific RFID tags. Clothing customization needs to redesign the process according to the customer's requirements. In order to reduce the operation time of the personnel, the basic craft sheet can be made in advance. After the system reads the customer style information, it will automatically jump out modification of the craft list which can form a customer's personalized craft list. This method of making documents greatly reduces the time to remake the craft sheet, and the technicians only need to click to select or input a few sentences to complete the production. The content of the subpage of the "production" link of the digital production process sheet is shown in Figure 5.

Click to enter the production sheet section, the production sheet that has been made will display "modify," and the customer column that has not been made will display the "make" link. The homepages of production sections such as production notices, production process sheets, production processes, and RFID tags are all in tabular form, as shown in Table 2.

Set up a buffer zone for the stock of flour and accessories, and set a red line for the stock volume to ensure the stability of the buffer stock. When the inventory is below the red line, the management staff immediately contact the supplier to supplement the materials, instead of waiting until the surface accessories have been consumed. The traditional inventory only needs to keep the noodles and accessories. When the production department needs the materials, the outbound management is done. The material management under the digital collaborative management requires the management personnel to prepare in advance based on the daily fabric sales data and the inventory balance. This mechanism can ensure that as long as the fabric is displayed at the front end of the sales, the production department can provide enough processing materials, and the overall production process will not be affected by the lack of stock. At the same time, we can arrange customized production sequence and adjust production technology according to the availability of surface accessories. In the material management module, it is possible to know the inventory situation at any time and, according to the sales situation of last week, combined with the inventory red line, determine whether to request replenishment. Material management is shown in Table 3.

According to 50% calculation, the lowest market price and garment price are shown in Table 4. The cost of the vest is lower, and the use of yarn replacement to keep warm can also reduce a certain cost. The thicker the fabric weave, the greater the cost. Because the factory's products need to maintain a 15% profit, agents and shopping malls also have a certain profit, so the sales price is generally more than 50% of the cost. The retail price of the clothing is 198 yuan, and the actual purchase price is 89 yuan. Therefore, the clothing designed in this study is moderately priced in the market and has a certain market potential.

The fabric comparison of different samples is shown in Table 5. It can be seen from Table 5 that the ground yarns of the fabrics of the 9 samples are all nylon, so the antipilling performance is the same for the inside of the fabric. The veil

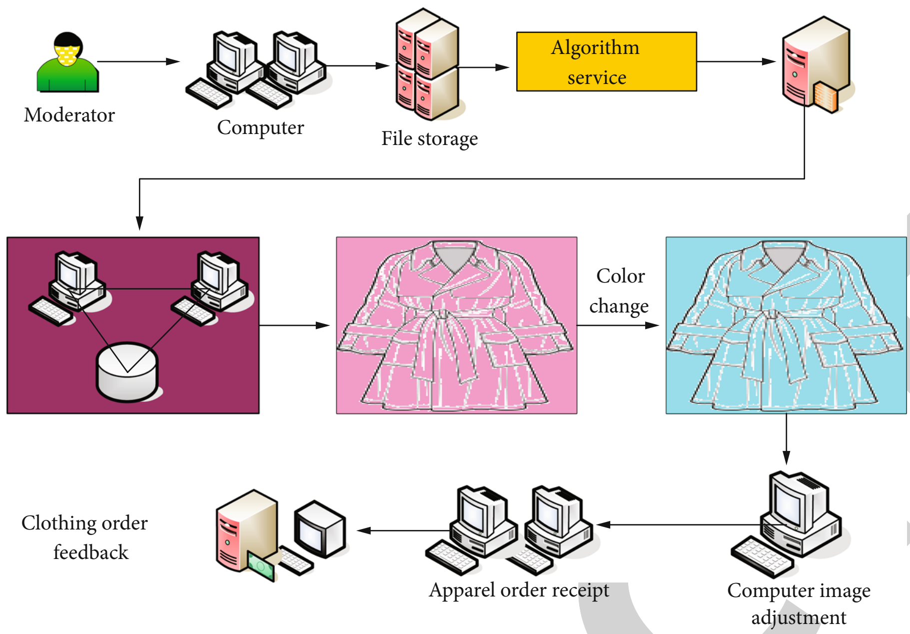


Figure 4: Digital and intelligent design of clothing.

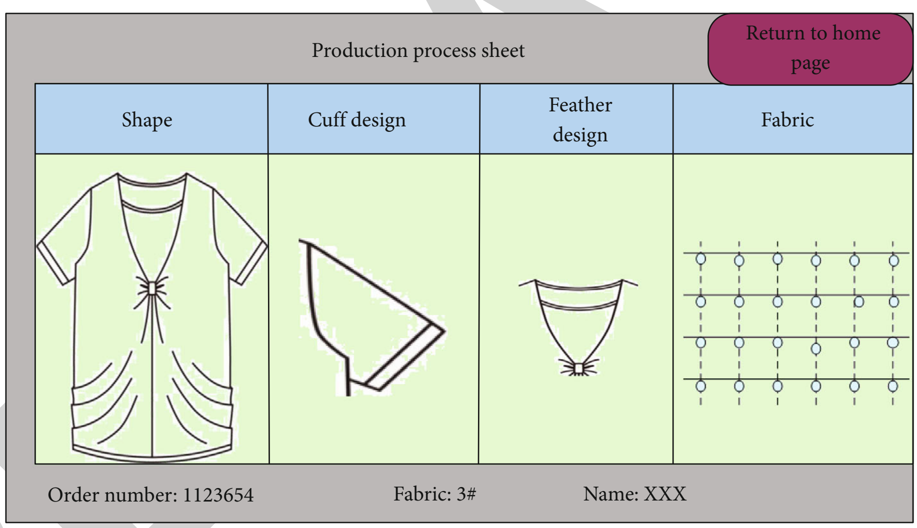


Figure 5: Subpage content of the digital production process list.

Table 2: Home table form.

Customer serial number	Order number	Notice/process/process/RFID
1	2222356	Make
2	2222357	Make
3	2222358	Make
4	2222359	Make
5	2222360	Revise
6	2222362	Revise
7	2222362	Revise

of the fabric is different, and the antipilling performance is different. The veil is nylon, which has a high resistance to pilling, and there is almost no pilling after rubbing for 7000. The antipilling performance of the fabric using viscose is relatively low. After 2000, serious pilling has been produced on the surface of the fabric. Experiments show that the fuzzing and pilling resistance of the veil made of nylon is better than that of the veil made of viscose. Nylon is not easy to fuzz and pill, which has little effect on the appearance of the fabric.

After the fabric was irradiated with a full-spectrum UVB metal halide solar lamp for 10 minutes, samples 1-6 rose to the highest temperature, and samples 2 and 5 were higher than other fabrics. Turn off the metal halide solar lamp, and each sample undergoes a 10-minute cooling process.

Table 3: Material management.

Type code	Style description	Last week's sales	Inventory balance	Inventory red line
#1	6% cotton, 94% polyester	11 meters	345	300 m
#3	Oxford fabric	23 meters	128	150 m
#4	2% chemical fiber, stripes	168 meters	456	400 m
#2	Pure cotton red	123 meters	785	200 m

Table 4: The minimum market price and ready-to-wear price are calculated at 50%.

Clothing style	$X1$	$X2$	$X3$	$Y1$	$Y2$
Cost price (yuan)	22	22	41	42	30
Lowest market price (yuan)	34	67	62	63	45

Table 5: Fabric comparison for different samples.

Clothing style	#1	#2	#3	#4	#5	#6	#7	#8
125	4.7	4	4.7	3.7	4	4.7	7	4
500	4	3	3	3.7	7	3	3.7	3
1000	7	3	3	3	3.7	3	3.7	3
2000	7	1.7	3.7	1	1	1	7	1
5000	7	1.1	3	1	3	1.7	7	1
7000	4.7	1	3.7	1.7	3.7	1.7	7	1.7

The final temperature of sample 2 is close to sample 1 and higher than sample 3, and the temperature of sample 5 is close to sample 4 and higher than sample 6. It can be seen that when graphene-modified nylon is on the surface of the fabric, the fabric has better heat storage performance. Graphene-modified nylon heat storage performance is shown in Figure 6.

The test results of the fabric's thermal insulation performance are shown in Figure 7. The veil of sample 2 uses graphene-modified nylon, and the heat preservation rate is higher than that of other fabrics. Judging from this, when the coverage of the graphene-modified nylon on the surface of the fabric increases, the warmth retention of the fabric is improved. The main reason is that the surface of the graphene-modified nylon has particulate matter, which increases its specific surface area and has more voids in the composition. The formation of still air is relatively more.

The mass fraction of graphene-modified nylon of sample 1 is 40%, and the corresponding *Staphylococcus aureus* and *Escherichia coli* have the highest antibacterial rate. When the mass fraction of graphene-modified nylon is reduced to 18%, *Staphylococcus aureus* has antibacterial rate of bacilli which is still greater than 80%. Graphene-modified nylon makes knitted fabrics have longer-lasting antibacterial properties, and when the mass fraction of graphene-modified nylon reaches 18%, the antibacterial properties of knitted fabrics can meet the standard. The antibacterial effect is shown in Figure 8.

Orthogonal experiment to explore the relationship between temperature, time, and expansion rate is shown in Figure 9. As the temperature increases, the expansion rate increases and then decreases. The longer the time, the greater the expansion rate, which will decrease after 30 s.

Fourier transform infrared spectroscopy is used to study the chemical structure of fibers. It can be seen that fiber 1 and fiber 2 have weak amide characteristic peaks around 1720 cm (respectively, -CO-NH- stretching vibration and bending vibration), while the modified graphene fiber does not show corresponding characteristics. Peak, which shows that during the formation of fiber 1 and fiber 2, the carboxyl groups on the modified graphene sheet are ionized and form noncovalent ionic bridges with the coupling agent. During the fiber drying process, in the process, with the volatilization of the solvent between the sheets, the distance between the modified graphene sheets decreases so that the ion bridge can be further reacted into a covalent bond form. The transition from ionic bridges to covalent bonds can enhance the mechanical properties of the fibers. Among them, such a transformation is more significant in fiber 2. Fourier transform means that a function that satisfies certain conditions can be expressed as a trigonometric function (sine and/or cosine function) or a linear combination of their integrals. In different research fields, Fourier transform has many different variants, such as continuous Fourier transform and discrete Fourier transform.

The mechanical properties of the fiber can be characterized by a tensile machine. In the characterization, the original size of the fiber is 1 cm, and the stretching rate is 10%/min. The final value obtained is the average value obtained by testing at least 10 samples of each fiber. Dried fiber 1 and fiber 2 prepared by this method have good mechanical strength. The mechanical strength of fiber 2, fiber 1, and modified graphene fibers can reach 356 MPa, 296 MPa, and 148MPa, respectively, and their mechanical strength is comparable to modified graphene fibers and CNTs obtained by other wet spinning methods. At the same time, the fiber is also flexible and can be bent into different shapes or spun into a textile structure. High bulk density and large ion accessible surface area are two prerequisites for supercapacitor electrodes to achieve high volume capacity. The infrared spectra and tensile properties of fiber 1, fiber 2, and modified graphene fibers are shown in Figure 10.

4. Discussion

At present, the main types of thermal underwear on the market include pure cotton underwear, cashmere thermal underwear, and wool thermal underwear. The advantages of pure cotton underwear are breathable, moisture-permeable, soft, and comfortable, but its disadvantages are easy

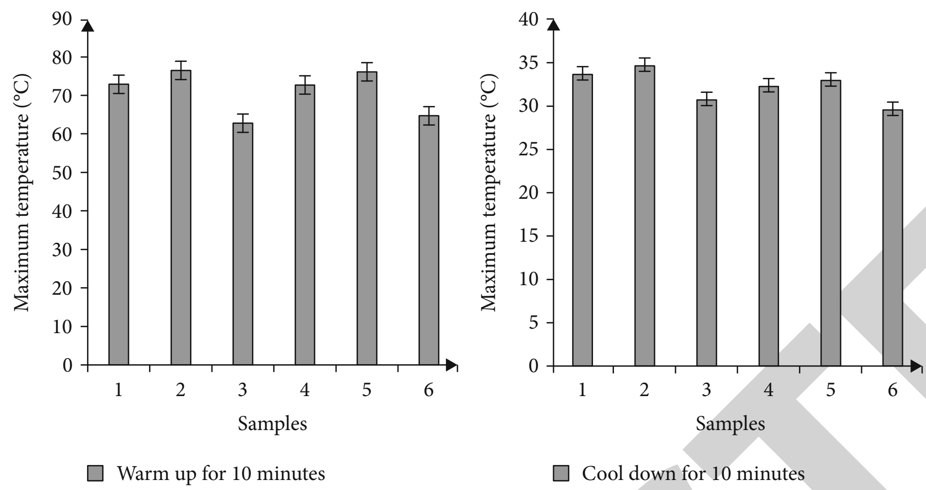


Figure 6: Thermal storage properties of graphene-modified nylon.

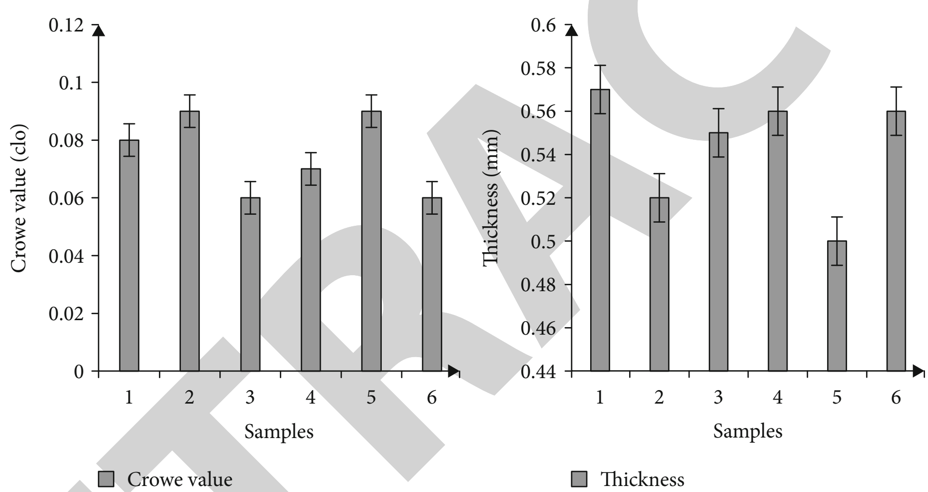


Figure 7: Test results of the insulation performance of the fabric.

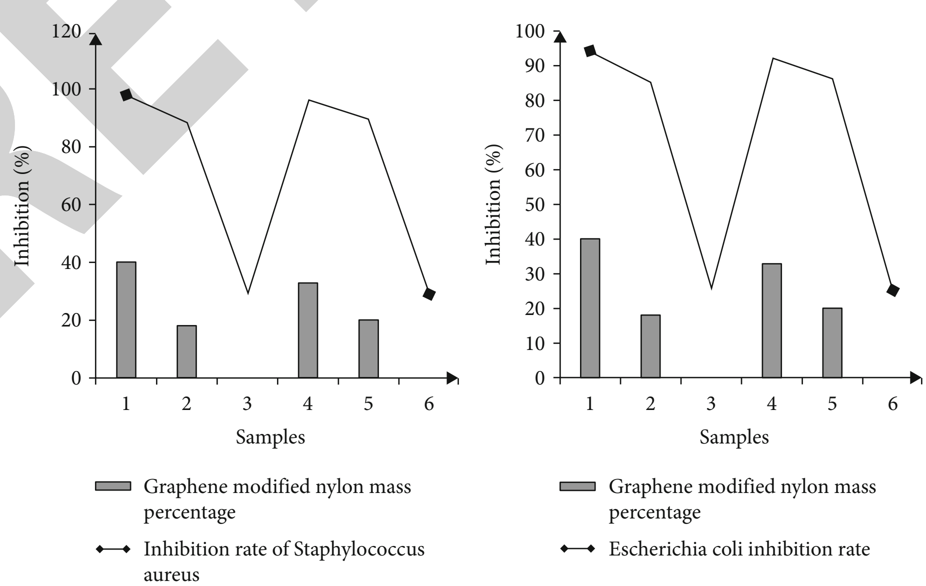


Figure 8: Antibacterial effect.

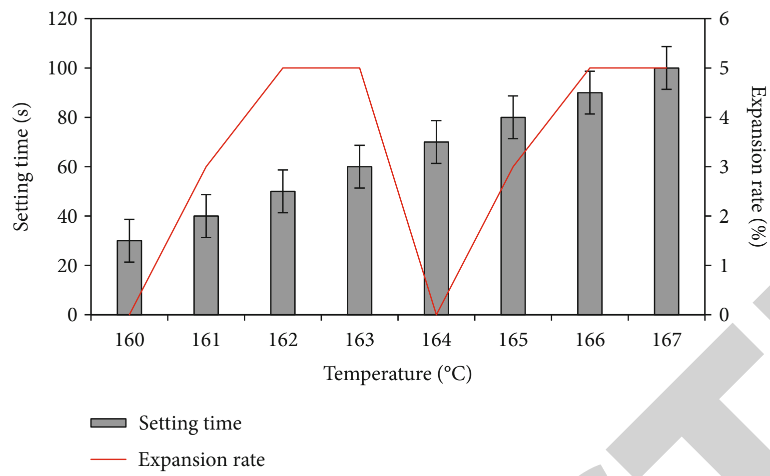


FIGURE 9: The relation between the time and the amplification rate.

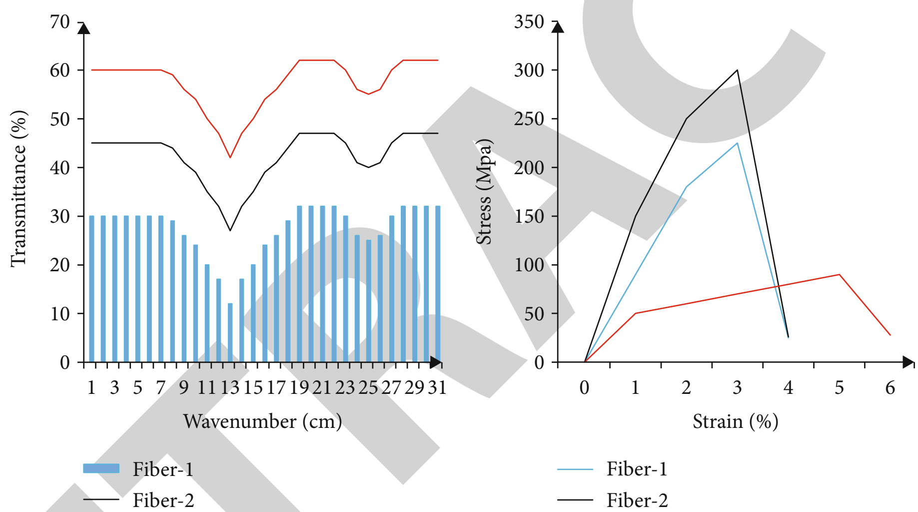


FIGURE 10: Infrared map and tensile properties of fiber 1, fiber 2, and modified graphene fibers.

to shrink, easy to deform, and not close to the body; cashmere thermal underwear has the advantages of soft, slippery, comfortable, and dry. There is a high content of still air inside the fabric, and the curled fluff on the surface of the fabric also enhances the fabric's elasticity, warmth retention, and bulkiness, making the underwear more elastic. Cashmere fabric can also quickly discharge sweat and quickly adjust the temperature to make people feel comfortable according to the external environment. However, the output of cashmere is relatively rare, and its price is relatively high; most of the wool used in wool thermal underwear is merino wool. Merino wool has delicate fabrics and has the advantages of being comfortable to wear next to the body, without any irritation. In addition to its good heat retention and moisture absorption, it also has a more comfortable stretch tension. In China, in the 1950s, a method of adding warmth to people with warm colors was adopted. Long ago, thermal underwear used was mostly cotton wool, which is comfortable and warm, and by increasing its thickness to reduce heat loss, thereby improving the thermal effect of underwear. However, the thickness of the clothing is not linearly related to the warmth retention effect, and the warmth retention effect will decrease when it is thicker to a certain stage. In addition, the continuous increase in the thickness of underwear also seriously affects people's free movement and beauty. In order to make thermal underwear not only have good thermal insulation properties but also reduce the thickness of clothing, people have introduced various thermal underwear [25, 26].

The preservation of key lines and key points of components is the more cumbersome part of the digital preservation process, but it is also the basis for the intelligent realization of the software, because only the definition of each key line and each key point can be used to make these inputs The lines are no longer ordinary drawing lines, but smart lines that can be changed according to the requirements of the designer and can be combined and transformed in place according to instructions. The digital realization of clothing styles is the basic part of the entire clothing design software, and the purpose is to serve the display and changes of subsequent clothing styles. Since the display of clothing styles requires a large number of fully defined original clothing styles as a basis, professional designers need to draw the required styles into the library. This drawing and storage of the digital clothing design system research process is the digital process of styles [27, 28]. How to enable professional designers to input styles accurately and as easily as possible has become the most important problem in the design process of this research [29].

With the development of industrialization, in order to reduce the cutting and stitching process in the traditional knitting process, seamless knitting technology has begun to be developed. Seamless garments can be woven not only on circular knitting machines but also on flat knitting machines. Seamless flat knitting machines can weave multiple tubular fabrics at the same time and connect them directly in the production process. The intelligence of a computer is given by people. When the designer enters the style into the computer, the computer does not know that the input line is the neckline, which is the neckline, or the combination of these lines is a collar, it just records the entire line in a picture format just the picture. Therefore, simply using the brush to draw how many styles on the computer can not realize the future intelligent call, so assigning values to the drawn lines and points has become a prerequisite for achieving intelligence [30, 31].

5. Conclusion

This research mainly discusses the digital clothing design method oriented to the production process of graphene-modified nylon knitted fabric. The color of graphene-modified cotton fiber is gray and black. With the increase of graphene content, the color becomes darker. Therefore, when designing graphene-modified cotton fiber jacquard graphene knitted fabric, the color matching has certain restrictions. The fabric feels plump after shrinking, forming fluff, and improving the warmth retention performance. Due to the different design of the veil material, ground yarn material, and organizational structure of the fabric sample, the basic parameters of the fabric are directly different. Therefore, first perform the width, density, areal density, thickness, and raw material content ratio of the blank sample of the fabric. The customization system platform was developed in research and changed the custom model of customers in the store to try on clothes in the past. Consumers can choose suitable products according to the clothing categories, styles, fabrics, etc. provided on the corporate website and can discuss the details of clothing with the designer. Designs such as embroidery and logo, while saving customers' time, meet customer's personalized clothing design. The follow-up work can further optimize the production process sheet and production notice. In the later stage of the article, different fabrics can be studied, combined with ergonomics, to design and develop a set of graphene composite fiber seamless underwear.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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