

## Research Article

# National Costume Art Design Optimization under the Background of Artificial Intelligence Decision Making and Internet of Things

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As the most external symbolic representation of the nation, national costumes are an integral part of the wonderful culture of the Chinese nation. Our country has many ethnic minorities and has a unique national costume culture, which provides rich resources for the art design of ethnic costumes. This paper uses artificial intelligence technology and Internet of Things technology to design a national costume element library system. In this system, users can match national costume suits according to their own preferences, and they can also transmit national culture to people through this system. After the system is designed, the system performance is optimized by interactive algorithms, and the availability of the system is verified by testing system security, stress resistance, concurrency, etc. Through the verification of the system designed in this paper, the national costumes designed by innovative technology can be copied in batches, which enhances the innovation of national costume design in our country and has high production efficiency. It is finally proved that the design results of this paper meet the design requirements.

## 1. Introduction

Artificial intelligence decision making has improved the intelligence level of various industries. The Internet of Things technology has increased the degree of equipment linkage in various industries and has also realized the interconnection of all things. The application of these technologies to our country's traditional clothing design industry will set off a new trend in the clothing industry. The continuous improvement of our country's comprehensive national strength and the continuous improvement of the level of economic development have led to a qualitative improvement in all aspects of our national living standards. It is for this reason that people's needs for daily life are also increasingly diversified, especially in decoration. In terms of design, most people like to pursue the unique style of the niche. Therefore, further in-depth study of decorative design is an important channel to meet the

current diverse needs of people. As the traditional national costume that can best integrate into the essence of national culture, on the basis of not destroying the essence of national culture, there is an urgent need for human protection, inheritance, innovation, and development to adapt to the aesthetics of modern life.

There is a lot of literature on the artistic design of ethnic costumes in the context of artificial intelligence decision making and the Internet of Things. For example, when designing ethnic costumes, Chinese designers are based on national culture and are committed to combining ethnic costume culture with modern clothing design, hoping to push national costumes to the international clothing stage and convey our country's excellent cultural connotations to foreign countries [1]. Some foreign designers are very interested in the elements of Chinese national costumes [2]. A designer's work combines Eastern and Western design styles, emphasizing the

importance of mixed design and splicing, and applies the unique asymmetric tailoring design method to the artistic design of clothing based on the effect of deconstruction processing [3]. Although many designers have carried out innovative research on the artistic design of ethnic costumes, how to make the culture of ethnic costumes deeply rooted in the hearts of the people and make more people love the unique ethnic costumes is a problem to be solved at present.

This article starts with the extraction method of ethnic costume elements, uses the relevant knowledge in modern design, summarizes the outline, color, and fabric pattern of ethnic costume elements, extracts and analyzes it from a new perspective, then researches and innovates the design method of the new era, sums up new ideas suitable for national costume art design, and finally uses artificial intelligence technology to design the national costume element database based on the Internet of Things technology to promote the system to the whole world.

After combining artificial intelligence and Internet of Things technology, users can match ethnic clothing suits according to their own preferences and can also convey ethnic culture to people through this system. In addition, the Internet of Things technology can speed up the production efficiency of ethnic clothing. It can copy the national costumes designed by innovative technology in batches, speed up the dissemination of our country's traditional culture, and enhance the influence of our country's culture. Through the verification of the system designed in this paper, it is proved that the design results of this paper meet the design requirements.

## 2. The Characteristics of Ethnic Costumes Used in Artistic Design

### 2.1. The Application Characteristics of National Costumes in the Jacket

**2.1.1. Tile Distribution.** The application of ethnic costumes to artistic design through tiling can enhance the audience's visual experience, and the fabrics used in this application method are usually relatively thin, which is more suitable for spring and summer seasons, such as "Shengjing Zhang Yan" jacket and "Tingxiang" jacket [4, 5].

Although there are many kinds of clothing of different ethnic groups, due to the difference in geography and climate, they can be roughly divided into two groups, the north and the south, that is, what people call "southern skirts and north robes" [6]. Because the southern ethnic minorities live in a hot and humid climate, their clothes are generally loose, light, and short and have good heat dissipation; the northern ethnic minorities have a cold climate and are mainly nomadic and productive, resulting in more clothes that are narrow and long for hunting. Also, the form of keeping out the cold is the main form, and even due to the large temperature difference between day and night, the appearance of the clothes is symmetrical and asymmetrical [7].

**2.1.2. Symmetrical Distribution.** This application method is to symmetrically design the national costumes on both sides of the placket, which is divided into a spread type and a placket design. The spread type is usually carried out in an overall symmetrical style, similar to the "Louis Vuitton" double-placket jacket. Symmetrical floral prints add to the beauty of womenswear. The display of the placket design is mainly based on the embroidery of ethnic costumes. Among them, the "NE TIGER" 2019 placket jacket is designed with gold flower embroidery patterns, which looks more gorgeous [8, 9].

**2.1.3. Asymmetric Distribution.** By designing continuous and discontinuous ethnic costumes when the fronts are connected, a connected beauty is formed, but the entire ethnic costumes are not designed in a symmetrical way. This asymmetrical beauty is used in "Legend of Gaia" and "EVE." This is clearly reflected in the "CINA" exhibition [10].

### 2.2. The Application Characteristics of National Costumes in Improving Cheongsam

**2.2.1. Independent National Costumes.** In artistic design, it is more common for ethnic costumes to be used to improve the design of cheongsam [11]. This application method is mainly divided into independent ethnic costumes and linear ethnic costumes [12–15]. Independent ethnic costumes can adjust the visual display ratio of the female body and make the wearer look more slender. Among them, "Qu Tingnan" is a perfect interpretation in the spring and summer exhibition. The use of this floral feature is further reflected in the "Moliere" autumn and winter's improved cheongsam [16].

**2.2.2. Linear Ethnic Costumes.** In the direction of the application of linear ethnic costumes, in order to reflect the curvaceous beauty of women's bodies, designers use a linear way to display ethnic costumes, so as to highlight the proportions of women's bodies and visually elongate the proportions of the wearers' bodies [17]. Its specific application cases are similar to the styles of the "NE TIGER" 2017 and 2019 spring and summer models, and through the well-proportioned line diagrams, it can visually modify the beauty of women's bodies [18, 19].

**2.2.3. Heteromorphism.** In Chinese traditional clothing, this design method is also applicable, which is reflected in the combination of tradition and modernity. It is the process of transforming flat graphics into works and applying it to the creation of three-dimensional clothing. Especially for the extraction and transformation of traditional ethnic elements, isomorphism reorganizes many elements from different subjects, and through the silhouette, craftsmanship, patterns, fabrics, and many other aspects of the costumes, the traditional ethnic costumes are rejuvenated through multiple combinations and matching [20, 21]. This combination can be constantly changed, and it can also be

continuously paired and reorganized to maximize the optimization of creative resources [22, 23].

**2.2.4. Deformation and Reconstruction.** Shape-breaking and reconstruction, literally, is to break the original shape through a series of methods such as breaking, cutting, and decomposing the original shape, and through rearrangement and combination, a new design that is different from the original shape is obtained. The “broken shape” in clothing design is mainly considered from three aspects, namely, the silhouette structure, color pattern, and fabric of the clothing [24, 25]. Due to the high practical performance of some clothing styles and silhouettes in traditional ethnic clothing, they cannot take into account the formal beauty of clothing. The geographical environment and productivity level of some ethnic minorities are relatively backward, resulting in the fabrics of some clothing being too bulky and rough, and the color dyestuffs are also unable to achieve more standard dyeing and printing results. Due to the constraints of various objective reasons, many elements that constitute national costumes cannot reach the modern aesthetic standards, so that the loss of traditional national costume culture is becoming more and more serious, and even influenced by foreign clothing culture. The essence of ethnic costumes is preserved by way of breaking and reconstructing, and it is deconstructed and reconstructed from the aspects of style profile, color pattern, fabric, and so on, so as to interpret the cultural connotation of ethnic costumes from a new perspective, and comparing it with modern times, the combination of advanced design technology, clothing production process, and dressing concept makes it glow with new brilliance [26].

**2.2.5. Reverse Mutation.** Reversing this design method itself is a kind of thinking variation in the design process. In the field of fashion design, the necessary conditions for reverse thinking are reverse elements and prototypes of reverse design. The way of thinking about decorative patterns is reflected in patterns, colors, accessories, and so on. The reverse thinking method of material texture is to make different clothing fabrics to give people different feelings and form the beauty of contrast. In the process of reverse mutation, especially in the creative design of ethnic costumes, relaxation should be achieved, and elements with reversible potential in ethnic elements should be used. Do not over-transform and mutate elements and eventually lose their ethnic costumes characteristics and symbolic national traditional symbols [27].

### 2.3. Classification of Ethnic Costumes Used in Art Design

**2.3.1. Integrity and Independence.** Ethnic costumes can usually be divided into complete and independent forms, where complete represents the pattern in which the pattern and clothing are designed as a whole, while independent represents the ethnic costumes appearing alone in a certain place in the art design. For example, in the exhibition of

“Zhang Yan” in the previous year, the designer combined Baoxianghua with the hem of the skirt, showing the smooth beauty of costumes and national costumes after the festival. Another example is the Dior 97 exhibition, where ethnic costumes are individually embroidered with pearls and embellished on the neckline, which increases the audience’s attention to the neck of women’s clothing and reflects unique design thinking.

National costumes are placed in different positions to show different effects. For example, in the spring and summer series of “Chu Yan” last year, the designer put the peony flower pattern on the waist belt, showing a kind of Chinese style and beauty. Another example is the “Tianxi” Millennium Exhibition, where the designer wrapped different flowers around the buttons of the clothes, reflecting the beauty of stacking. For example, in the exhibition “Chu Yan” five years ago, the designer decomposed the Baoxiang flower map into independent small units, showing an exquisite self-cultivation effect.

#### 2.3.2. Two-Dimensional and Three-Dimensional.

According to the spatial structure of national costumes in art design, it can be divided into two-dimensional and three-dimensional modes. Two-dimensional and three-dimensional will present different characteristics to the audience. For example, the foreign brand “Mary Katrantzou” in 2011, the designer will mainly display it in a two-dimensional way and display buttons or other elements in a three-dimensional way, giving people a peculiar beauty. For example, this improved cheongsam from the 2017 “First Dream · Fu Suqin” autumn and winter series, the designer will mainly display it in a two-dimensional way and use a three-dimensional way to display buttons or other elements, giving people a strange beauty. The designer’s stamens are displayed in a spatial structure, making the cheongsam look more three-dimensional as a whole.

**2.3.3. Freehand and Realistic.** According to the form of national costumes in artistic design, they can be divided into freehand and realistic categories corresponding to the mood and external characteristics, respectively. For example, in the “NE·TIGER” 2020 autumn and winter series, the designer fully displayed the unique natural beauty of spring magnolia through freehand brushwork. In “Legend of Gaia” 2020 spring and summer series, the designer showed the exquisite Chinese-style women’s clothing features through peony. In “Wang Xiaohe-Fan Yong” 2019 spring and summer series, the designer increased the visual effect of the audience by combining freehand brushwork and realism.

In art design, digital printing methods are often used to express freehand brushwork. For example, in the exhibition “Tu Jun” last year, designer draws orchids freehand, showing different effects. Another example is the “Silk Royal” exhibition series, in which the designer used the freehand brushwork of lotus flowers to show the beauty of simplicity. Another example is the “Gaia” summer exhibition, which emphasizes the exquisite design of Mohe.

At present, designers like to recreate traditional freehand folk costumes with modern ones. For example, in the spring and summer of 2019, “Helongfeng-Zhu Zheling,” the designer carried out innovative designs combined with lilies. Another example is the “ZENG FENGFEI” 2019 series, which combines modern and traditional design to show a unique beauty [28–30].

**2.4. Application of Chinese Traditional Culture.** Chinese traditional Confucian culture has always had an impact on women’s clothing design, and the guiding ideology of aesthetics and values has also always affected art design. In the past, the patterns and flowers on clothing were generally plum, orchid, bamboo, chrysanthemum, and peony. Times change, and the design of artistic design incorporates Western ideas such as Europe and the United States, and combined with Chinese traditionalization, it has become a new type of women’s clothing. The ways in which ethnic costumes are used in artistic design have also become diverse. For example, the spring and summer series of “Legend of Gaia” in 2017 reflects the influence of traditional cultural elements in art design. Another example is the “Lawrence Xu” 2015 spring and summer series and the 2017 autumn and winter series, in which the designer used Chinese-style women’s clothing to show its design beauty. For example, in this improved cheongsam in Guo Pei’s series of Chinese-style women’s clothing in 2012, the designer used simple and modern clothing styles to set off the exquisite traditional ethnic costumes and fully reflected Chinese clothing craftsmanship in it.

On the other hand, the ancients all pursued simplicity, and this concept is reflected in the combination of floral prints and modern Chinese-style women’s clothing. For example, the outstanding spring and summer series in 2017 and the two skirts in Shicaotang’s spring and summer series in 2019 are all designed with digital printing, but the simple style can better reflect the beauty.

Looking at the above works, the design is based on the simple traditional Chinese style of art design, but each design can show a unique beauty, which also shows the current designers’ inheritance of the minimalist ideas of the ancient Chinese. These designs also contain different Chinese charms. These costumes can not only reflect the elegance and beauty of women but also reflect the elegant aesthetics of Chinese literati.

**2.5. Design of Clothing Geometric Pattern.** Radial basis function neural network is a kind of feedforward neural network. In terms of function approximation, its notable feature is optimal approximation; in terms of search range, its more notable feature is global optimality, as shown in the following equations:

$$H_j(\xi) = e^{-\|\xi - \beta_j\|/2\mu_j^2}, \quad (1)$$

$$\lambda_i(\alpha) = \sum_{k=1}^m \omega_k e\left(-\frac{\|\alpha - \beta_k\|}{2\mu_k^2} + \theta_k\right). \quad (2)$$

### 3. System Design and Implementation of National Costume Element Library

**3.1. System Architecture Design.** The user browser in the B/S structure of the system shown in Figure 1 is mainly responsible for the presentation layer that interacts with the user, while the background server acts as the business layer to execute user queries and logical transactions. The main problem with the data layer is that the database server processes the data. We do not need any special software of B/S structure to integrate it into any browser, and the operation difficulty of the computer is not high, and most of the operations are done by the server.

#### 3.2. System Test

**3.2.1. Development Environment.** As shown in Table 1, the development language, development tools, development framework, and operating environment of the national costume element system are required. It is these convenient engineering technologies and advanced server systems that can ensure the successful operation of the element library.

**3.2.2. Running the Test.** After using artificial intelligence technology and Internet of Things technology to design the national costume element system, it is necessary to test whether the system can operate normally and ensure that the operation is not stuck. As shown in Table 2, the system CPU usage, memory usage, and hard disk I/O usage are tested. According to the test results, these three test contents are all within the set values, indicating that the system can operate normally.

**3.2.3. Performance Test.** Security refers to the data security of the system and ensuring the security of user information; pressure resistance refers to the system maintaining stable operation for a long time under a certain load; concurrency refers to how many users the system can carry online at the same time. It can be seen from the test results in Table 3 and Figure 2 that the test values of these three properties are all within the theoretical value range, indicating that the normal operation of the system can be guaranteed.

**3.3. User Satisfaction Survey on Ethnic Costume Art Database.** After designing the system, it is also necessary to test the user’s satisfaction with the ethnic costume element system during the use of the system. We randomly conducted a satisfaction survey on 145 users, and Figure 3 shows the survey results. As can be seen from the data in the figure, 67.21% of the people are satisfied with the ethnic costume element system, 16.55% are in a general attitude, and 16.24% are dissatisfied with the system, indicating that the system can meet the needs of most people.

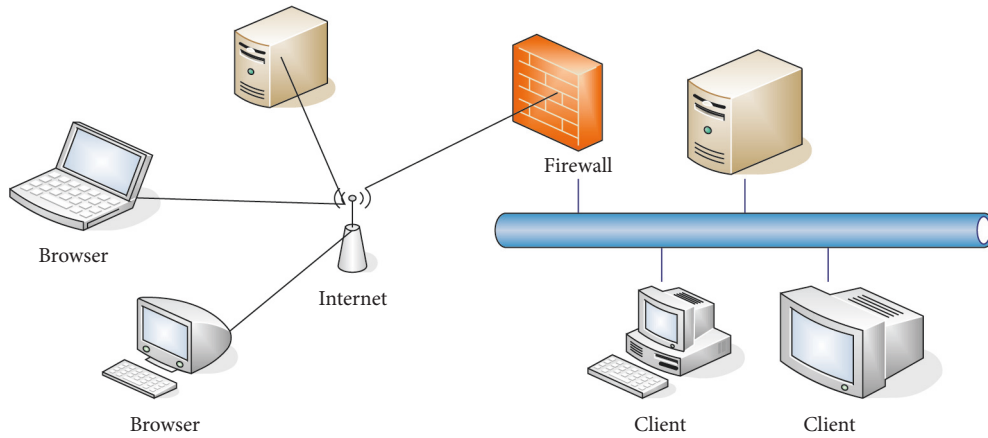


FIGURE 1: Structure diagram of B/S system based on IoT technology.

TABLE 1: Development and runtime environments.

Development environment	Development language	Java, C
	Development tools	Eclipse
	Development framework	MyBatis
Operating environment	Operating system	Windows 10
	Server	B/S
	Database	MySQL

TABLE 2: Run test results.

Test content	Settings (%)	Test value (%)
CPU usage	≤60	50
Memory usage	≤40	35
Hard disk I/O usage	≤40	30

TABLE 3: Performance test results.

	Theoretical value	Test value
Safety	92	96
Compression resistance	86	93
Concurrency	93	97

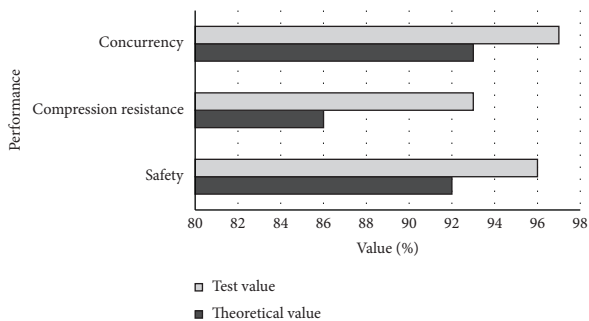


FIGURE 2: Comparison of theoretical and test values for performance testing.

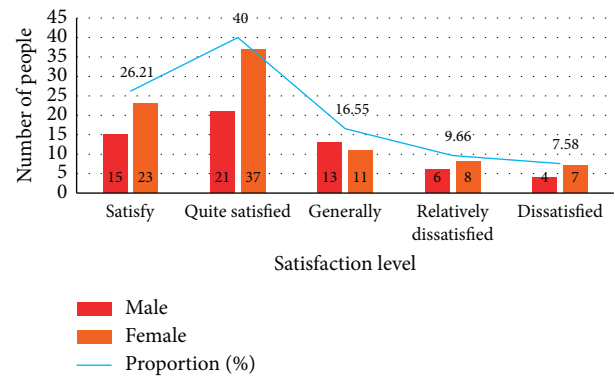


FIGURE 3: Satisfaction survey results.

### 4. Conclusion

Artificial intelligence decision making has improved the intelligence level of various industries. The Internet of Things technology has increased the degree of equipment linkage in various industries and has also realized the interconnection of all things. These technologies are applied to our country’s traditional clothing design industry which will set off a new trend in the clothing industry.

In the era of advanced information technology, the promotion of ethnic costumes is getting wider and wider, not only popular in our country, but also on the international stage. Therefore, this paper designs the national costume element library system through artificial intelligence technology, which can allow designers to refer to various ethnic costume elements, so that the innovative design of costumes will not destroy the essence of ethnic costumes on the basis of modern aesthetics. The reengineering of standards can also promote national culture among the masses.

### Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Conflicts of Interest

The authors declare that they have no conflicts of interest.

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