

Platform Construction for Digital Analysis and Redesign of Traditional Chinese Opera Costume Patterns

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Abstract

The study on platform construction for digital analysis and redesign of traditional Chinese opera costume patterns is to explore the heterogeneity and homology of traditional Chinese opera costume patterns, which are unique in visual arts, with modern design vocabulary through big data acquisition and discussion of new algorithms. On this basis, a design model is constructed, in which traditional visual culture and current aesthetic value are mutually translated, realizing "creative transformation". The digital approaches are applied to explore the feasibility and methodology of modern redesign and reapplication of traditional opera costume patterns. A perfect database and knowledge base of traditional costume patterns is established by the combination of traditional Chinese opera costume patterns and digital technology, and the creative redesign and design innovation of traditional patterns in visual design are explored. The study aims to construct a public data sharing platform for traditional Chinese opera costume patterns, which is a pioneering experiment for the formation of a design industry transformed by traditional Chinese arts. With the integration of traditional patterns and modern technology, the traditional culture is passed on through modern technology in an even better fashion and thus better promoted. Also, digital technology provides a new way to protect cultural heritage. In view of the current situation of traditional handcraft conservation, the advantages of digitization are fully explored, and the important role of digital acquisition and storage technology, display and dissemination technology in the preservation of traditional culture and the issues that need attention.

Keywords

Traditional Chinese Opera; Costume Patterns; Digital; Design.

1. Introduction

The digital innovation of traditional Chinese culture is the focus of the national culture and technology strategy in China. The specific promotion of the national strategy for digital culture is examined, where the systematic ability to preserve and inherit cultural heritage is improved through the inheritance and innovation of traditional Chinese opera culture based on digital technology. In addition, a digital infrastructure and platform is built for traditional Chinese opera costume patterns and culture, which forms a fusion of online and offline interaction, covers the cultural service provision system in all aspects, and propels the application, dissemination and innovation of traditional culture and even intangible cultural resources, and realizes the sharing of digital cultural achievements. In the world's visual arts, traditional Chinese opera costume patterns have unique cultural status and artistic value. Through big data acquisition and new algorithms, the homology and interchangeability between traditional opera costume patterns and modern design vocabulary are

explored and discussed, and the visual design vocabulary, method and way "element code design" that translates traditional visual culture and contemporary aesthetic values are created, in an attempt to implement the cultural concept and value orientation of "bringing cultural relics to life". In the study on platform construction for digital analysis and redesign of traditional Chinese opera costume patterns, the emphasis is laid on database establishment, digital analysis model and interactive design application of traditional opera costume patterns based on the systematic combing of traditional opera costume patterns, with a focus on the multi-dimensional analysis of traditional patterns and their diversified homology with current fashion trends, which are put into practice and form typical cases as the evidence of practice.

2. Research Status and Significance of Traditional Chinese Opera Costume Patterns

The exquisite and gorgeous traditional Chinese opera costume patterns with rich implicants are cultural treasures of the Chinese nation with hundreds and even thousands of years of historical accumulation. However, a grim reality is that in the rapidly developing modern cultural industry market, many traditional Chinese opera cultures, which have lost their vitality among the perception of young people, are trapped in a difficult situation of being eliminated from the market and entering museums.

The feasibility and methodology of modern redesign of traditional opera costume patterns are discovered by virtue of digital approaches. Related studies at home and abroad focus on two aspects. One is the data sorting and research of traditional opera costume patterns, and the other is the research and development of database, cultural computing and interactive design.

Regarding the data sorting and research of traditional opera costume patterns, the information data compilation of early opera costume patterns, Chinese Opera Costume Patterns (1957) by Lu Hua, Xia Yang and Ma Qianghui, published by the People's Fine Arts Publishing House, with the title inscribed by Mr. Mei Lanfang should be regarded as the foremost in the data compilation of early traditional opera costume patterns. Later, Rui Jinfu and Wang Baiyun compiled Reference Materials for Traditional Opera Costume Patterns (1959) and Materials for Traditional Opera Costume Patterns (1964), respectively. Since the 1990s, studies and publications of traditional opera costume patterns have been seen periodically in various catalogues of traditional opera costumes and apparels, such as China Costume Art of Peking Opera (edited by the National Academy of Chinese Theatre Arts; illustrated by Tan Yuanjie, 1992), Chinese Opera Costume Patterns (by Ma Qiang et al., 1995), Costumes of Peking Opera (edited by Zhao Shaohua, 1999), and The Suitcase of Kunqu Opera (by Liu Yuemei, 2010), etc. From the 1950s to date, either by type of costume or by theatrical repertoire, traditional Chinese opera costume patterns have been compiled either by type of costumes or by operas, while related papers have focused on the study of local traditional opera costume patterns and the analysis of form composition and symbolic meaning.

Regarding the research and development of database, cultural computing and interactive design, with the advancement of technology, database technology has been widely used in the management and research of various image documentation materials with the advance in science and technology, the development of computer technology, and the increasing informatization degree of human beings. As for data mining, Tosa Naoko (Kyoto University, Japan) proposed the concept of cultural computing. It is a method of applying computing and related technologies to the cultural field, to explore its development, reveal its interconnections or visually analyze and present it. In the meantime, the trend of "Internet Plus" has promoted the transformation and upgrading of pattern design to digital design, and "Big Data" has pushed "Internet Plus" to a new climax, bringing the revolution of data counting. The fusion of big data and Internet technology is gaining importance. For instance, interactive genetic algorithms and neural network agent models are integrated and used in pattern design, which is an irresistible trend for improving creativity, competitiveness and productivity. These technologies,

whether for the management, research or redesign and utilization of traditional opera costume patterns, are extremely important guarantees.

The International Image Interoperability Framework (IIIF) is developing rapidly, despite its short history and narrow applications. The dozens of founding members of its sharing alliance IIIF-C include the EU Project, as well as the National Library of France, The British Library, the National Library of Scotland, the National Library of Wales, the National Library of Poland, the National Library of Israel, the Vatican Apostolic Library, the Harvard University Library, the Stanford University Library, the Yale University Library, etc. Its members in Asia include the National Institute of Japanese Literature, the National Diet Library, Japan, the University of Tokyo, the Kyoto University Library, the Kansai University, the HKU Libraries, etc. At present, there are billions of IIIF-compliant images around the world involved in sharing. IIIF is used for digital image resource integration with low technical threshold, so it is suitable for the image documentation resource platform of traditional Chinese opera patterns. However, there are no published reports on its research and application in the mainland China.

As for traditional Chinese opera costume patterns, related researches mainly focus on the compilation of historical documents and the analysis of structural forms and symbolic meanings in the traditional speculative way, while the application of the latest information and computer-aided design technology to the management and analysis, redesign and reuse of traditional opera costume patterns is to be studied and developed. The only way for the inheritance and development of traditional Chinese culture is to transform new resources and methodologies for modern design through big data acquisition and research of the formal structure of traditional opera costume patterns.

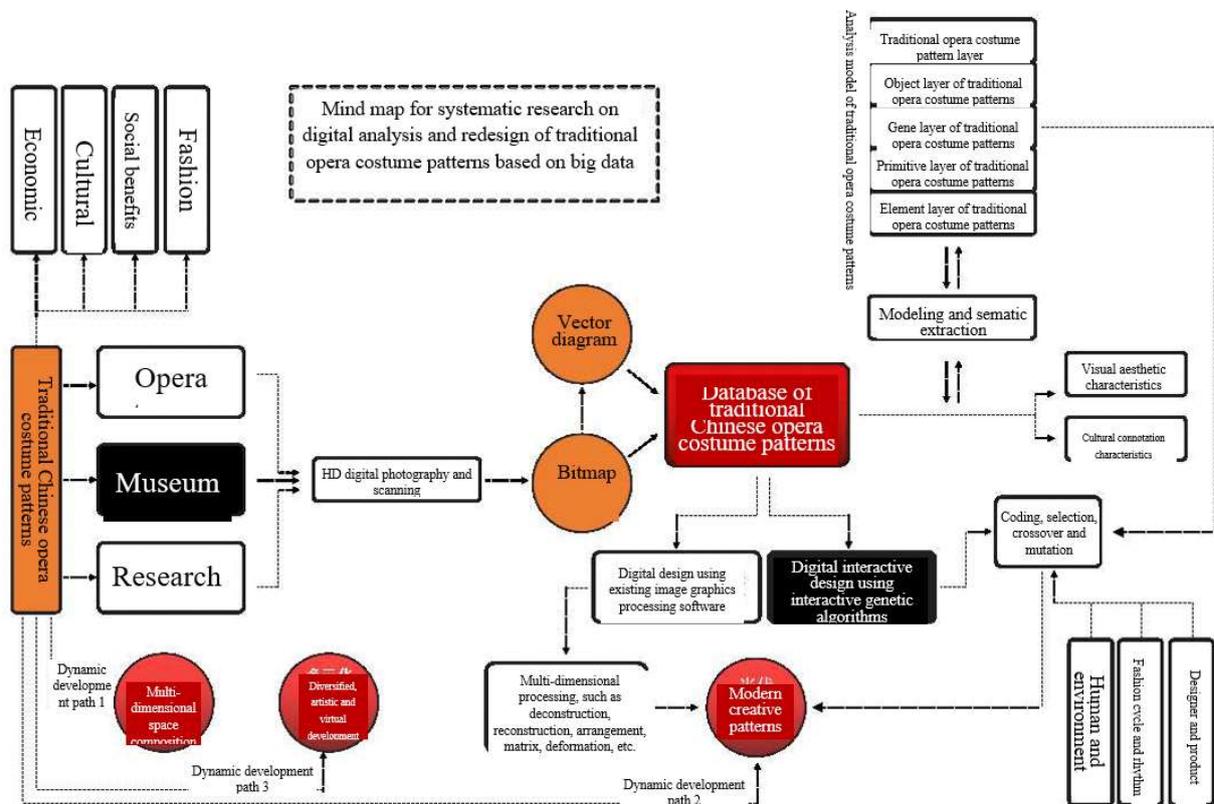


Figure 1. Mind map for systematic research on digital analysis and redesign of traditional opera costume patterns based on big data

3. Digital Analysis and Redesign Innovation of Traditional Chinese Opera Costume Patterns

The innovation of digital analysis and redesign of traditional Chinese opera costume patterns lies in combing. And it focuses on the multi-dimensional analysis of traditional patterns and the study of diversified homology of current popular culture based on the systematic combing of traditional opera costume patterns. The innovation focuses on the database construction, digital analysis model and interactive design application of traditional opera costume patterns, with an emphasis on innovative practices. It is important to complement and expand the existing OA I system in the field of image open data mining with the development of IIF technology. The IIF technical agreement is fully utilized to realize the practical application in the practice of open data mining in traditional Chinese opera costume patterns. It involves cultural heritage collection, research and modern innovations.

The innovation involves four aspects, including system, perspectives and views, methodology, and design concept. In system innovation, it is necessary to break through the previous system structured by individual studies, and strive for the research system of batch comparison and synthesis, highlighting the universality and difference of traditional pattern inheritance and utilization. The dynamic data research of traditional opera pattern element coding based on big data investigates and analyzes patterns from quantitative, systematic and rational perspectives instead of individual and concrete perspectives, aiming to create a scientific and intelligent digital analysis and redesign system. As for the innovation of perspectives and views, it is required to break through the views and perspectives of the previous single-dimensional study of a single discipline, and explore the development of traditional patterns from an integrated dimension of traditional pattern revitalization. Based on the ethnicity, decoration and uniqueness of traditional Chinese opera costume patterns, the economic, cultural, social and environmental benefits of their digital redesign are explored, which is of realistic cultural research value. Regarding methodology innovation, we should break through the previous research methodologies that focus on qualitative descriptions, and strive to explore new results of the inheritance and utilization of traditional patterns from a systematic and comprehensive viewpoint and a combination of qualitative and quantitative methods. Traditional visual resources are transformed into a big data entry platform for new modern design vocabulary. Moreover, the study on element code design of traditional Chinese opera costume pattern becomes a guiding study on traditional Chinese opera costume patterns in the modern design knowledge system, with a focus on the multi-dimensional deconstruction analysis of traditional patterns and the study of diversified homology of modern design. As for the innovation of design concept, we have to break through the previous design method that relies on the artist's personal aesthetic experience, and create a dynamic, creative, integrated, open and shared resource platform using information management technology and IIF-based image digital resource integration technology as the main tools for design.

4. Implementation Steps of Digital Analysis and Redesign Platform for Traditional Opera Costume Patterns

The implementation of digital analysis and redesign platform for traditional opera costume patterns involves four basic aspects: 1) Aggregating patterns and building a shared data platform for traditional Chinese opera costume patterns; 2) Designing a model to analyze the visual aesthetic characteristics and cultural connotations of traditional opera costume patterns; 3) Using digital design to transform traditional opera patterns into modern innovative forms; 4) Collecting digital images of traditional Chinese opera costume patterns, and making them public through IIF and other digital protocols. In fact, the implementation is divided into five stages.

In the first stage, an open data platform is constructed for traditional Chinese opera costume patterns. Professional collection is conducted in museums, theatrical troupes, collections, etc., such as tens of millions of embroidery pieces of traditional opera costumes, as the data source of the open data platform; the pattern images are digitized and vectorized to achieve scientific metadata collection with the acquisition method combining HD digital photography and scanning. Data items are

designed and defined by attributes such as type of traditional opera, place of collection, opera, role, form, theme, composition, process, fabric, etc.

In the second stage, the cultural computing based on classical feature analysis is studied. We identify the multidimensional factors influencing the visual aesthetic characteristics and cultural connotation characteristics of traditional opera costume patterns, explore the hierarchy of classical characteristics of traditional opera costume patterns, and establish a hierarchy of models consisting of element layer, primitive layer, gene layer, object layer and pattern layer, thereby forming a digital map of traditional Chinese opera patterns. Through the standard identification and management of the new knowledge system, the relationship between the core concepts is displayed and compared using visual pattern atlas, and new algorithms are discussed and new model are established to achieve an effective cultural computing function.

The third stage involves the transmedia design and presentation of digital innovation. The digital interactive design method and system of traditional opera costume patterns are studied based on transmedia design of digital innovation using image acquisition and graphic processing software. The pattern data is extracted, and innovative forms are created through multi-dimensional composition processing in the image graphics processing software, including deconstruction, reconstruction, arrangement, matrix, deformation, etc. The process of coding, selection, crossover, mutation and adaptability evaluation of interactive genetic algorithm is combined with the redesign process of traditional opera costume patterns, and the models of human-environment, designer-product interaction, and popular cycle and rhythm are introduced to intervene in the process, to create an interactive system with independent analysis, learning and innovative design.

The fourth stage is to make public and share the data. One hundred thousand digital images of traditional Chinese opera costume patterns are collected, and then made public through IIF and other digital protocols. The resources of traditional Chinese opera costume patterns from various sources are summarized, organized and released in a unified manner to truly realize the ideal open data co-construction and sharing.

The last stage is the research and development of digital transmedia design based on the transformation of traditional Chinese opera costume patterns, as well as the industrial application research and the presentation of platforms with commercial values.

5. Research Methods and Key and Difficult Points of Digital Analysis and Redesign Platform for Traditional Opera Costume Patterns

There are five research methods for the digital analysis and redesign platform of traditional opera costume patterns: 1) combination of literature research and field research; 2) combination of comprehensive analysis and comparative analysis; 3) combination of information research and simulation research; 4) combination of qualitative evaluation and quantitative analysis; 5) combination of theoretical research and cases in practice.

One of the key and difficult points is the design of the cultural computing model. It extracts the key aspects of the visual and cultural characteristics of patterns in the pattern database. A storage model for semi-structured data is proposed for cultural computing. However, the design structure of the model will change with the research perspectives. In addition, new models may be introduced to the new analysis and study with the rapid development of information technology.

Another key and difficult point is the digital interactive design methodology. Digital design using captured images and graphic processing software is based on the designer's personal experience and aesthetic judgment. However, the digital interactive design using interactive genetic algorithms requires both programming skills and knowledge of the pattern design process.

The third key and difficult point is the transmedia-based dynamic development path. The theory of transmedia art is a new and big topic, which has accumulated a large amount of data from research

and practice, focusing on how to integrate transmedia with the creative transformation of traditional opera costume patterns, broaden the development path and form a virtuous circle.

6. Conclusion

The study on digital analysis and redesign platform for traditional opera costume patterns involves multidimensional composition and cross-dimensional and transmedia research, focusing on the establishment of a relational database of traditional opera image data structures, matrices, chains, diagrams, pattern attributes, etc. Relying on information technology such as the latest cultural computing and genetic algorithms, the dynamic data research of traditional opera pattern element coding based on big data investigates and analyzes patterns from quantitative, systematic and rational perspectives instead of individual and concrete perspectives, aiming to create a scientific and intelligent digital analysis and redesign system. Based on the knowledge system of traditional Chinese opera costume pattern map, patterns are guided to realize standard identification and management, while leading future pattern users to learn and use the system dynamically, serving the future design.

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