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Research on Digital Protection of Red Culture in Jiangxi Province Based on Landscape Gene Theory

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Abstract: *Exploring red genes and inheriting red culture have always been the focus of academic research and attention. In today's digital age, digital technology has gradually penetrated into every aspect of people's lives with its unique charm and powerful functions. At the same time, as a part of traditional culture, red culture is also a spiritual treasure of a country and nation, carrying the memory and wisdom of history. Through research, on the one hand, it can achieve the inheritance and protection of red culture, and on the other hand, make red culture closer to modern digitization. This article aims to elaborate on the necessity of integrating landscape genes into the digital protection of red culture in Jiangxi Province based on the theory of landscape genes. It studies the technological path of digital presentation of red culture and explores its digital presentation methods from three aspects: digital modeling, digital platform construction, and feedback research data, providing theoretical support for the digital protection and presentation of red culture.*

Keywords: *Landscape Gene Theory; Red Culture; Digital Protection*

1. Introduction to Landscape Genetics

The concept of "gene" originated from biology and is the basic unit of inheritance in organisms and the key unit that controls biological traits. One of its characteristics is the ability to continuously replicate and maintain the basic characteristics of organisms during the genetic process. Similar to genetic traits, landscape factors that have stable inheritance and distinct characteristics in the process of historical and cultural development [1]. Landscape genes specifically refer to the inherent cultural factors that are unique to a landscape and distinguish it from other landscapes. They are the basic units of landscape "inheritance", that is, certain factors that have been passed down from generation to generation and distinguish it from other landscapes. The definition of landscape genes originates from a profound analysis of the essence of cultural landscapes, which is a dual expression and abstraction of the material carrier and cultural connotation of landscapes. Liu Peilin analyzed the cultural characteristics of traditional settlements from a scientific perspective of human geography, integrated cultural genes and urban morphology theories, and drew on biological gene analysis to propose the landscape gene theory [2].

2. The Necessity of Integrating Landscape Genes into the Digital Protection of Jiangxi's Red Culture

In recent years, policies to promote digital empowerment for the protection and utilization of red cultural heritage have not only been refined year by year, but also become increasingly clear in their thinking. The General Office of the Communist Party of China Central Committee and the General Office of the State Council have successively issued documents such as the "Opinions on Implementing the Project of Inheriting and Developing Excellent Traditional Chinese Culture" and the "Opinions on Implementing the Project of Protecting and Utilizing Revolutionary Cultural Relics (2018-2022)", pointing out the need to strengthen strategic thinking, enhance organizational leadership for the digitization of red cultural resources, increase financial investment, and solidly promote it; It is emphasized that relevant departments should effectively carry out the work of "catalogue and large database of revolutionary cultural relics resources" and "moderately utilize modern technological means to enhance the interactive and experiential experience of revolutionary cultural relics exhibition". At the same time, the Ministry of Culture and Tourism and the China cares for the next generation working committee issued a notice on the "Action Plan for Utilizing Red Resources, Cultivating New People of

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the Times, and Promoting Soul Building and Education through Red Tourism (2023-2025)", proposing important discourse spirits such as "protecting, managing, and utilizing red resources with care and emotion", "inheriting red genes and continuing red bloodlines", and "cultivating new people of the times". As an old revolutionary base area, Jiangxi has nurtured the cradle of the Chinese revolution, Jinggangshan; The cradle of the Republic, Ruijin; The place where the military flag was raised, Nanchang; The birthplace of the Chinese workers' movement, Anyuan on this 166900 square kilometer land.

2.1 The Advantages of Digitalization in Protecting Red Culture

There is no eternal thing in the world. The existence of all things is conditional, historical, and temporary. The reason why red culture needs to be protected is precisely because it is in a process of disappearing. The use of digital technology can provide conditions and delay time for its protection. Compared with traditional protection methods, digital technology has the following advantages: first, it has strong anti-interference ability and high implantation accuracy; Secondly, digital technology can establish long-term "digital copies" of red culture while reducing risks; Thirdly, it has good confidentiality and can be encrypted in digital systems to reduce the leakage of precious resources; Fourthly, it has strong universality, and after forming a digital system, it can be modularized and standardized for reference in various similar projects.

2.2 The Digital Display and Protection Methods are Relatively Single

Red culture can be divided into two types: material culture and non-material culture. Currently, material red culture is mostly presented in physical form, but with the passage of time, this approach is easily influenced by external factors, resulting in a certain degree of physical loss of material. Once not properly protected, substances such as metals will oxidize with air, while paper-based materials will become damp with humidity, leading to irreversible damage and eventual disappearance. Taking the Nanchang August 1st Uprising Memorial Hall as an example, the degree of damage to its revolutionary cultural relics reached 96.31%, and the degree of severe damage reached 3.63%. Non material red culture, such as audiovisual and traditional Chinese opera, is facing "endangerment" as the number of inheritors gradually decreases.

2.3 Insufficient Digital Management of Red Culture

As an important part of the digital display of red cultural relics, digital management can collect, store, classify and process information about revolutionary cultural relics, forming a scientific management cycle. However, in the digital management of red cultural relics in the collection, some cultural relics have not been digitized due to technical reasons and cannot be displayed and protected through digital channels. Some container cultural relics lack sufficient data support for digital management due to incomplete digital collection of information on various aspects such as size, shape, decoration, source, age, transmission process, history, and artistic value. This may be related to cultural relics resources, digital technology, and human resources investment, leading to insufficient digital management of some revolutionary cultural relics in the collection.

2.4 Lack of Talent Protected by Digital Technology

Digital display technology is the use of information technology for artistic processing and creation. It is a work that combines emotional artistic aesthetics and rational procedural thinking, requiring practitioners to possess both abilities as much as possible. From the perspective of academic disciplines, students studying art and design have not yet delved into the study of code, while students studying information technology lack aesthetic education. There is a relative shortage of composite talents who understand both digital technology and cultural arts, which hinders the deep integration and innovative development of the two. At present, only the digital media art major can combine the two, but as of 2024, there are 246 universities in China offering this major, accounting for only 0.08% of the national universities. The talent output rate can also be imagined, and sufficient talent reserves are one of the necessary conditions for promoting the smooth development of digitalization.

2.5 Combining Landscape Genes with Digital Technology to Enhance Recognition

Liu Peilin proposed in his research method and theory of "ancient village cultural landscape genes" that "landscape genes" are the essence that distinguishes one cultural landscape from another. Like genes

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in biology, they have replicability, uniqueness, and variability [1]. There are many birthplaces of red culture in China, such as Jiaxing, Zhejiang, the birthplace of the Red Boat culture, Changsha, Hunan, where a single spark can ignite a prairie fire, Yan'an, the birthplace of the "Double Support Movement", and so on. Every city has a red story created for us with the blood of its predecessors, which is the unique landscape gene of each city. In the process of protecting and constructing red culture, landscape genes should be endowed to give the city's red culture development its own recognition.

Based on the above necessity, this study takes the protection of Jiangxi's red culture as an example, identifies the genetic characteristics of Jiangxi's red cultural resources from the perspective of landscape genes, and constructs a reasonable landscape gene recognition system for red culture through the extraction and analysis of genetic characteristics. It deeply understands the genetic characteristics and their connotations, and constructs a three-dimensional digital presentation of red culture's genetic feature system.

3. Digital Protection of Red Culture in Jiangxi Province Based on Landscape Gene Theory

3.1 Collect Research Data

Before starting a study, it is necessary to conduct research to obtain more accurate data for further exploration. There are roughly three sources of data for this study. One is to consult paper documents, such as collecting relevant literature and materials from archives, museums, cultural and tourism bureaus, etc. in planned protected areas; The second is to use digital collection, such as using drones for full scene oblique photography of the entire protected area, using scanners for building laser scanning, and using wearable 3D laser mobile scanning devices for full color point cloud scanning of tourist routes to obtain aerial, surveying, photo and other graphic and textual data; The third is to conduct field investigations, such as obtaining audio recordings, interviews, and other survey materials. Collect information on architectural spatial form, geographical environment, traditional features, red culture, customs and activities. After the entire research is completed, the obtained research materials, internal materials provided by local archives, online search materials, and literature research materials are organized to provide comprehensive data and literature support for the research.

3.2 Identify Landscape Genes

At present, the identification of landscape genes mainly follows the four principles proposed by Liu Peilin, namely intrinsic uniqueness, extrinsic uniqueness, overall dominance, and local uniqueness. In terms of landscape gene extraction research, Shen Xiuying et al. proposed four landscape gene extraction methods based on the expression forms of settlement landscapes: element extraction, pattern extraction, structure extraction, and meaning extraction [2]. However, these four identification methods cannot effectively extract some special cultural factors, and there are still certain limitations in practical situations [3]. Based on this, Hu Gang et al. reflected on the adequacy and advantages of the aforementioned extraction methods, and combined them with an object-oriented landscape gene classification model, proposed a feature deconstruction extraction method. This method deconstructs the landscape features of the recognized object, establishes landscape gene recognition index elements, and classifies the identified landscape genes into environmental feature genes, architectural feature genes, cultural feature genes, and layout feature genes under the principle of "merging if similar categories"[4]. This article tends to use landscape gene theory to deeply explore the red cultural resources in Jiangxi. Firstly, the landscape genes of the research object are identified according to the indicator system. Secondly, representative landscape genes are extracted. Finally, these landscape genes are virtually presented and applied using digital technology.

3.3 Confirm the Gene Recognition Indicator System

The landscape gene recognition index system can be classified from four perspectives: layout characteristics, environmental characteristics, cultural characteristics, and architectural characteristics. Layout features refer to geographical location and geographic units. Environmental features include terrain features and water system features. By collecting genes related to the terrain and water system features of the red culture coverage area, we can understand the relevant characteristics of its regional environment. The architectural features include revolutionary sites in red culture, residential features, subjective public building features, and overall spatial layout features. The most important thing is cultural characteristics, which include two major parts: regional cultural characteristics and red cultural

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characteristics. The regional cultural characteristics include totems, beliefs, historical context, living traditions, values, customs, etc. The red culture includes revolutionary stories, revolutionary spirit, revolutionary traditions, revolutionary literature, revolutionary cultural relics, revolutionary songs, revolutionary literary works, cultural atmosphere, etc. In our research, we can use the landscape gene recognition system listed above to analyze the attribute characteristics of objects, and then establish category standards based on the differences in each attribute characteristic, and refine them into specific indicator systems.

3.4 Establish a Path for Digital Protection Methods

In the process of exploring digital protection, we need to accurately grasp the technical and genetic connotations and objectively present them in order to identify, recognize, and implement landscape genes based on the characteristics of various elements summarized above. The technical path for the digital presentation of red culture is roughly as follows: digital acquisition → screening of effective data and gene extraction → digital modeling imaging → building a digital platform → feedback research data and other processes. Ultimately achieving digital virtual display and presentation. After its release, continuous feedback and correction of data are still needed. In terms of corresponding technological implementation, it relies on multiple digital technologies to achieve its three-dimensional digital presentation. The specific technical path will be described in detail in the section on digital protection measures.

3.5 Measures for Digital Protection Methods

3.5.1 Establish a Digital Repository

Red cultural resources are mainly divided into two types: two-dimensional and three-dimensional, which require different methods for storage. On the one hand, for three-dimensional cultural relics such as buildings and products, it is necessary to use technology equipment such as drones and scanners to perform three-dimensional scanning, high-definition extraction, and other methods to obtain information as comprehensively as possible without blind spots. For some delicate parts, it is necessary for the production personnel to have a certain modeling technology ability. Based on the 1:1 ratio of the physical object, 3D software such as 3DMAX, Maya, etc. are used to create virtual models to achieve simulation effects. At the same time, digital technology is needed to protect the cultivation of talents. On the other hand, for two-dimensional flat objects such as text and information, high-definition scanning and capture processing are required to obtain high-definition image data. Especially for the scanning of red books and literature, it is not only necessary to treat the surface, but also to collect the specific content inside the books and literature, which can comprehensively and accurately scan the information of cultural relics and convert it into digital information. Afterwards, it will be showcased through the construction of a digital platform.

3.5.2 Building a Digital Platform

The construction of digital platforms, also known as virtualization platforms, will broaden the channels for the dissemination of red culture. The construction can be roughly divided into two parts. The first step is to design the platform interface, functional framework, and interactive experience after establishing the digital repository, relying on Unity3D to build the digital platform. At the same time, it is necessary to consider that the platform users have a wide range of age levels. The design of the platform interface needs to conform to the characteristics of red culture, and also has the cultural characteristics of various regions. The design also needs to follow the user's visual browsing, operating habits, and other aspects in combination with the education field. The digital platform can also add online courses and educational games for red culture. Users can contact and understand relevant red culture anytime and anywhere through the connection scanning of the Internet and mobile devices, so that users can learn and inherit red culture in a relaxed and pleasant atmosphere, and finally display the artistic value of advanced red culture through the construction of the digital platform.

3.5.3 Feedback Research Data

The three-dimensional digital presentation of red cultural resources requires data and cultural verification, correction, and feedback. This is mainly achieved through three channels: firstly, expert feedback; secondly, big data mining of user evaluation information from various online platforms; and thirdly, establishing direct information feedback channels through experiential platforms. After obtaining information through this channel, the digitized model is continuously revised. At the same time, further

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behavioral characteristics analysis will be conducted on users' online experience process. Through data analysis of their stay time at different locations, activity participation time, real-time travel needs, and online platform review content, a digital prediction system will be established to understand users' travel preferences and emotional needs. This will not only provide data support for the three-dimensional digital presentation of more red culture in the future, but also for the evaluation of the dissemination effect and social benefits of red culture.

4. Conclusion

Following the theory of landscape genes and combining digital technology to construct a red culture database, it will become an important digital production factor, a new form of red culture resource dissemination, and an important path towards a new generation of intelligent industries; Meanwhile, the application of 3D digital technology based on landscape gene theory also has certain guiding significance for landscape genes of other cultural resources.

However, there are still many problems that need to be solved with 3D digital technology, such as cumbersome hardware equipment, display dizziness, and large amounts of model data. In the future, in order to promote the digital presentation and application of red cultural resources, it is necessary to deeply integrate cutting-edge technologies such as fifth generation communication technology, big data, and artificial intelligence, and move towards the direction of the metaverse. It is also necessary to standardize the accuracy of digital collection and presentation standards, strengthen the construction of high-quality red cultural content ecology, and promote the interaction and mutual promotion between virtual technology and traditional culture.

While utilizing the advantages of digital technology to protect and inherit red culture, red culture has also injected new vitality into the development of virtual technology. In the future, we should focus on solving the problems that arise during the integration process, balancing technology and culture, emphasizing intellectual property protection, cultivating technology related talents, promoting collaborative innovation between virtual technology and red culture, and achieving cultural prosperity and technological progress. But whether it is combined with landscape gene theory or various other methods, ultimately all research is aimed at reminding everyone not to forget the path they came from, no matter how far they go.

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