Article

Research on Genetic Identification and Genomic Atlas Compilation of Minnan Folk Temple Murals

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Abstract: ***Background:*** Academia has recently shown significant interest in the scientific organization of vast amounts of data related to outstanding cultural heritage using biological research methods. This study explores the topic of gene identification and atlas compilation of traditional Minnan temple murals. ***Purpose:*** This study aims to utilize gene identification technology to extract the core elemental factors of traditional Minnan temple murals. The research has developed a specialized talent cultivation system and has constructed a comprehensive gene map of Minnan temple murals. This has resulted in the creation of a systematic, convenient, and visualized database that scholars can use to study the art of Minnan temple murals. ***Methods:*** The paper employs the Analytic Hierarchy Process (AHP) to create chord diagrams for the relative weight analysis of core elements in Minnan temple murals. Gene identification techniques are then used to extract four core elements, laying the foundation for constructing a gene map of Minnan temple murals. ***Results:*** Compared to traditional data collection methods, gene identification technology offers a broader application range and higher accuracy in information collection. The gene map is more scientifically advanced and convenient than common databases, enabling researchers to efficiently access the needed information. ***Conclusion:*** The construction of the gene map for traditional Minnan temple murals provides extensive data support for historians, mural artists, and researchers of Minnan culture.

Keywords: Minnan temple murals; Genetic identification; Compilation of illustrations

1. Introduction

1.1 Research Background

Since the 18th National Congress of the Communist Party of China, General Secretary Xi Jinping has placed great importance on the preservation and development of China's outstanding traditional culture, providing a systematic explanation of the theory of "cultural genes." The "Cultural Relics Protection Law of the People's Republic of China," issued in 1982 and gradually improved since then, along with related administrative regulations, outlines the implementation of the survey and registration system for cultural relics, the construction of cultural relics archives, and the information management system for cultural relics. This includes, facilitating the management, protection, and subsequent research of cultural relic resources found in temple murals.

1.2 Research Purpose

This study reveals that research on statistical methods for temple mural data in China is still in its early stage. Despite strong national policy support, there is a need for further scientific and intuitive methods for data collection. Genetic identification and atlas compilation techniques have primarily been applied to landscape layout research. Thus, this study aims to scientifically integrate these techniques with the data collection

and analysis of Minnan Folk Temple Murals, advancing the inheritance and protection of cultural heritage.

1.3 Research Content

Analyze the cultural background and comprehensive value of Minnan folk temple murals. Furthermore, investigates the current application status of information collection and integration technologies in cultural heritage, identifying any existing problems. Finally, utilize gene identification technology to extract core elemental factors, applying AHP for relative weight analysis and simplification of core elements. Establish a specialized talent cultivation system, and construct a comprehensive gene map of traditional Minnan temple murals, providing a systematic, convenient, and visualized research database for scholars studying Minnan temple mural art.

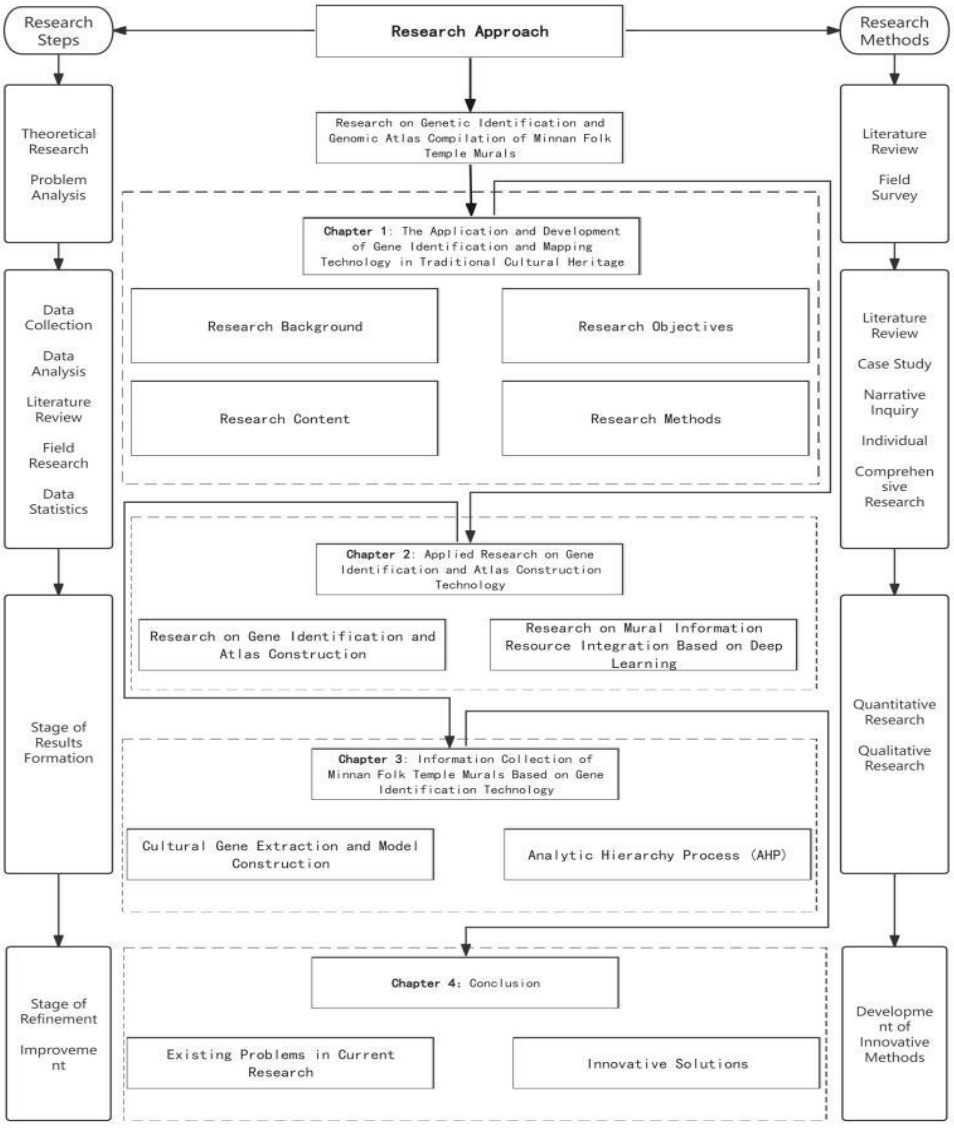


Figure 1: Frame diagram

1.4 Research Methods

This study employs the literature review method to conduct a comprehensive information survey on traditional Minnan temple murals. This involves examining and organizing relevant literature to outline the cultural background and analyze the value

system of these murals. The literature review helps in understanding the historical context, symbolic meanings, and aesthetic significance of the murals. Furthermore, the field survey method is utilized to gather extensive on-site image information. This includes capturing high-definition images from various angles and detailed close-up shots. Additionally, discussions with local residents and professionals are conducted to gain deeper insights and contextual knowledge. These discussions help in understanding the local interpretations and historical significance of the murals. Finally, scientific methods of gene identification are applied to systematically organize and analyze the collected information. This involves exploring the genetic composition system of traditional Minnan temple murals and identifying recurring patterns and stylistic elements. The results of this analysis are used to construct a detailed decorative atlas of these murals, providing a comprehensive visual and analytical resource for further study and appreciation.

2. Literature Review

A search using the keywords "genetic identification" and "atlas compilation" in the China National Knowledge Infrastructure (CNKI) database found numerous studies on these topics. Researchers such as Shen Xiuying began in-depth research on genetic identification and atlas compilation techniques, which played a crucial role in the initial development of resource integration technology (Xiuying, 2006). Wang Yian further researched and applied genetic identification and atlas compilation techniques, promoting resource integration in the layout of traditional villages and cultural heritage protection (Yian , 2010). Liu Peilin continued to deepen research on genetic identification and atlas compilation techniques, applying them to the inheritance of traditional handicrafts and enriching the range of applications for resource integration technology (Peilin, 2011). Zhang Hua enhanced and refined the resource integration technology, making the atlas system more complete and effectively supporting the preservation of the cultural heritage of traditional handicrafts (Hua, 2018). Based on these studies, Li Minghui conducted research on the integration, sharing, and dissemination of mural information in the digital age, proposing innovative technical support and enriching the theoretical foundation and application scope of resource integration technology (Minghui, 2021). Liu Yutong continued in-depth research in the field of genetic identification and atlas compilation techniques, further enhancing the precision and application effectiveness of resource integration technology, thereby promoting the preservation and inheritance of traditional culture (Yutong, 2023). Through the continuous provision of essential information, they have made the atlas system more complete, greatly streamlining related research.

Figure 2: Timeline of the Development of Resource Integration Technology

Further analysis conducted in this study found that domestic research on data statistics methods related to temple murals is still in its infancy. Although there is considerable support from numerous national policies, there is a noticeable lack of more

scientific and intuitive data collection methods. Currently, genetic identification and atlas compilation techniques are mostly applied in landscape layout studies rather than in the study of temple murals. Therefore, this study aims to scientifically combine genetic identification and atlas compilation techniques with the integration and statistical analysis of traditional temple mural data in southern Fujian. The study seeks to enhance the methodologies used for data collection and analysis in this field, thereby promoting the inheritance and protection of this valuable cultural heritage.

Table 1: Summary of Literature Features

Research Direction	Reference	Trait
Genetic identification	Research on Gene Extraction and Intelligent Assisted Innovative Design of Nanjing's Republican Era Architecture Research on the Protection and Revitalization of Traditional Ancient Villages Based on Landscape Gene Identification and Expression A Case Study of Huitong Village in Zhuhai City	These articles combine genetic identification technology with the collection and classification of traditional cultural information, achieving flexible interdisciplinary application of technology.
Genetic mapping	Cultural Gene Inheritance and Design Transformation of Southern Dynasties Stone Carvings Based on AHP-Grounded Theory Construction of Cultural Gene Mapping and Design Translation of Yurt Culture from the Perspective of Cultural Field	Such articles incorporate the collected information into meticulously structured genetic maps, addressing issues of traditional cultural information being scattered and time-consuming to retrieve.
Database establishment	Construction of the Huayao Embroidery Database and Analysis of the Cultural Connotations of Its Patterns Integration of Information Resources and Innovation of Service Models in Digital Libraries under Cloud Computing Environment	These two articles delve into the scientific methods of information resource integration, providing significant reference value for this research.
Information resource integration	Current Status and Development Trends of Public Digital Cultural Resource Integration Abroad Research on the Digital Protection and Development of Chinese Intangible Cultural Heritage	Such literature conducts in-depth research on data digitization and clarifies the overall direction for the integration of vast information resources.

3. An Overview of Traditional Temple Mural Paintings in Southern Fujian

3.1 A Brief Overview of the Historical Development of Wall Paintings in Minnan Folk Shrines

Minnan, a region located in the southeastern coastal area of China is well-known for its rich cultural heritage, which is characterized by its distinct folk beliefs and religious culture. Among these, the wall paintings in Minnan folk shrines stand out as unique cultural artifacts, reflecting the development of Minnan folk art and religious traditions. This article explores the evolution of wall paintings in Minnan folk shrines from a historical perspective.

The Tang and Song Dynasties mark the early development stage of wall paintings in Minnan folk shrines. During this period, as Buddhism and Taoism spread widely in China, the number of temples and Taoist abbeys in Minnan increased. Wall paintings, as an important form of religious art, began to appear in these shrines. The wall paintings of the Tang and Song periods primarily featured religious themes, including Buddhist

classic stories, Taoist deity images, and ritual scenes. The artistic style was simple, with modest lines, yet the paintings were already taking shape.

The Ming and Qing Dynasties represent the flourishing period of wall paintings in Minnan folk shrines. As the economy and culture thrived, religious activities in Minnan became increasingly vibrant, and the number of shrines significantly increased. During this time, the wall paintings not only grew in quantity but also saw remarkable improvements in quality.

Entering the Republic of China period, the social environment in Minnan experienced significant changes, which had an impact on the development of shrine wall paintings. Due to wars and social upheavals, many shrines were damaged, and wall painting art faced a period of decline. However, since the 1980s, with the nation's increased focus on cultural heritage protection, efforts to restore and preserve Minnan shrine wall paintings have been initiated. Some significant works of art were restored and revived.

At present, wall paintings seen in Minnan folk shrines serve as both historical heritage and living cultural expressions. As cultural exchanges deepen and technology advances, the art of wall paintings continues to innovate while preserving its traditional elements.

The wall paintings in Minnan folk shrines serve as a unique form of cultural and artistic expression, documenting the social, economic, and cultural transformations of the Minnan region throughout history. From their initial emergence during the Tang and Song Dynasties to their flourishing development in the Ming and Qing Dynasties, and through the transitions and preservation efforts of the modern era to the contemporary transmission and innovation, Minnan shrine wall paintings have consistently radiated a unique brilliance throughout history. By meticulously tracing their historical development, we can gain a deeper understanding of the rich and multifaceted nature of Minnan culture. This enables us to better protect and preserve this invaluable cultural heritage in the context of modern society. The evolution of these wall paintings illustrates the changes in Minnan's societal structure and highlights the dynamic nature of cultural expression in the region. Their enduring presence and continuous adaptation underscore the importance of cultural continuity and the need for ongoing efforts to maintain and revitalize traditional art forms in the face of contemporary challenges and opportunities. Through a comprehensive examination of their historical trajectory, we can appreciate the intricate layers of meaning embedded in these artworks and recognize their significance as a testament to the resilience and creativity of the Minnan people. By fostering a greater appreciation for the cultural heritage embodied in these wall paintings, we can ensure that future generations will continue to benefit from and contribute to the rich legacy of Minnan's artistic and cultural traditions.

3.2 Cultural Background of Southern Fujian

3.2.1.Minyue Culture

Minyue Culture, with its long history and unique local characteristics, is vividly and comprehensively presented in the temple murals of the region. These murals often depict the rich and diverse folk customs of Minyue, capturing a wide array of cultural elements. They record local legends and myths, Minyue allusions, religious figures, and festive scenes, providing a visual narrative of the region's heritage. The character images portrayed in these murals, along with their artistic styles, all bear a distinct and unmistakable flavor of Minyue culture. This artistic expression highlights the unique cultural identity of the Minyue people, reflecting their traditions, beliefs, and historical experiences. The murals serve not only as decorative art but also as cultural documentation that preserves and promotes the essence of Minyue culture, showcasing its depth and richness to viewers and scholars alike.

3.2.2.Maritime Culture

Due to the close proximity of residences to the ocean, fishing, and navigation have become indispensable means of livelihood for the people of southern Fujian. As a result, the traditional temple murals of this region prominently feature and are greatly influenced by maritime culture. Common elements depicted in these murals include boats, marine creatures, and sea gods, reflecting the daily life and cultural importance of the sea to the local community. Furthermore, as an important hub on the ancient Maritime Silk Road, southern Fujian's traditional temple murals often feature themes related to this historical trade route. These murals accurately record and preserve the prosperous scenes of cultural and trade exchanges between China and foreign countries, highlighting the region's historical role in international commerce and cultural interaction. The maritime elements in the murals not only represent local livelihoods but also symbolize the broader cultural and economic connections provided by the sea.

3.2.3 Religious Culture

The region of southern Fujian is characterized by a diverse and vibrant religious environment, which includes the practices of Taoism, Buddhism, and various folk beliefs. Taoist and Buddhist murals often depict intricate religious rituals and mythical stories, filled with detailed images of Buddhist statues, deities, and other sacred iconography. Among the folk beliefs, the veneration of Mazu, the goddess of the Sea, stands out as the most renowned and influential. Mazu Temple murals primarily celebrate Mazu's miracles and her protection of people's safety at sea. These murals not only reflect the deep influence of religious culture on the local community but also reflect the pervasive maritime culture of the region. The depiction of Mazu’s deeds and her benevolent guardianship highlights the cultural integration of spiritual beliefs and the everyday realities of life by the sea. This blend of religious devotion and maritime heritage is a distinctive feature of the traditional murals in southern Fujian, showcasing the region's unique cultural identity.

3.3 Value System

3.3.1 Artistic Reference Value

The traditional temple murals of southern Fujian possess significant artistic reference value, offering a rich source of inspiration and insight for the broader field of Chinese temple mural art. These murals, which skillfully integrate various religious elements, have developed a unique stylistic character that distinguishes them. Marked by vibrant and striking colors, concise and elegant lines, and richly symbolic portrayals of characters and deities, these murals encapsulate the essence of southern Fujian's cultural and artistic heritage. The intricate mural patterns, including meticulous brushwork with heavy, bold colors, refined line drawings, and detailed painted reliefs, demonstrate a high level of artistic craftsmanship. These techniques and styles provide valuable insights for artists and researchers interested in the development and evolution of Chinese temple mural art. By studying these murals, one can gain a deeper understanding of the traditional techniques and symbolic representations that have been passed down through generations. Furthermore, the fusion of different religious iconographies within these murals highlights the cultural diversity and spiritual richness of southern Fujian, offering a unique perspective on the region's historical and artistic development. As such, the traditional temple murals of southern Fujian serve as a crucial reference point for appreciating and advancing the art of Chinese temple murals, preserving a legacy of beauty, symbolism, and cultural depth for future generations to explore and cherish.

3.3.2 Comprehensive Social Value

The traditional temple murals of southern Fujian hold immense and comprehensive social value. As a key item protected under cultural heritage laws, these murals play a crucial role in enhancing public historical awareness and promoting educational outreach. By preserving these artworks, society can better understand and appreciate the rich history and cultural significance of the region. Additionally, these murals serve as a valuable cultural and tourism resource. They attract numerous tourists, which in turn contributes significantly to the economic development of southern Fujian. The influx of tourists not only boosts local businesses but also fosters cultural exchanges and dissemination, allowing for a broader appreciation of the region's unique heritage. Through these murals, the cultural identity of southern Fujian is highlighted and shared with a wider audience, ensuring its preservation for future generations.

3.3.3 Historical Research Value

The traditional temple murals of southern Fujian have significant historical research value, serving as a rich repository of information about the region's past. The content of these murals reflects various aspects of social life during the periods in which they were created, offering detailed and tangible references for historians and sociologists. These scholars can utilize the murals to examine the social development, transformation, and historical-cultural evolution of southern Fujian. The murals depict a wide array of social activities, customs, and events, providing insights into the everyday lives of the people, their beliefs, and their societal structures. This visual documentation is invaluable for understanding how southern Fujian society has evolved over time, making the murals an essential resource for academic research and historical analysis. Through these artworks, researchers can trace the historical narrative and cultural heritage of the region, deepening our knowledge and appreciation of its unique history.

3.3.4 Cultural Inheritance Value

The traditional temple murals of southern Fujian manifest significant cultural heritage, reflecting the region's rich and deeply rooted religious culture. The majority of these murals center on religious themes, showcasing various deities, religious rituals, and mythological stories that are integral to the beliefs and practices of the local community. These murals effectively promote and transmit religious culture throughout the region by aligning closely with the spiritual and cultural values of southern Fujian residents. They serve not only as artistic expressions but also as visual narratives that reinforce and perpetuate the local religious heritage. The murals play a crucial role in educating future generations about the region's cultural and religious history through their detailed depictions and symbolic imagery. This continuity ensures that the unique traditions and beliefs of southern Fujian are preserved and celebrated, highlighting the essential role of these murals in cultural preservation and inheritance.

4. Analysis of Genetic Identification and Atlas Construction Technologies

4.1 Extraction of Cultural Genes and Model Construction

In the 1980s, domestic scholars derived the concept of "cultural genes" based on the "biological gene" theory. Jiang Guanghui stated, "'Cultural genes,' unlike 'genes' in biological genetics, cannot directly become objects of scientific experiments but can only be understood through historical and logical analysis" (Zhang, 2023). Currently, there is an abundance of research on the extraction of genes and the compilation of atlases related to intangible cultural heritage. However, there is a lack of studies that combine Minnan Folk Temple Murals with meme theory. This study aims to explore this topic.

According to the concept of genetic identification, the genes of Minnan Folk Temple Murals can be classified into dominant and recessive genes (Liu, 2023). Dominant factors are core elements that can be directly captured by visual senses, such as the shapes,

techniques, and colors of the murals. Recessive factors, on the other hand, include the implied semantics (symbolic emotional elements, cultural connotations, and allegorical meanings) within the murals. These require synthesizing information on the historical development, era background, and local folk beliefs associated with the Minnan Folk Temple Murals. It finally establishes four key identification themes: shape plane factors, color presentation factors, technique performance factors, and semantic connotation factors. A divergent model for the genetic extraction atlas of Minnan Folk Temple Murals is created using PowerPoint software for image creation and optimization (Figure 3). Additionally, the Analytic Hierarchy Process (AHP) is employed to analyze the significance of the four factors of Minnan Folk Temple Murals.

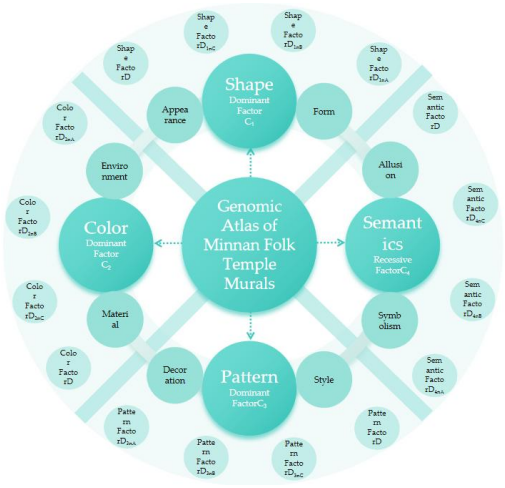


Figure 3: Genealogy of Minnan Folk Temple Murals

Table 2 Genomic Atlas of Minnan Folk Temple Murals

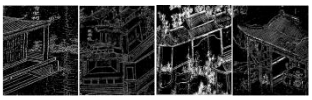
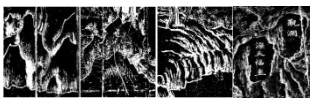
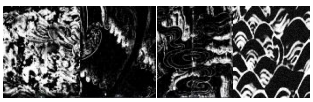
Shape Dominant Factor C1	Color Dominant Factor C2	Pattern Dominant Factor C3	Semantics Recessive Factor C4
Form Appearance	Environment Material	Decoration Style	Symbolism Allusion
Shape Factor D	Color Factor D	Pattern Factor D	Semantic Factor D
Shape Factor D1nA	Color Factor D2nA	Pattern Factor D3nA	Semantic Factor D4nA
Shape Factor D1nB	Color Factor D2nB	Pattern Factor D3nB	Semantic Factor D4nB
Shape Factor D1nC	Color Factor D2nC	Pattern Factor D3nC	Semantic Factor D4nC

4.2 Extraction of Shape Genes

The shape plane factor is an important dominant visual factor in Minnan Folk Temple Murals. It includes various forms such as figures, buildings, rocks, and vegetation from different periods and locations. Careful observation reveals traces of evolution within these shapes. This study examines the primary research samples of major mural elements found in Tianhou Temple, Kaiyuan Temple, and Shenggong Temple in the Minnan region. It extracts and simplifies the genetic information of shapes from different periods, locations, and angles, using contour lines to represent the basic shape characteristics of Minnan Folk Temple Murals. This process provides a data foundation for the construction and compilation of the genomic atlas.

Table 3: Extraction of Shape Genes

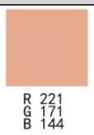
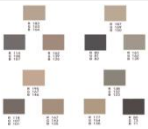
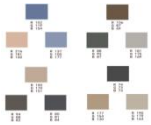
Shape Factor	Shape Factor Carriers	Extraction of Shape Factors	Simplification of Shape Factors

Shape Factor D11（Figures）			
Shape Facto D12（Architecture）			
Shape Facto D13（Rocks）			
Shape Facto D14（Clouds and Waves）			

4.3 Extraction of Color Genes

The color presentation factor is a relatively secondary dominant visual factor in the genomic atlas of Minnan Folk Temple Murals. It primarily reflects the composite colors of the base materials, pigments, and surrounding environment used in these murals. Minnan Folk Temple Murals often use materials like lime, hemp fiber, clay, and ceramics as substrates, and techniques such as ink wash and mineral pigments for coloring, resulting in diverse colors. This study focuses on collecting, extracting, and classifying the representative and predominant color factors from different materials, environments, and coloring methods used in Tianhou Temple, Kaiyuan Temple, and Shenggong Temple in the Minnan region.

Table 4: Extraction of Color Genes

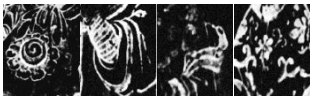
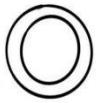
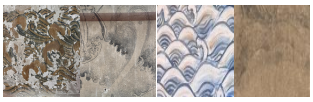
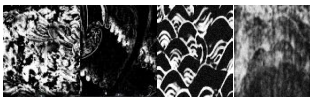
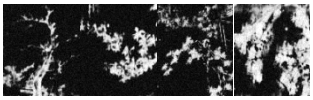
Color Factor	Color Factor Carriers	Extraction of Color Factors	Simplification of Color Factors
Color Factor D21（Figures）			 R 221 G 171 B 144
Color Factor D22（Architecture）			 R 221 G 188 B 171
Color Factor D23（Rocks）			 R 190 G 160 B 135
Color Factor D24（Clouds）			 R 190 G 176 B 152

4.4 Extraction of Pattern Genes

The pattern factor is a dominant element in the genomic atlas of Minnan temple murals, representing the unique cultural connotations of the region. The mural elements from Tianhou Temple, Kaiyuan Temple, and Shenggong Temple encompass a rich variety of decorative patterns such as garment patterns, cloud patterns, wave patterns, and plant patterns. These patterns emphasize symmetry, often using line-based shapes with balanced proportions. They are organically combined to exhibit a harmonious

blend of solid and empty spaces, as well as curves and straight lines. This study selects and integrates frequently occurring patterns to compile a representative genomic atlas of Minnan traditional temple mural patterns.

Table 5: Extraction of Pattern Genes

Pattern Factor	Pattern Factor Carriers	Extraction of Pattern Factors	Simplification of Pattern Factors
Pattern Factor D31（Garment Patterns ）			
Pattern Factor D32（Cloud Patterns）			
Pattern Factor D33（Wave Patterns）			
Pattern Factor D34（Plant Patterns）			

4.5 Extraction of Semantic Genes

The semantic connotation factor, although a recessive element in Minnan Folk Temple Murals, is a concentrated reflection of the cultural essence of the Minnan region. It not only embodies core cultural aspects such as Minyue culture, maritime culture, and religious culture but also carries the beliefs and aspirations of the Minnan people. This study analyzes the relevant allusions and connotations within the murals of Tianhou Temple, Kaiyuan Temple, and Shenggong Temple in the Minnan region. By extracting, analyzing, and categorizing the different semantic elements of various murals, the study aims to comprehensively understand and document their cultural significance.

Table 6: Extraction of Semantic Genes

Semantic Factor	Semantic Factor Carriers	Analysis of Semantic Factors	Extraction of Semantic Factors
Semantic FactorD41（Eight Immortals Crossing the Sea）		The mural of the Eight Immortals Crossing the Sea symbolizes wishes for happiness, longevity, and good fortune.	Happiness, longevity, and good fortune
Semantic FactorD42（Heavenly Empress Mazu）		The mural of Mazu as Heavenly Empress signifies respect for Mazu and prayers for safe voyages and travels.	Protection and safety
Semantic FactorD43（Shenggong）		The mural of the temple establishment and title conferment represents hopes for eliminating evil and seeking blessings.	Eliminating evil and seeking blessings

Semantic FactorD44（Dragon and Tiger）		The mural of dragons and tigers delivering blessings conveys prayers for protection from disasters.	Disaster relief and stability

4.6 Analytic Hierarchy Process (AHP)

The Analytic Hierarchy Process (AHP) was used to compare the four core elements of the murals in Minnan folk temples to explore their deeper relationships. AHP, introduced by American operations researcher T.L. Saaty in the 1970s, is a decision-making method that involves breaking down decision-related elements into multiple levels and factors. It involves evaluating the importance of pairs of factors to create a judgment matrix and calculating the weights of each factor to select the best solution. In this study, AHP was employed to extract the core elements of Minnan folk temple murals by calculating the relative weight vectors of the four core elements through scientific and mathematical pairwise comparisons. To achieve this, a questionnaire was designed and distributed to 18 experts, 9 teachers, and 24 local temple workers. They rated the importance of the four core elements of the murals using a 1-5 scale. The results were used to construct a primary indicator judgment matrix and calculate the corresponding relative weight vectors. Consistency testing was performed, resulting in a CR value of less than 0.1, indicating that the test passed consistency checks. This confirms that the extracted core elements of Minnan traditional temple culture are reliable and can support the construction of a genetic map.

Table 6: Relative Weight Vectors of Genes in Minnan Folk Temple Murals

Genes in Minnan Folk Temple Murals	Relative Weight Vectors	CI	CR
Shape Factor	0.1675	0.0650	0.0720
Color Factor	0.0664		
Pattern Factor	0.2581		
Semantic Factor	0.5080		

5. Conclusion

5.1 Lack of Professional Interdisciplinary Talents

With the increasing workload associated with cultural heritage information statistics and the gradual maturity of gene mapping technology, there is an evident shortage of interdisciplinary talents in this field. These professionals are required to scientifically apply biological concepts such as "gene recognition" and "gene mapping," while also having a thorough understanding of local historical development, cultural beliefs, and social values. The ability to organically combine and practically apply these two areas of expertise is essential. Cultivating such comprehensive talents is not only a major issue emphasized by national policies but also a practical challenge faced by the development of cultural heritage across various provinces, counties, and townships. In the long-term process of gene mapping, numerous obstacles are anticipated. One of the most significant challenges is the lack of professional talents, which can seriously affect the continuity and progression of mapping work. The shortage of individuals who possess both the scientific acumen to handle complex biological data and the cultural sensitivity to interpret historical and social contexts can lead to significant delays and impediments in the overall progress of gene mapping initiatives. Therefore, it is imperative to focus on developing a robust system for the cultivation of interdisciplinary talents who can meet these demands. Such a system would ensure that the field is equipped with professionals capable of navigating both the scientific and cultural

dimensions of gene mapping. This, in turn, would facilitate the smooth and continuous advancement of cultural heritage projects, ultimately preserving and enhancing our understanding of historical and cultural legacies.

5.2 Lack of Efficient Information Collection Methods

The original procedure of collecting information for traditional temple mural paintings is stringent in terms of conditions and consumes significant human, material, and time resources. Current research on the documentation and integration of information related to the restoration, protection, and inheritance of outstanding cultural heritage has often overlooked the inherent difficulties of data gathering and the unreliable nature of data management. Given the vast volume of data collected, traditional methods such as capturing photos, conducting field surveys, and performing internet searches require immense human and material resources, and even then, they can only barely ensure data completeness. Furthermore, the lack of scientific refinement and integration of the collected data samples leads to significant issues in the later stages of information collation. These issues include the complexity and difficulty in classifying the intricate image information of outstanding cultural heritage, the obscurity of semantic information that is challenging to comprehend, and the inability to distinguish between different manifestations of the same core element. Such problems significantly increase the time cost of information collation, organization, and database establishment. This, in turn, indirectly contributes to the probability of errors during repeated information collection efforts related to outstanding cultural heritage. In the context of the precise and highly interconnected information collection and integration of traditional temple mural paintings in southern Fujian, even minor errors can trigger a "butterfly effect." Such errors can have far-reaching consequences, amplifying small mistakes into significant issues. Consequently, addressing the challenge of high resource consumption in the collection process and providing a stable, accurate, and convenient method for information collection becomes a critical focus of this research. By developing more efficient and scientifically rigorous approaches, we can ensure the integrity and reliability of the collected data, ultimately facilitating better preservation and understanding of our cultural heritage.

5.3 Insufficient Support from Correlated Databases

The current efforts to gather statistical information about the outstanding cultural heritage are significantly hindered by the lack of a scientifically designed and integrated resource database. This deficiency becomes particularly apparent in the early stages of research, where it is necessary to conduct thorough research and compile statistics on relevant information. Researchers are often required to search and retrieve data from a multitude of related platforms, including websites, WeChat official accounts, the State Administration of Cultural Heritage, the National Library of China, and local gazetteers. The process of integrating valuable information for the intended research is inherently complex and cumbersome, presenting a variety of challenges. Among these challenges are issues related to scattered and weakly correlated data, which create significant difficulties in forming a cohesive understanding of the subject matter. Additionally, valuable information is frequently lost due to stringent time constraints, further complicating the research process. These issues pose substantial obstacles to the comprehensive study of traditional temple mural paintings in southern Fujian, making it arduous to conduct thorough and accurate research. Given these challenges, it is evident that when conducting such intricate and detailed research, having access to a vast, clearly integrated, and closely correlated database is imperative. Such a database would greatly facilitate the research process by providing a centralized repository of information that is accessible and easy to navigate. This would not only streamline the research process but also ensure that all relevant data is available in a comprehensive

and organized manner, thereby significantly enhancing the accuracy and efficiency of the research. A well-structured database would allow researchers to quickly locate and correlate information, reducing the time and effort required for data compilation and analysis, and ultimately leading to more robust and insightful findings.

6. Suggestions

6.1 Establish a Comprehensive Talent Cultivation System

To continuously promote the construction of genetic maps for traditional temple mural paintings in southern Fujian, it is essential to establish a comprehensive talent cultivation system. Firstly, it is necessary to set clear cultivation objectives and provide adequate cultivation conditions to nurture a large number of well-rounded talents. These individuals should be capable of systematically and solidly grasping historical and cultural knowledge, as well as biological gene mapping knowledge, and be able to flexibly apply this knowledge in practical scenarios, thereby meeting the developmental needs of cultural heritage work. Secondly, scientific and well-structured teaching content should be designed, and a foundational curriculum system should be established. The proportion of courses should be adjusted according to the identified priorities of talent cultivation. For instance, setting the ratio of historical and cultural courses to biological courses at 6:4 and the ratio of practical courses to theoretical courses at 7:3 would ensure a balanced and comprehensive education. Lastly, the talent cultivation model should be optimized by moving beyond the traditional single-track approach. Research talents from universities with interests in history, archaeology, biology, and computer science, as well as local cultural researchers and cultural inheritors, should be recruited for centralized teaching and management. Based on the specific requirements of constructing genetic maps for traditional temple mural paintings in southern Fujian, key courses should be extracted from the original curricula of various disciplines. Additionally, an online learning platform should be established to facilitate continuous learning. During the learning process, various forms of practical activities should be carried out to enhance practical skills. As the size of this interdisciplinary talent pool expands, related elective and compulsory courses can even be offered at local universities, further integrating this specialized knowledge into the broader educational framework. This approach not only ensures the development of highly skilled professionals but also promotes the interdisciplinary integration and practical application of knowledge, thereby providing robust support for the ongoing construction and refinement of genetic maps for traditional temple mural paintings in southern Fujian.

6.2 Application of Scientific Gene Recognition Technology

To advance the comprehensive and systematic collection of information about the traditional temple mural paintings in the southern Fujian region, the scientific application of gene recognition technology proves to be of paramount importance. At the initial stage of the gene mapping process, representative images of these mural paintings are meticulously captured. Following this, gene recognition technology is utilized to meticulously extract core elemental factors, which include shape, color, technique, and semantic factors. These extracted factors are then simplified and outlined using concise lines, enabling researchers to intuitively retrieve and distinguish the target information with greater ease. Additionally, semantic information is summarized and consolidated, allowing murals that share similar semantic content to be grouped. Their cultural connotations are then briefly described, which significantly enhances the accuracy and efficiency of information categorization. Furthermore, by employing the Analytic Hierarchy Process (AHP), researchers can establish matrices and create intuitive chord diagrams that reflect the relative weights of the various factors involved. This methodological approach improves the precision and stability of information

collection during the preliminary research phase. Notably, this approach effectively reduces the consumption of human and material resources, thereby saving a considerable amount of time. By aligning gene recognition technology with the systematic information collection of traditional temple mural paintings in southern Fujian, we can achieve better coordination in the construction of their genetic maps. This integration not only streamlines the research process but also ensures a more accurate and comprehensive understanding of these cultural artifacts.

6.3 Establishing a Comprehensive Cultural Gene Map

The current efforts to gather statistical information about the outstanding cultural heritage are significantly hindered by the lack of avaible data from a scientific and integrated resource database. During the early stages of research related to outstanding cultural heritage, it becomes imperative to conduct extensive research and compile statistics on relevant information. This often involves searching and retrieving data from various related platforms, including websites, WeChat official accounts, the State Administration of Cultural Heritage, the National Library of China, and local gazetteers. The process of integrating valuable information for the intended research is both complex and cumbersome, presenting numerous challenges. Among these challenges are the issues of scattered and weakly correlated data, which make it difficult to create a cohesive understanding of the subject matter. Additionally, valuable information is often lost due to time constraints, further complicating the research process. These issues pose a significant obstacle to the study of traditional temple mural paintings in southern Fujian, making it difficult to conduct thorough and accurate research. Therefore, when conducting such intricate and detailed research, it is imperative to have access to a vast, clearly integrated, and closely correlated database. Such a database would greatly facilitate the process by providing a centralized repository of information that is easy to access and navigate. This would not only streamline the research process but also ensure that all relevant data is available in a comprehensive and organized manner, thereby enhancing the accuracy and efficiency of the research.

This study analyzes the cultural background and comprehensive value of Minnan Folk Temple Murals, investigating the current application of collected information and integrating technologies in cultural heritage. It summarizes the existing challenges and uses genetic identification technology to extract core element factors. Employing AHP and Origin, the study performs relative weight analysis and simplifies these core elements. Furthermore, it establishes a professional talent cultivation system and constructs a comprehensive genomic atlas of Minnan Folk Temple Murals, providing researchers with a systematic, convenient, and visualized research database for the study of this art form.

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