

Research on Inheritance and Development Strategies of Local Cultural Genes: A Case Study of Historical and Cultural Districts in Guangzhou

He Yifei¹, Zhang Yu^{2,*}, Lin Peisong²

¹Guangzhou University, Guangzhou, 510006, China

²Jiaying University, Meizhou, 514015, China

*Corresponding author: nange_green@yeah.net

Abstract: Cultural gene theory offers an analytical framework for shifting the protection of historic districts from spatial control to the transmission of cultural meaning. Taking Enning Road, Xinhepu, Shamian and Beijing Road in Guangzhou as case districts, this study combines field investigation, archival research, space syntax and gene coding to build a three-dimensional framework of material, behavioral and conceptual genes. A total of 127 cultural gene elements are identified and assessed. The results show that Guangzhou's historic districts are characterized by multi-source accumulation, a commercial-capital foundation and openness. Behavioral and conceptual genes face stronger pressure from the loss of inheritors, the weakening of everyday scenes and functional replacement. Based on authenticity, integrity, vitality and adaptability assessment, the paper proposes a staged strategy of digital gene bank construction, community-based living inheritance and innovative transformation. The study provides a reference for moving from object-based conservation toward fine-grained governance oriented by cultural gene networks.

Keywords: cultural gene; historical and cultural district; Guangzhou; pedigree analysis; living inheritance

1. Introduction

Historical and cultural districts are major carriers of urban cultural genes, concentrating local identity, collective memory and everyday ways of life[1,2]. Rapid urbanization and renewal have improved physical environments while also introducing homogenized space, replacement of traditional business types and loss of transmission communities[3]. As a result, some districts now retain recognizable forms but exhibit weakened cultural content[4-6]. As a national historic city, Guangzhou has built a distinct Lingnan urban cultural gene pool through elements such as arcade streets, the Thirteen Factories trading port, Xiguan residences, Overseas Chinese villas and the traditional urban axis[7].

Existing studies have focused mainly on architectural conservation, renewal control and tourism utilization, while paying less attention to the internal structure, transmission chain and transformation mechanism of cultural genes[8-10]. The concept of cultural genes emphasizes the replication, mutation and continuity of cultural elements across memory, spatial carriers and social practice[11,12]. This perspective is therefore useful for explaining why historical districts should be transmitted, what should be transmitted and how that transmission can be transformed in contemporary contexts[13].

Accordingly, this study addresses three issues: first, it establishes a framework for identifying and coding cultural genes in historical and cultural districts; second, it maps the pedigree and spatial network of Guangzhou's representative districts; third, it proposes graded and phased inheritance strategies on the basis of viability evaluation.

2. Research Design

2.1 Study Area

This study selects four representative historical and cultural districts in Guangzhou: Enning Road Arcade Street as a Xiguan commercial district, Xinhepu Villa District as an Overseas Chinese cultural district, Shamian as a modern diplomatic and colonial heritage district, and Beijing Road Ancient Route

Site as a traditional axis and commercial-cultural district. Their spatial distribution is shown in Figure 1 and their basic characteristics are summarized in Table 1.

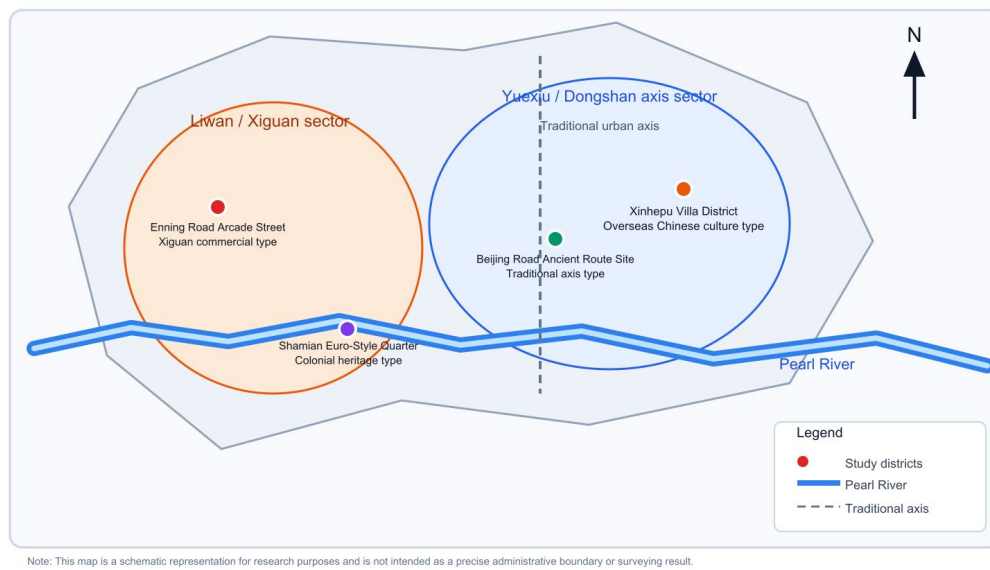


Figure 1 Spatial distribution of study districts

Table 1 Basic characteristics of study districts

District	Location and extent	Core period	Functional type	Representative cultural genes
Enning Road	Xiguan sector of Liwan District, about 16.8 hm ²	Late Qing to Republic era	Commercial-residential	Arcade streets, time-honored brands, Xiguan everyday life
Xinhepu	Dongshan sector of Yuexiu District, about 6.2 hm ²	1910s-1930s	Villa-residential	Red-brick villas, Overseas Chinese mansions, diaspora memory
Shamian	North bank of the Pearl River in Liwan District, about 30.0 hm ²	1860s-1920s	Diplomatic-commercial	Euro-style architecture, treaty-port trade, waterfront space
Beijing Road	Traditional axis of Yuexiu District, about 20.4 hm ²	Qin-Han to the present	Commercial-cultural	Ancient route remains, millennial commercial lineage, urban axis

2.2 Research Methods

The study follows a technical route of identification, coding, evaluation and strategy design. First, cultural gene elements are identified from three dimensions - material, behavioral and conceptual - through field investigation, historical documents and spatial morphological analysis. The material layer includes building forms, street layouts and landscape nodes; the behavioral layer includes folk activities, business forms and daily life; the conceptual layer includes place identity, collective memory and value orientation[14].

Second, a three-level coding system of layer code, type code and serial number is established. For example, M-A-01 denotes 'material layer-building form-bamboo-tube house', and B-F-01 denotes 'behavioral layer-folk activity-Spring Festival flower fair'. This coding system makes it easier to connect spatial location, historical source, viability status and strategic response.

Third, a viability evaluation model is constructed using authenticity (A), integrity (I), vitality (L) and adaptability (Ad):

$$V = 0.30A + 0.25I + 0.25L + 0.20Ad$$

Each indicator is scored on a five-point Likert scale. $V \geq 3.5$ is classified as high viability, $2.5 \leq V < 3.5$ is classified as medium viability, and $V < 2.5$ is classified as low viability.

< 3.5 as medium viability, and $V < 2.5$ as low viability. Finally, gene types and viability states are cross-analyzed to form a differentiated strategy matrix.

2.3 Data Sources

Field investigation was conducted from March to August 2023, covering 42 survey days, 127 interviews with original residents, 89 interviews with merchants and 34 interviews with cultural practitioners. The study also collected 23 historical maps and 156 cadastral files. Space syntax analysis was carried out using Depthmap to calculate indicators such as integration and intelligibility. Archival records, interview materials and spatial analysis were jointly used for gene identification, coding verification and viability scoring.

3. Pedigree Analysis of Cultural Genes in Guangzhou's Historical and Cultural Districts

3.1 Identification and Coding of Cultural Gene Elements

A total of 127 cultural gene elements were identified across the four sample districts. The material, behavioral and conceptual layers correspond respectively to spatial carriers, practical activities and value recognition. Together, they form a compound transmission system for historical and cultural districts. The coding results are summarized in Table 2.

Table 2 Statistical summary of coded cultural gene elements

Level	Type	Number	Share	Typical examples
Material layer (M)	Building form (M-A)	18	14.2%	Bamboo-tube houses, arcades, red-brick villas
	Street layout (M-S)	15	11.8%	Granite-paved alleys, comb-like layout, grid street network
	Landscape node (M-L)	12	9.4%	Gate towers, memorial arches, banyan gathering nodes
Behavioral layer (B)	Folk activities (B-F)	22	17.3%	Spring Festival flower fair, Dragon Boat races, private Cantonese opera clubs
	Business forms (B-C)	19	15.0%	Time-honored brands, specialty streets, arcade ground-floor shops
	Daily life (B-D)	14	11.0%	Yum cha, opening timber shutters, courtyard cooling life
Conceptual layer (C)	Place identity (C-P)	11	8.7%	Xiguan young masters/ladies, Dongshan young masters
	Collective memory (C-M)	10	7.9%	Prosperity of the Thirteen Factories, Overseas Chinese nostalgia
	Value orientation (C-V)	6	4.7%	Pragmatic commerce, openness and inclusiveness, clan mutual aid
Total	-	127	100%	-

3.2 Pedigree Characteristics of Cultural Genes

First, multi-source accumulation forms a compound gene pool. Guangzhou has long been a point of convergence for Lingnan local culture, migrant culture from the Central Plains, overseas commercial culture and modern imported culture. Its cultural genes therefore display cross-period layering. In Enning Road, for example, the gene sequence can be summarized as 'Ming-Qing clan settlement genes-Qing dynasty Thirteen Factories commercial genes-Republic era arcade architecture genes-contemporary creative insertion genes'.

Second, the city's commercial foundation reinforces functional genes. The behavioral layer accounts for the largest share of identified genes, and business-form genes are strongly linked with folk-activity

genes, reflecting the urban logic of 'commerce gathers people, and gathering forms customs'. Space syntax results further indicate high overlap between highly integrated street nodes and the distribution of time-honored brands and specialty streets, confirming the continuing anchoring effect of commercial genes on district space[15].

Third, openness and inclusiveness enhance adaptability. Conceptual genes such as openness, inclusiveness and pragmatic commerce remain highly recognizable across districts and continue to operate through mixed architectural forms, iterative business models and the renewal of community composition. These conceptual genes constitute an important internal driver for the contemporary transformation of Guangzhou's historical districts.

3.3 Mapping of Cultural Gene Networks

Based on the spatial placement, historical source and relational intensity of coded elements, this study maps the cultural gene network of Guangzhou's historical and cultural districts (Figure 2). The map adopts a three-ring structure of core genes, secondary genes and derived genes: core genes express the stable cultural kernel of district identity, secondary genes connect specific scenes and social practices, and derived genes indicate channels of contemporary transformation and communication.

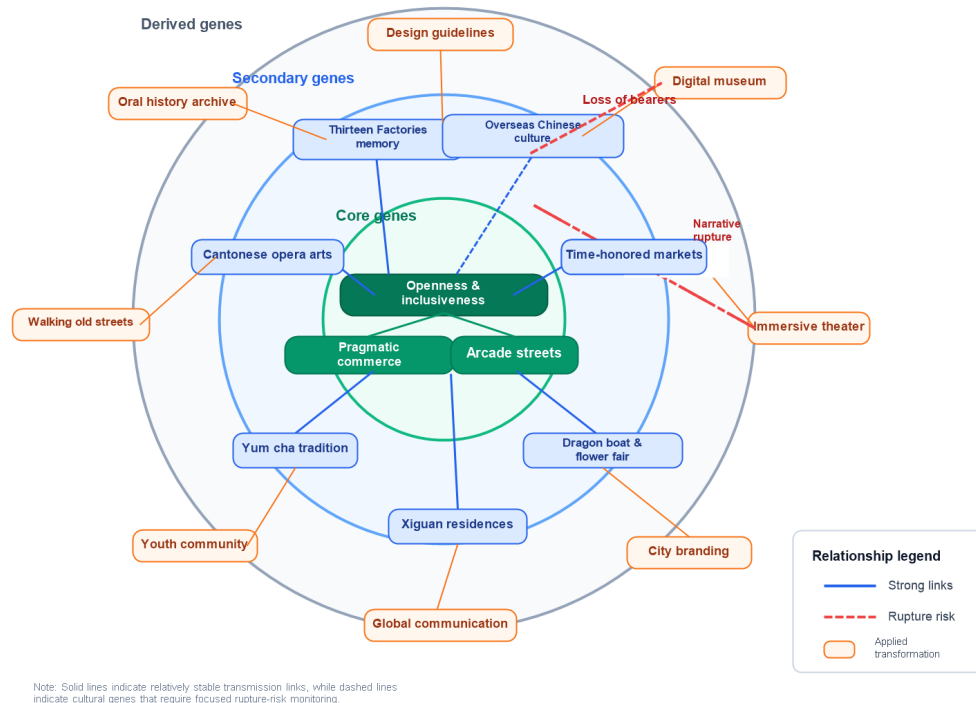


Figure 2 Cultural gene map of Guangzhou's historical and cultural districts

The map shows that the network of core genes remains relatively intact, while some peripheral and scene-based genes display rupture risks. In Xinhepu, for example, the gene of Overseas Chinese nostalgia has been weakened by the out-migration of original residents and descendants of Overseas Chinese. In Beijing Road, the gene associated with ancient route remains faces pressure on authenticity and integrity because of underground development and insufficient narrative interpretation.

4. Viability Crisis and Evaluation of Cultural Genes

4.1 Current Status of Gene Loss

A comparison between historical materials around 2000 and the 2023 investigation (Table 3) shows that 44 of the 127 cultural gene elements have clearly degenerated or disappeared, producing an overall loss rate of 34.6%. The behavioral and conceptual layers are more strongly affected by functional substitution, reduction of transmission communities and weakening of everyday scenes, whereas the

material layer shows a lower loss rate because of comparatively stable conservation institutions and restoration inputs.

Table 3 Evaluation of cultural gene viability status

Level	High viability ($V \geq 3.5$)	Medium viability ($2.5 \leq V < 3.5$)	Low viability ($V < 2.5$)	Loss rate
Material layer (M)	28	12	5	11.1%
Behavioral layer (B)	24	21	10	21.8%
Conceptual layer (C)	8	14	5	22.7%
Total	60 (47.2%)	47 (37.0%)	20 (15.7%)	34.6%

This pattern reveals a double squeeze. On the one hand, physical carriers may remain, but the everyday practices and local narratives behind them are gradually weakening. On the other hand, new consumption logic and external display modes enter districts rapidly, making some places increasingly symbolic, performative and socially thinned out.

4.2 Types of Viability Crisis

The four-dimensional assessment identifies four typical crisis types. Authenticity crises mainly involve inappropriate alterations to historic buildings, street textures and relic environments. Integrity crises occur when gene elements are displayed in fragmented ways without continuous narrative support. Vitality crises appear when inheriting communities are insufficient and daily-life scenes recede. Adaptability crises arise when traditional functions fail to respond to contemporary living and commercial demands.

Authenticity and integrity crises are concentrated mainly in the material layer, while vitality and adaptability crises occur more often in behavioral and conceptual genes. This indicates that conservation cannot stop at material restoration alone; it must also sustain community actors, ways of life and systems of cultural interpretation.

5. Strategies for Inheritance and Development

5.1 Strategy Framework: Viability-Type Matrix

Based on the cross-analysis of gene types and viability states, this study constructs a differentiated strategy matrix (Table 4). The key shift is from uniform protection to graded and classified governance: core genes require emphasis on authenticity and continuity, secondary genes require scene recovery and community participation, and peripheral genes require documentation, warning mechanisms and innovative transformation.

Table 4 Strategy matrix for cultural gene inheritance and development

Gene type	High viability ($V \geq 3.5$)	Medium viability ($2.5 \leq V < 3.5$)	Low viability ($V < 2.5$)
Core genes	Conservation strengthening: in situ protection, living monitoring	Repair and upgrading: functional insertion, scene reconstruction	Rescue and revival: gene bank construction, digital archiving
Secondary genes	Display and utilization: culture-tourism integration, educational communication	Cultivation and development: community building, youth participation	Research and excavation: oral-history rescue, pedigree completion
Peripheral genes	Innovative transformation: IP development, cross-sector collaboration	Warning and monitoring: regular assessment, risk control	Documentation and archiving: literature sorting, image preservation

5.2 Three-Stage Implementation Strategy

Stage 1 (1-3 years): construct a cultural gene bank and complete digital protection. The priority is to build integrated records for all 127 elements and establish a data chain linking gene code, spatial location, historical source, viability score and responsible actor. High-value historic buildings and street nodes should be documented through three-dimensional scanning and visual recording, while oral histories of original residents, senior merchants and cultural practitioners should be collected simultaneously.

Stage 2 (3-5 years): advance living inheritance and community building. In response to vitality and adaptability crises, traditional commerce, folk activities and everyday social scenes should be restored through rent support, business-entry control, co-governance of public space and community deliberation mechanisms. Enning Road should prioritize the activation of arcade ground-floor shops; Xinhepu should establish transmission programs and honorary-resident mechanisms for Overseas Chinese culture; Beijing Road should rebuild historical layering through relic display and immersive storytelling.

Stage 3 (5-10 years): promote innovative transformation and interregional communication. Architectural, commercial and conceptual genes should be translated into design guidelines, digital exhibitions for time-honored brands, urban cultural branding and international exchange programs, allowing cultural genes to retain local distinctiveness while entering contemporary life, industrial innovation and public communication systems.

5.3 Safeguard Mechanisms

Implementation requires coordinated mechanisms across policy, education, community participation, digital governance and international communication. The core is not simply to add more display projects, but to establish routine monitoring, public participation and renewal feedback so that cultural gene conservation becomes embedded in the normal workflow of urban governance (Table 5).

Table 5 Safeguard mechanisms and supporting measures

Dimension	Key task	Implementation focus
Policy making	Establish a graded control list for cultural genes	Integrate core genes into conservation plans, urban renewal and project approval procedures
Public education	Develop 'walking old streets' courses and university-oriented research themes	Create sustained communication mechanisms for teenagers and local communities
Community participation	Build a district gene guardian network	Use deliberation meetings and co-creation workshops to join renewal decisions and activity organization
Digital governance	Build a dynamic monitoring platform	Regularly update viability scores, risk levels and restoration progress
International exchange	Participate in Maritime Silk Road heritage-city cooperation	Share Guangzhou's cultural gene mapping methods and district conservation experience

6. Conclusions and Discussion

This study establishes a framework for the identification, coding, evaluation and strategic design of cultural genes in historical and cultural districts, and applies it to four representative districts in Guangzhou. The results show that Guangzhou's cultural genes are characterized by multi-source accumulation, a commercial-capital foundation and openness, while behavioral and conceptual genes face higher loss risks than material genes.

Differentiated strategies based on viability assessment can move district governance beyond object lists toward network-oriented management of cultural transmission. Future research should proceed in three directions: testing the stability of the coding system across more cities and districts, introducing long-term tracking data to explain mutation and reproduction mechanisms, and extending comparison to the scale of the Guangdong-Hong Kong-Macao Greater Bay Area.

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