

Unveiling the Narrative Tapestry: A Multifaceted Approach to Digital Visualization in Overseas Chinese Yinxin Design

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Abstract

This research highlights the significance of visualizing overseas Chinese Yinxin from Guangdong museums for digital art translation and heritage communication. The study employs content analysis and fuzzy set qualitative comparative analysis to explore factors influencing the emotional resonance of immersive digital interactions. Analyzing factors across availability, expressiveness, and resonance dimensions, it identifies eight key factors that enhance interaction, including morphological, sensory, and cognitive availability, and narrative, symbolic, and intertextual expression. These factors are grouped into three categories, forming five paths that contribute to the effectiveness of digital heritage experiences. Utilizing data mining algorithms, the study evaluates these paths within an immersive VR context, interpreting motion patterns meaningfully. The results contribute to the understanding of immersive digital interaction's role in heritage sharing and provide insights into "productive preservation" methodologies for overseas Chinese Yinxin.

Keywords: Overseas Chinese Yinxin, Fsqca, Content analysis method, Immersive digital interaction techniques

1 Introduction

Overseas Chinese Yinxin, recognized as a "memory container" embodying peoples identity and sense of belonging, has been listed in the Memory of the World Heritage List [1]. Through the research process of the Memory of the World Cultural Heritage both domestically and internationally, during the ongoing innovation in carrier materials and recording methods in the digital era, there has been a gradual transition from a focus on technology to a greater emphasis on humanities. This shift extends from traditional paper carriers to safeguarding and revitalizing digital memory cultural heritage content, prompting a heightened interest in addressing the psychological resonance of memory and information needs.

Artificial intelligence's capabilities in text recognition have given rise to innovative technologies that convert

obscure and difficult-to-understand information into simplified text information, making it easier to overcome the limitations of cultural heritage restoration. For example, the combination of Raspberry Pi 4B and convolutional neural networks (CNN) has been used for object classification and optical character recognition (OCR) [2-3]. Google Glass paired with Microsoft Azure's customized visual API service can provide real-time image-to-speech feedback [4].

Immersive digital interaction technology, exemplified by Falko Kuester's VR-based particle visualization system at the University of California, integrates virtual reality for intricate data analysis, focusing on real-time 3D data detection and analysis, particularly for virtual wind tunnels [5]. Han Wei Shen has proposed an interactive texture algorithm tailored for contextualized fields, furnishing users with a comprehensive framework that enables the utilization of interactive methods to map the fluidity of data through textures [6]. Nevertheless, their interaction methods are currently confined to conventional approaches such as menus. Meanwhile, Isung Pin Yeh employs a streamlined finite element algorithm to amalgamate visualization with analytical calculation processes. Leveraging WTK and IRIS GL, virtual scenes are generated and observed using a helmet-mounted display. The interaction mechanism involves parameter inputs, with real-time performance being prioritized over computational accuracy, marking the nascent stages of mastering visualization techniques [7]. Chengli Luo et al. designed and implemented a deep camera image recognition system based on YOLOv11. Through an alignment algorithm between RGB images and depth images, the system can effectively fuse the two types of image data, thereby improving the accuracy of object detection and performing well in measurement operations in complex environments, with an accuracy rate of up to 98% [8].

This research employs a visualization system with RGB images and OCR algorithms to analyze overseas Chinese Yinxin text content, aiming to create a model that integrates Yinxin characteristics and external environmental factors. The framework assesses emotional synchronization in information design for overseas Chinese communities, focusing on intrinsic, associative, and situational information needs. Hypotheses on design factors are tested using fuzzy sets to analyze psychological

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impacts, and Qualitative Comparative Analysis describes sustainable cultural heritage visualization design. An immersive, interactive visualization method explores Yinxin narratives, facilitating emotional storytelling and user engagement through data and VR.

2 Research on Overseas Chinese Yinxin

The overseas Chinese Yinxin, also referred to as “Qiaopi”, serves as a significant document for overseas Chinese relatives to access funds” [9]. It stands as the inaugural memory of World Heritage in Guangdong Province, China, as depicted in Figure 1.

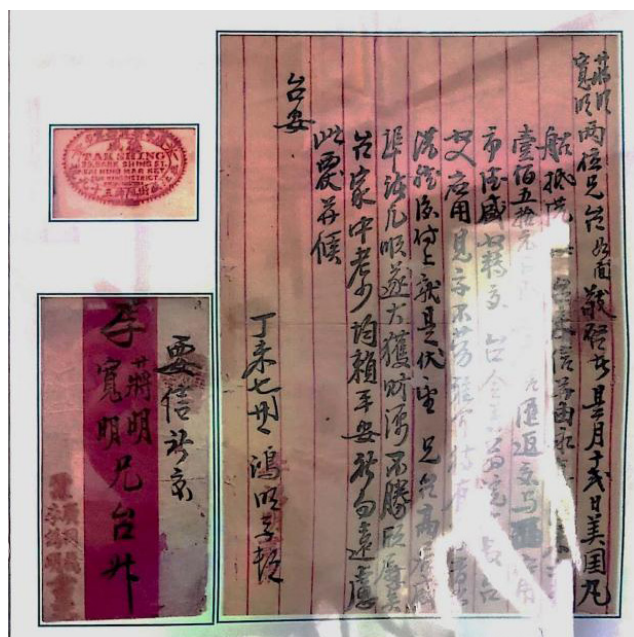


Figure 1. Overseas Chinese Yinxin

Digital technology and emotion recognition offer new tools for cultural heritage research, aiding analysis of emotional nuances in various contexts, including literature and history [10]. Kloiber and colleagues introduced an innovative approach to historical heritage research by creating virtual historical scenes using VR technology, allowing participants to immerse themselves in past events [11]. Technologies spanning from cultural heritage data visualization [12] and mobile visual search [13] to the replication of virtual cultural relics and the fusion of murals and physical objects through AR are gradually permeating the daily lives of the public. By converting over 50,000 Chinese immigrant archival records into metadata and high-definition scan images, users can readily access and refine searches via relevant keywords [14]. Present Yinxin digital platforms focus on metadata-based searches and content presentation, neglecting the deep profiling of Yinxin’s textual features and cultural significance. These shortcomings present significant research opportunities for scholars studying Yinxin’s development, translation, and inheritance. Analyzing Yinxin’s role in World Heritage memory could yield innovative frameworks and methodologies to protect and perpetuate cultural heritage.

3 Research Framework for Examining the Content of overseas Chinese Yinxin through the Lens of Group Cognition

The content analysis method, frequently employed in the artistic translation of textual heritage, dissects extensive textual information. Shuying Li examines the trajectory of development in digital media art through the lens of content analysis, elucidating its progression from the vantage points of digital media art design and trend analysis [15]. This study, focusing on inanimate objects, employs content analysis and fuzzy set qualitative comparative analysis to explore overseas Chinese Yinxin text content’s impact on visualization design. It examines sentiment divisions, quantifies content dimensions, and serves as antecedent conditions for design, aiming to minimize bias and enhance validity.

3.1 Content Analysis Method

3.1.1 Sample Selection and Determination of the Analysis Unit

As a cultural heritage, overseas Chinese Yinxin embodies the qualities of authenticity, uniqueness, and irreplaceability. In contrast to other forms of cultural memory, overseas Chinese Yinxin stands out for its comprehensive and uninterrupted historical record. Based on the overseas Chinese Yinxin text and its content and nature, 57 relevant letters were ultimately selected as the research sample. Prior to analysis, the text is meticulously preprocessed to exclude vocabulary and syntax that do not align with the research query.

3.1.2 Sample Data Analysis

This study qualitatively analyzes overseas Chinese Yinxin content using a three-step approach. Initial word frequency analysis categorizes content with ROST CM 6.0. The research draws on Huifen Shen’s study on war-related letters from the Chinese diaspora in Southeast Asia, illuminating collective memory construction [16]. Similarly, Zhaohui Liu explored the identity construction of returned overseas Chinese using the concept of “social memory” [17], while Sihui Chen investigated the social memory and identity construction of Yao returned overseas Chinese at Guangxi’s Shimanshan overseas Chinese [18]. Regarding research on the emotional content division of the text, Chao Guan delineated three dimensions: compassion, from benevolence to propriety, and value orientation discourse, with emotional characteristics rooted in Confucianism and its internal logic [19]. Building upon prior theoretical findings, the author conducted a standardized sampling of dispersed textual materials, extracting words and phrases relevant to the memory research theme and subjecting them to frequency statistics. In addition, the study explored the potential value of using digital visualization techniques to construct emotional memory within overseas Chinese Yinxin focusing on emotional appeal and identity, which are two dimensions that are crucial to the topic.

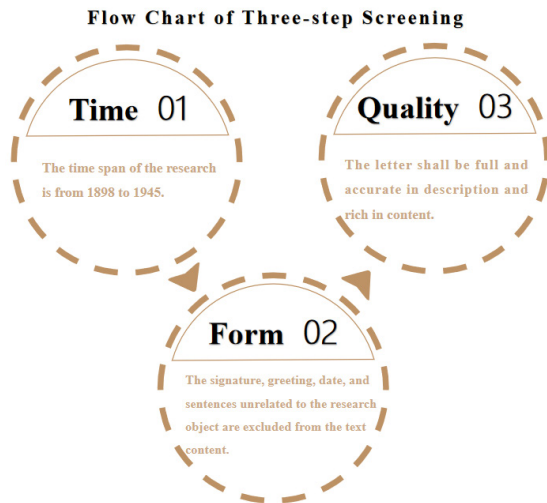


Figure 2. Flow chart of three-step screening

Simultaneously, drawing from relevant memory content and its emotional nuances as depicted in overseas Chinese Yinxin, five types of textual emotions were extracted and incorporated into secondary categories: love of mulberry and catalpa (25 letters), relief of poverty (9 letters), will serve the country (7 letters), love for the hometown (14 letters), and dream of rejuvenation (2 letters), as shown in Figure 2. Consequently, a coding category list was formulated, as shown in Table 1.

$$\text{Ratio} = \frac{\text{code}}{\text{QTY} (A1+A2+B1+B2+B3)}$$

Table 1. Statistical breakdown of the study content

Code I	Code II	Name	Quantity	%
Emotional appeal	Thinking about the Family	A1	25	45%
	Helping Families	A2	9	16%
Identity	Serving the Motherland	B1	7	
	Affection for the homeland	B2	14	42%
	Dream of Revival	B3	2	

3.1.3 Coding Reliability Tests

This study analyzes overseas Chinese Yinxin text content, categorizing it into two primary and five secondary categories based on sentiment representation, informed by prior research. To ensure category reliability, a three-person coding method is employed, involving familiarization with coding guidelines, independent coding of 57 texts, and a confidence test.

Previous research has shown that a reliability threshold above 85% is considered satisfactory. Table 2 presents a Cronbach's alpha value of 0.894 and a standardized Cronbach's alpha value of 0.896. Both coefficients approximate 90%, indicating a high level of consistency

among the coding members codes. Thus, the text of the overseas Chinese Yinxin can be analyzed according to this category.

Table 2. Content analysis method encoding reliability test and reliability statistics chart

Reliability statistics		
Cronbach's Alpha	Cronbach's alpha-based on normalized terms	Number of items
.894	.896	3

3.2 Dynamic Modeling of Information Elements in Chinese Yinxin Texts

Drawing from Roland Barthes two-layer symbol system of explicit and implicit symbols [20]. The study analyzes the connotation of information design elements in overseas Chinese Yinxin texts, categorizing content into explicit and implicit emotional expressions. A model is constructed, as seen in Figure 3, with three first-level and nine second-level indicators based on explicit and implicit symbolic analysis, refined through literature review and analysis.

The availability dimension, influenced by Hartson, Norman, and Luquan Yan [21], and the emotional aspect of overseas Chinese Yinxin, define interactive immersive digital interaction elements as morphological, sensory, and cognitive availability. This study explores overseas Chinese Yinxin visualization, focusing on physical form, sensory cues, and comprehension. Morphological availability pertains to size, shape, and structure; sensory availability to tactile and visual elements; and cognitive availability to facilitate recognition and appreciation of design nuances. The expressive dimension encompasses narrative, symbolic, and intertextual expressions. Narrative visualization reconstructs reality to evoke emotions and convey the circulation process of Yinxin items [22], while intertextual expression highlights the interconnectedness and cultural context of literary works [23]. Immersive digital interaction goes beyond visuals, emphasizing the readability and comprehensiveness of visual design, with intertextual elements linking visuals to text for enhanced audience recognition and acceptance.

Resonance in Yinxin involves contextual co-creation, emotional empathy, and memory resonance, reflecting user engagement and the letter's textual meaning, with Mowen and Meiner's "consumer context" influencing behavior [24], affirms that users generate emotional resonance through associations with certain stimuli, which is a stimulus-driven automated process. This emotional communication fosters a closer and more harmonious connection between the user and the product. Memory resonance, achieved through the visualization design of overseas Chinese Yinxin content, evokes past experiences to bridge the gap between individuals and the legacy text. This pleasurable emotion, triggered by the design, ultimately forms an immersive memory link and an emotional bond between the user and the product.

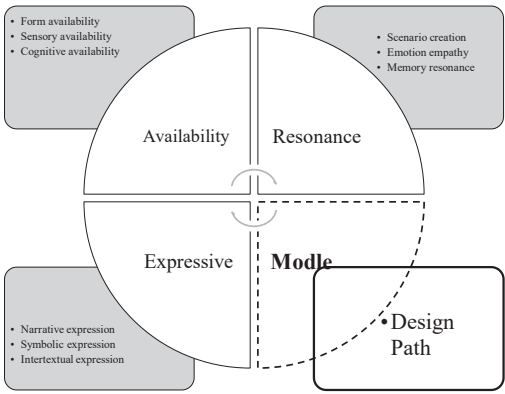


Figure 3. Characterization model of text message Immersive digital interaction techniques elements in Chinese Yinxin

Immersive digital interaction with overseas Chinese Yinxin fosters holistic understanding and emotional resonance, preserving heritage through textual symbols that encapsulate memory.

3.3 Qualitative Comparative Analysis

3.3.1 Data Quality Tests

In this study, an electronic questionnaire collected data, identifying nine antecedent variables: morphological availability, sensory availability, cognitive availability, narrative expression, symbolic expression, intertextual expression, contextual co-creation, emotional empathy, and memory resonance, to assess information visualization effectiveness. The questionnaire items were categorized using a seven-point Likert scale, ranging from 0 to 7 to denote responses from strongly disagree to strongly agree. Among the dispersed survey instruments, a total of 507 were retrieved. The validity and reliability of the questionnaire were evaluated via SPSS26.0 software, resulting in a Cronbachs alpha value of 0.97, KMO of 0.973, and Bartletts spherical test value of <0.001, indicating favorable reliability and validity of the questionnaire. Subsequently, the collected questionnaire data were calibrated. As indicated in Table 3.

Table 3. Analysis of the questionnaire reliability and validity

Reliability statistics		
Clone Bach Alpha	Cloning Bach Alpha based on standardized terms	Number of items
.970	.971	27
KMO and Bartletts test		
KMO sampling suitability quantity.		.973
Bartletts Sphericity Test	Approximate chi-square	4372.984
	Degree of freedom	351
	Significance	.000

3.3.2 Data Calibration

Data calibration involves assigning set affiliation scores to cases, i.e., allocating measured variables to a specific set [25]. The crucial aspect of this process is the researcher's judgment and justification of critical values based on their factual experience, theoretical knowledge, and the research context. Three essential values, known as anchor points, are necessary for delineating set affiliation during calibration: full membership, crossover point, and full non-membership.

The questionnaire data obtained from the Likert scale presented inherent advantages over qualitative data because of its structured nature. The scale provides a calibration standard, that facilitates calibration using the direct method, in which the highest value represents full affiliation, the mean signifies the crossover point, and the lowest value indicates full non-affiliation [26]. For Likert seven-point scale, the critical values are 6, 4, and 2 respectively [27]. However, in cases of small research samples or response bias among respondents, data often cluster around the mid-range values of 4, 5 and 6 with minimal responses at the lower extremes of 1 and 2, necessitating the researcher to address this imbalance. Scholars have addressed this issue by adopting Ragins percentile method, which uses the 95th, 50th, and 5th percentiles of sample data as indicators of full affiliation, intersection and non-affiliation respectively. Thus, this study adopts this method to calibrate eight variables, including morphological availability, sensory availability, cognitive availability, narrative expression, symbolic expression, intertextual expression, contextual co-creation and affective empathy with specific results detailed subsequently in Table 4.

Table 4. fsQCA data calibration table

Variable	Complete affiliation	Intersection point	Completely non-subordinate
façade	7	5	2
Sensory availability (Organ)	7	5	1.67
Cognition	7	5	1.67
Narrative expression	7	5	1.67
Symbolic representation	7	4.67	1.67
Intertextuality	6.901	4.67	1.67
Situation co-creation	7	5	1.67
Emotion	7	4.67	1.67

3.3.3 Analysis of the Necessary Conditions

According to the fuzzy set analysis procedure, before examining conditional combinations, it is imperative to discover the necessity of individual variables for the outcome variable which is assessed through two indicators:

consistency and coverage. Consistency determines the presence of a sufficient and necessary relationship between the condition variable and the outcome variable in geometric terms, deeming a condition variable necessary for the outcome if it achieves a consistency score of 0.9 or higher. Meanwhile, coverage assesses the extent to which the given conditions or combinations thereof elucidate the manifestation of the outcome.

The consistency scores for each variable concerning the outcome variable, derived from the consistency analysis conducted using the fsQCA software, are as follows:

As indicated in Table 5, the foremost influences in terms of necessity, ranked from the highest to the lowest, are intertextual expression with a score of 0.873005, followed by sensory variables availability with 0.872151, morphological availability with 0.870820, and emotional empathy with 0.870535. However, none of the individual antecedent conditions reached the threshold value of 0.9 or higher for being deemed a necessary condition. Hence, no single explanatory variable could fulfill the criteria for necessity. In addition, the individual antecedent conditions did not meet the requirements to be considered sufficient conditions for the outcome. Therefore, this study necessitates the combination of multiple antecedent conditions to conduct a comprehensive construct analysis.

Table 5. Consistency scores of individual variables regarding outcome

Variable name	Consistency	Coverage rate
Facade	0.870820	0.867033
Sensory availability (Organ)	0.872151	0.875226
Cognition	0.855338	0.863955
Narrative expression	0.851634	0.874561
Symbolic representation	0.858852	0.833518
Intertextuality	0.873005	0.846707
Situation co-creation	0.864647	0.878329
Emotion	0.870535	0.843380

3.3.4 Conditional Portfolio Analysis

In conditional combinatorial analysis, the results obtained through Boolean minimization operations consist of three parts: complex solution, simple solution and intermediate solution. The intermediate solution is considered superior to both the complex and intermediate solutions in terms of complexity and generalizability, offering the best interpretability. Therefore, in this study, the variables present in both the intermediate and parsimonious solutions are designated as core conditions, whereas the variables found only in the intermediate solution and not in the parsimonious solution are identified as auxiliary conditions. Based on this classification, five conditional combinations of antecedent variables that influence the resultant variables are derived, as illustrated in Table 6.

As shown in Table 6, the collective consistency of the five histogram solutions is 0.943446, indicating their high explanatory strength regarding the outcome variable.

The overall coverage of the solution is 0.7178, indicating that these five groupings elucidate approximately 72% of the heightened memory resonance. Specifically, all five combinations of antecedent variables boast consistency scores exceeding 0.9, with none exhibiting a unique coverage of 0, signifying that these five conditional combinations suffice as conditions for the overseas Chinese Yinxin immersive digital interaction techniques to evoke users' memory resonance. Notably, the core conditions across all five groupings remain consistent, each incorporating the intertextual and expression factor. Thus, this study identifies five avenues to amplify the memory resonance of the overseas Chinese Yinxin immersive digital interaction techniques.

Path 1: The antecedent configuration "Facade*Organ*Cognition*Intertextuality*Situation*Emotion" encompasses 62.47% of the cases in the sample. Intertextual expression emerges as the core condition prompting the user's memory resonance with the overseas Chinese Yinxin immersive digital interaction techniques, while auxiliary conditions include form availability, sensory availability, cognitive availability, contextual co-creation, and emotional empathy.

Path 2: The antecedent construct is "Facade*Organ*~Cognition*Narrate*Symbol*Intertextuality*Situation," accounting for 36.17% of the cases in the sample. The core conditions include intertextual expression, accompanied by secondary conditions such as morphological availability, sensory availability, cognitive availability, narrative expression, symbolic expression, and contextual co-creation.

Path 3: The antecedent configuration, "Facade*Organ*Cognition*Narrate*Symbol*Intertextuality*Emotion," encompasses 56.74% of the cases in the sample, with intertextual expression remaining the core condition. Auxiliary conditions include morphological availability, sensory availability, cognitive availability, narrative expression, symbolic expression and emotional empathy.

Path 4: The antecedent construct, "Facade*Narrate*Symbol*Intertextuality*Situation*Emotion," accounts for 56.82% of the cases in the sample, with intertextual expression serving as the core condition. Secondary conditions include morphological availability, narrative expression, situation co-creation, and emotional empathy.

Path 5: The antecedent construct, "Organ*Cognition*Narrate*Symbol*Intertextuality*Situation*Emotion," covered 57.56% of the cases in the sample, with intertextual expression as the core condition. Secondary conditions include sensory availability, cognitive availability, narrative expression, symbolic expression, contextual co-creation, and emotional empathy.

3.3.5 Robustness Tests

In this study, robustness assessment was conducted by increasing both the case frequency threshold and the original consistency threshold to reassess the combination of antecedent and dependent variables. The results of these robustness tests are presented in Table 7 and Table 8. Comparison with the original consistency threshold of 0.80 reveals that the overall consistency and coverage of the solution remain consistent after raising the consistency

threshold, and the antecedent variable configurations of the results are consistent with the previous ones. Raising the frequency threshold from 2 to 3 increased the consistency of the solution, resulting in enhanced core explanatory power. Upon validation, the resulting histograms demonstrate good stability.

Table 6. Results of the conditional combination analysis

Conditional variables	Solution				
	1	2	3	4	5
Form availability Facade	●	●	●	●	
Sensory availability Organ	●	●	●		●
Cognitive availability Cognition	●	○	●		●
Narrative expression Narrate		●	●	●	●
Symbolic expression Symbol		●	●	●	●
Intertextual form Intertextuality	●●	●●	●●	●●	●●
Contextual co-creation Situation	●	●		●	●
Affective empathy Emotion	●		●	●	●
Consistency Consistency	0.963099	0.967242	0.965417	0.955904	0.968825
Original coverage Raw coverage	0.624715	0.361797	0.567439	0.568294	0.575608
Unique coverage Unique coverage	0.0756078	0.0290655	0.0183321	0.019187	0.0265009
Consistency of solutions Solution	0.943446				
Coverage of solutions Solution coverage	0.7178				

Table 7. Robustness test results for increasing the original consistency thresholds

Conditional variables	Solution (The original consistency threshold is 0.85)					Solution (The original consistency threshold is 0.80)				
	A	B	C	D	E	1	2	3	4	5
Facade availability	●	●	●	●		●	●	●	●	
Sensory availability, organs	●	●	●		●	●	●	●		●
Cognitive availability	●	○	●		●	●	○	●		●
Narrative expression		●	●	●	●		●	●	●	●
Symbolic expression		●	●	●	●		●	●	●	●
Intertextuality expression	●●	●●	●●	●●	●●	●●	●●	●●	●●	●●
Situation co-creation	●	●		●	●	●	●		●	●
Emotional empathy	●		●	●	●	●		●	●	●

Consistency	0.963099	0.967242	0.965417	0.955904	0.968825	0.963099	0.967242	0.965417	0.955904	0.968825
Raw coverage	0.624715	0.361797	0.567439	0.568294	0.575608	0.624715	0.361797	0.567439	0.568294	0.575608
Unique coverage	0.0756078	0.0290655	0.0183321	0.019187	0.0265009	0.0756078	0.0290655	0.0183321	0.019187	0.0265009
Solution consistency	0.943446				0.943446					
Solution coverage	0.7178				0.7178					

Table 8. Robustness test for increasing the case frequency threshold

Conditional variables	Solution (Frequency threshold is 3)				Solution (Frequency threshold is 2)				
	A	B	C	D	1	2	3	4	5
Facade availability	●	●	●	●	●	●	●	●	
Sensory availability, organs	●	●	●		●	●	●		●
Cognitive availability	●	●		●	●	○	●		●
Narrative expression		●	●	●		●	●	●	●
Symbolic expression	●	●	●	●		●	●	●	●
Intertextuality expression	●	●	●	●	●	●	●	●	●
Situation co-creation	●	●	●	●	●	●		●	●
Emotional empathy	●	●	●	●	●		●	●	●
Consistency	0.9695	0.963825	0.960816	0.955904	0.963099	0.967242	0.965417	0.955904	0.968825
Raw coverage	0.579692	0.582067	0.572948	0.568294	0.624715	0.361797	0.567439	0.568294	0.575608
Unique coverage	0.0305851	0.0329596	0.0238412	0.0191868	0.0756078	0.0290655	0.0183321	0.019187	0.0265009
Solution consistency	0.947434				0.943446				
Solution coverage	0.65568				0.7178				

Note: ● represents the core condition, ● represents the auxiliary condition, ○ represents the missing auxiliary condition, and spaces indicate whether the condition is optional or not.

3.4 Findings

3.4.1 Intertextual Expression is the Primary Factor Contributing to Information Memory Resonance in the Design of Overseas Chinese Yinxin Immersive Digital Interaction Techniques

Intertextual expression is vital for enhancing user memory resonance in overseas Chinese Yinxin digital interactions, which are non-fiction historical narratives. Drawing on Saussure's linguistic theory, these texts embody implicit cultural connotations. High text comprehension and effective visual design may increase empathy for Yinxin memories. However, robustness tests show that factors like morphological availability, contextual co-creation, and emotional empathy also influence efficacy, suggesting complex interactions are key to memory resonance enhancement.

3.4.2 The fsQCA Method Unveils Five Paths for Enhancing Information Memory Resonance in the Overseas Chinese Yinxin Immersive Digital Interaction Techniques

The study identified five pathways that influence information memory resonance in overseas Chinese Yinxin immersive digital interaction design. Path 1 highlights the importance of credibility for users familiar with the techniques. Paths 2 and 3 suggest that users with high information literacy benefit from content effectiveness, while those with lower literacy value cognitive availability and co-creative contexts. Strengthening narrative and symbolic expressions is crucial for enhancing memory resonance. Path 4 and 5 both emphasize intertextual expression as a core condition, with narrative, symbolic, co-creative, and empathetic expressions as auxiliary conditions." Paths 4 and 5 reveal distinct priorities: Path 4 values morphological precision, while Path 5 emphasizes sensory cognition experience. This suggests a complementary relationship between these aspects. If the five variables are fulfilled, satisfaction with one can compensate for the others. In conclusion, three paths in overseas Chinese Yinxin visualization and interaction techniques, grounded in digital humanities, have been identified to enhance the spectral resonance of information memory.

4 Overseas Chinese Yinxin Immersive Digital Interaction Techniques from Digital Humanities Perspective Results

4.1 Intertextual Narrative Representation: Elucidating the Multidimensional Nature of Yinxin Ontology

The digitization of overseas Chinese Yinxin, transitioning from traditional letters to dynamic digital formats, enables nuanced content analysis and narrative coding. This study employs a narrative framework rooted in the Chinese diaspora's migratory experience, using Adobe After Effects and video editing to create engaging, emotionally resonant visuals. This approach enhances user

experience and immersion, aiming to deepen appreciation for the Chinese diaspora's banking culture.

4.2 From Sensory Expression to Design Narrative: Multimodal Affective Intertexts

Content analysis of overseas Chinese Yinxin reveals explicit emotional symbols, though this method overlooks hidden emotional cues, focusing on numerical assessments. This study enriches the digital interaction experience by enhancing scene tasks with icons and textual annotations, as shown in Figure 4, aiding user comprehension and engagement. VR environments use these visual cues to deliver interpretive prompts, allowing users to explore Yinxin from a third-person perspective, fostering narrative engagement.



Figure 4. Overseas Chinese Yinxin immersive digital interaction techniques display

4.3 From Cognitive Expressions to Affective Narratives: Diverse Empathic Intertexts

The traditional linear design of overseas Chinese Yinxin narratives is being replaced by a trend toward diverse, emotionally resonant, and interactive experiences. This study employs a VR narrative path that mirrors the Yinxin Postal Road, allowing users to deeply engage with the Yinxin process. Users navigate contextual tasks, seeking pivotal information within the narrative, fostering a structured understanding of Yinxin culture and its historical progression. This intertextual guidance enriches engagement and comprehension, as shown in Figure 5.



Figure 5. Scenarios of overseas Chinese Yinxin VR interaction

Design elements in the 3D letter interface enhance user sensory experience through dynamic interactions. Text introductions gently float, and letters emerge with animation. Clicking reveals the letter in 3D, complemented by images and narrative explanations. The overseas Chinese Yinxin VR Interaction offers an engaging “writing” environment, improving accessibility and resonance. It integrates historical data and documentaries, enabling users to trace family memories. Key features include intelligent character event searches, big data history construction, and personalized “Yinxin” creation, allowing for a customized and interactive experiences, as shown in Figure 6.

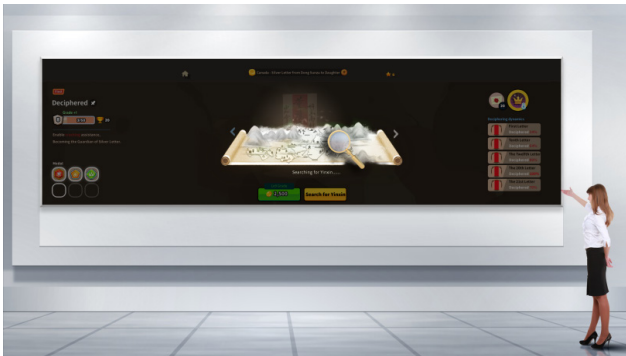


Figure 6. Overseas Chinese Yinxin VR immersive interactive holographic screen display

5 Conclusion

Digital humanities technology fosters innovation in cultural heritage information by encouraging the fusion of different elements to evoke novel visual VR immersive interactive language. As a pioneering digital technology method, digital humanities essentially shape the information form of the target object. By adhering to the principle of digitally translating Yinxin and advancing through interactive design modalities of accessibility, expression, and empathy, digital humanities design creativity will venture into a new field, enabling users to engage with, comprehend, and empathize with digital cultural heritage on multifaceted levels. Within the digital humanities realms, forms take on a rhythmic, sustainable, and ever-evolving dynamic existence, ultimately facilitating the intrinsic alignment of Yinxin memory content and the public's emotional resonance.

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