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Culture + Sojourn: A Study on the Symbolic Expression and Communication Strategies of Regional Culture in Sojourn Space Carriers

-- Taking the Tie-dye Culture of the Bai Nationality in Dali as an Example

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Abstract: Taking the tie-dye culture of the Bai Nationality in Dali as an example, this study explores the symbolic expression and communication strategies of regional culture in sojourn space carriers. Through methods such as literature review and field research, it conducts symbolic extraction and spatial translation of tie-dye culture, transforms tie-dye processes into spatial design elements, and realizes the application of these elements in the material layer and behavioral layer of sojourn space. The study proposes multiple application strategies for regional culture in space carriers, including the construction of symbolic systems, immersive communication, and the application of digital technologies. The research findings are of great significance to characteristic spatial design, regional economic development, and cultural inheritance. In the future, further expansion can be carried out from aspects such as deepening theoretical research, upgrading digital applications, improving cooperation mechanisms, and further exploring the role of rural revitalization.

Keywords: Tie-Dye Culture of the Bai Nationality; Sojourn Space; Symbolic Expression; Communication Strategy.

1. Introduction

1.1. Research Background

1.1.1. Traveling to Yunnan: Charting New Paths for Industrial Development

Against the backdrop of advancing the rural revitalization strategy, Yunnan Province launched the Three-Year Action Plan for Accelerating the Development of Travel and Residence in Yunnan in 2024. This plan aims to cultivate over 3,000 key rural travel and residence villages by 2027, attract and nurture leading enterprises in the sector, establish nationally renowned travel and residence models, and coordinate diverse travel and residence formats across urban and rural areas. Concurrently, Yunnan's 14th Five-Year Plan emphasizes enriching the substance of eight key industries. Centered on the deep integration of cultural tourism and wellness tourism, it aims to reshape the competitive edge of the tourism sector. As cultural tourism relies on physical spaces for its material foundation, the cultural adaptability of these spatial environments becomes crucial. [1]

1.1.2. Cultural Confidence: Igniting New Momentum for Rural Revitalization

The report of the 20th CPC National Congress calls for "advancing cultural confidence and self-strengthening to forge new glories in socialist culture." Rural cultural confidence, as the core pillar of rural revitalization, must inject cohesion and developmental momentum through cultural innovation, the revitalization of local traditions, the cultivation of civilized rural customs, and the flourishing of cultural industries. In rural settings, cultural confidence manifests as villagers' identification with and pride in indigenous traditions—such as tie-dye techniques and folk customs—directly boosting their enthusiasm for participating in rural revitalization. [2]

1.1.3. Multiculturalism: Showcasing New Characteristics of Yunnan's Rural Areas

Rural culture encompasses dimensions of production, daily life, customs, and spirituality. As China's region with the densest distribution of ethnic minorities, Yunnan hosts 26 ethnic groups comprising 34.3% of its total population (including six groups—such as the Yi and Hani—with populations exceeding one million). Long-term coexistence with the Han Chinese has fostered a diverse cultural landscape. As of March 2023, Yunnan boasts 777 villages listed in China's Traditional Village Registry—the highest nationwide—spanning 16 prefectures (cities) and 24 ethnic groups. For instance, Yi villages concentrated in Chuxiong and Dali preserve traditional customs and architectural styles; while Bai villages like Xizhou Ancient Town in Dali are renowned for their distinctive architecture and Three-Course Tea culture, offering rich case studies for regional cultural research. [3]

1.1.4. Responding to Policy, Creating New Tourism-Residence Models in Yunnan

The Three-Year Action Plan for Accelerating the Development of Yunnan as a Travel and Residency Destination (2024-2027) positions the travel and residency industry as a strategic priority. The Bai ethnic enclave in Dali, western Yunnan, leverages resources like tie-dye culture, architectural symbols, and folk arts to become a core hub for "artistic travel and residency" and "rural travel and residency." By integrating Bai cultural symbols into travel-residence space design, this approach not only fulfills the policy mandate to "create nationally renowned travel-residence models" but also leverages cultural IP to forge

differentiated competitiveness for travel-residence projects. This strategy propels Yunnan's travel-residence brand from emphasizing "ecological advantages" to achieving "cultural depth." [4]

1.2. Research Significance

1.2.1. Facilitates the Design and Creation of Distinctive Spaces

From an architectural perspective, elements of traditional Bai architecture—such as flying eaves, bracket systems, wood carvings, painted decorations, and the "three courtyards and one screen wall" layout—possess strong visual and artistic appeal. Integrating these cultural symbols into modern residential space design in Western Yunnan can break traditional design constraints, creating environments that blend regional characteristics with ethnic styles. Simultaneously, the Bai people's traditional construction techniques and material usage experience provide valuable references for modern building material innovation, driving the integration of traditional craftsmanship with modern technology. [5]

1.2.2. Promoting Regional Economic Development and Enhancement

The Bai ethnic group's tie-dye industry is a vital pillar of Western Yunnan's regional economy. According to the "2025–2030 China Tie-Dye Shirt Data Monitoring and Research Report," China's share of the global tie-dye shirt market is projected to reach 40% by 2030. By exploring the cultural symbolism of tie-dye, enhancing product value-added, and strengthening brand influence, cultural industry upgrades can be driven ， as exemplified by Zhoucheng Village in Dali, where nearly 100 tie-dye businesses support over 7,000 jobs, generate annual sales exceeding 70 million yuan, and export 80% of their products to more than 10 countries. This approach boosts residents' income while fostering tourism prosperity. [6]

1.2.3. Beneficial for Regional Cultural Export and Innovation

In the context of globalization, Bai tie-dye—a vital branch of Chinese traditional culture—features symbols (like butterfly and octagonal patterns) that transcend linguistic barriers, serving as bridges for cross-cultural exchange. Research into the symbolic expression and dissemination of tie-dye can propel this regional culture onto the international stage. Simultaneously, modern design and communication methods enable cultural innovation, preventing traditional techniques from fading into irrelevance. [7]

1.3. Research Overview

1.3.1. International Research Overview

Internationally, research on integrating regional culture with architectural spaces has reached a high level of maturity: Japan incorporates traditional elements like washi paper and tatami mats into modern design to enhance cultural identity within spaces; UNESCO promotes global preservation of traditional crafts through the Convention for the Safeguarding of the Intangible Cultural Heritage, with studies on the techniques and cultural symbolism of India's "Bandhani" tie-dye and Africa's "Adire" tie-dye emerging as hot topics. Additionally, international brands frequently apply tie-dye elements to fashion and home goods, forming a complete chain of "craft inheritance-design innovation-market conversion." For instance, Japanese Mino washi paper increased its cultural recognition by 40% through a multi-dimensional communication system combining "museums + workshops + digital experiences."

1.3.2. Domestic Research Overview

Domestic research focuses on preserving and applying regional cultures within the context of rural revitalization: In architecture, scholars explore integrating Tujia-Miao and Naxi cultures into rural landscapes and tourist accommodations—such as Lijiang Ancient Town leveraging Naxi culture for tourism development. In the field of tie-dyeing, research primarily centers on historical tracing (origins in the Eastern Han Dynasty, peak in the Tang Dynasty), technique documentation (1,180 patterns, 26 needlework methods), and design applications (clothing, soft furnishings) of Bai ethnic group tie-dyeing in Dali. However, existing studies predominantly approach the subject from a craftsmanship perspective, lacking analysis of the narrative system of tie-dyeing from the angle of pictorial symbolization. This falls short of meeting the demand for deep cultural dissemination within residential spaces. [8]

1.4. Research Subject

Table 1. Classification of Blue Dyeing

Wax Batik (Wax Dyeing)		
Gray Batik (Resist Dyeing with Starch Paste)		
Tie-dye (Tie-dyeing)		
Clamp Resist Dyeing (Stencil Printing)		
Dip Dyeing		

Traditionally known as "jiao xie," tie-dyeing emerged during the Qin and Han dynasties, flourished in the Sui and Tang periods, and later concentrated in southwestern ethnic minority regions during the Ming and Qing dynasties. Dali, renowned for its well-preserved techniques, is celebrated as the "Hometown of Ethnic Tie-Dyeing." Bai ethnic tie-dye motifs encompass animals, plants, and natural landscapes, predominantly featuring symmetrical and filled compositions. Using indigo dye, it achieves a "blue background with white floral patterns" effect, combining practical and aesthetic value—originally used for clothing, bedding, and other daily necessities, it has recently expanded into spatial decoration.

Zhoucheng Village in Dali, China's largest Bai ethnic settlement (with over 10,000 residents, 99% of whom are Bai), serves as the core hub of the tie-dye industry. It currently hosts nearly 100 tie-dye businesses employing close to 1,000 people, generating employment for over 6,000 individuals in the surrounding area. Annual sales revenue exceeds 70 million yuan, with 80% of products exported overseas. This dual economic value and cultural significance makes it the primary research site for this study.

2. Symbolic Extraction and Spatial Translation of Tie-Dye Culture

2.1. Practical Challenges in Symbolic Transmission of Regional Culture

2.1.1. Dilution of Cultural Essence: Symbolic Hollowing Under Commercialization

Current tie-dye dissemination excessively pursues commercial gains, reducing symbols to visual ornaments: Some tourist souvenirs simplify tie-dye patterns into geometric designs printed on T-shirts and canvas bags without interpreting cultural meanings like "the octagonal flower symbolizing family harmony" or "the Cangshan snow pattern representing regional identity"; To reduce costs, some workshops in Zhoucheng Village have replaced the manual process of "binding-dyeing-unbinding" with machine-based mass production, thereby losing the collective memory embedded in the craft (such as family collaboration in tie-dyeing) and the wisdom it embodies (like how soaking time affects color).

2.1.2. Limited Dissemination Channels: A Single-Model Focus on Product Sales

Tie-dye cultural exports remain dominated by physical products (clothing, home textiles), accounting for over 70% of output, while cultural experiences and digital dissemination channels remain underdeveloped. For example, while tie-dye themed guesthouses in Dali offer flower-tying experiences, these remain at the "hands-on play" level, lacking craft instruction (e.g., stitch variations) and cultural interpretation (e.g., pattern symbolism). Compared to Japan's Mino Washi system integrating "museums + workshops + digital experiences," Dali has yet to establish a composite dissemination matrix combining "products + experiences + digital platforms."

2.1.3. Insufficient Cognitive Depth: Disconnect in Visitors' Decoding of Cultural Symbols

A survey of 800 tourists in Dali revealed that only 23% could identify the "Cangshan Snow" and "Erhai Moon" motifs in tie-dye patterns, while 41% perceived tie-dye as merely "blue-and-white patterned fabric." This highlights a disconnect between the symbolic elements and audience recognition. The core reason lies in the lack of coherent interpretation linking "symbol-semantics-context" in communication—existing workshops and museums predominantly showcase finished products without presenting the complete chain of "plant dyeing (indigo root) → pattern design (blessing symbolism) → craftsmanship (randomness of unraveling threads)." This makes it difficult for tourists to grasp the value of tie-dye as a "living carrier of Bai ethnic culture."

2.1.4. Fragmented Symbolic System: Lack of Standardization and Distinctiveness

Batik patterns exhibit regional variations ("one village, one style")—Zhoucheng Village favors geometric motifs while Weishan emphasizes floral designs—without a unified symbolic recognition system. This results in vague external perceptions of "Bai batik" as a whole. Some modern designs awkwardly transplant symbols, such as directly applying the blue-and-white tie-dye color scheme to building facades without considering harmony with the Bai ethnic group's "three courtyards and a screen wall" architectural style, resulting in symbol piling rather than organic integration.

To address these issues, this study establishes a tie-dye cultural gene bank: patterns are categorized and organized under "natural imagery-daily scenes-spiritual beliefs" to build a digital database; process explanations from veteran artisans in Zhoucheng Village are collected (interview records in the Appendix) to provide a foundation for symbolic application.

2.2. Symbolic Expression and Spatial Design Application of Tie-Dye Processes in Travel-Residence Scenarios

2.2.1. Symbolic Immersive Experience of Physical Processes

2.2.1.1 Tie-Dyeing

Fabric Folding: Geometric forms like triangles and rectangles created through diagonal folds and repeated folding can be abstracted into spatial design elements—e.g., wall decorations featuring equilateral triangle reliefs, or furniture shapes incorporating rectangular contours, hinting at the "regularity" of the tie-dyeing process.

Tying Techniques: The symmetrical folds created by Zhoucheng Village's "butterfly tie" method can be transformed into continuous zigzag or wavy line symbols—such as curtains cut in wavy patterns and pillows embossed with folded textures, fostering a fluid and gentle ambiance.

Pattern Presets: Floral and butterfly motifs serve as visual focal points throughout the space. Examples include murals featuring tie-dyed floral patterns and butterfly-patterned ceramic tile mosaics on floors, enhancing cultural distinctiveness.

2.2.1.2 Dyeing

Dye Colors: Indigo blue, the signature color of tie-dye, embodies the regional imagery of "sky and water blending as one." It can be rendered through wall paint (gradient shades of indigo) and lighting design (cool-toned spotlights), simulating the tranquil nighttime ambiance of Erhai Lake.

Dyeing Duration: Light hues from brief immersion and deep tones from prolonged soaking mirror spatial light gradients—adjustable spotlights in exhibition halls gradually illuminate tie-dyed pieces from soft to intense, visually demonstrating color evolution.

Dyeing Methods: Cold dyeing (soft hues) and hot dyeing (vibrant hues) can correspond to different spatial functions—using cold-dyed tones in children's activity areas to foster warmth, and hot-dyed tones in art studios to stimulate creativity.

2.2.1.3 Unraveling

Pattern Randomness: The unpredictable textures revealed after unraveling threads can be transformed into spatial "negative space" design—such as reserving blank areas on guesthouse walls to display tie-dye pieces created by visitors, showcasing the artistic charm of "unfinished" aesthetics.

Textural Details: Exposed thread ends and subtle wrinkles can be recreated through material selection—such as using wood with coarse grain for furniture or applying textured wall paint to evoke an authentic, handcrafted ambiance.

2.2.2. Narrative Transformation of Tie-Dye Cultural Processes

The symbolic meanings and production scenes of tie-dye patterns can be recreated through spatial layout:

Pattern Symbolism: "The octagonal flower symbolizes family harmony" can be translated into a circular ceiling in the guesthouse living room (symbolizing reunion), paired with octagonal flower-shaped pendant lights; "Cangshan Snow, Erhai Moon" patterns can adorn guest room accent

walls, integrating local natural landscapes to explain cultural significance.

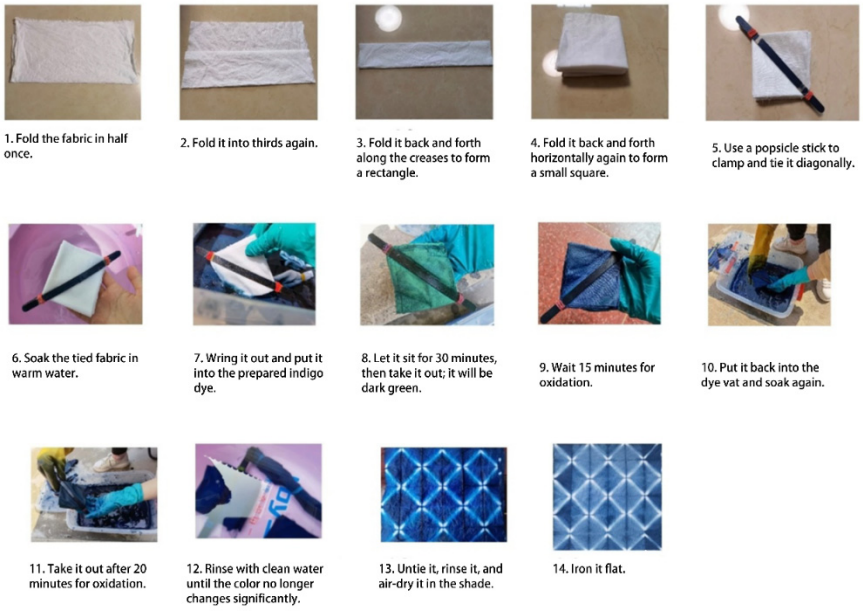
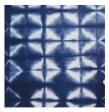
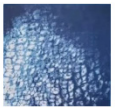
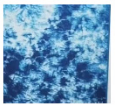


Figure 1. Schematic diagram of tie dyeing steps

Collective Memory: Scenes like "families gathering to tie-dye" and "collective fabric drying" can be recreated through functional zoning—such as an open-concept dyeing workshop with long communal workbenches for collaborative efforts, and an outdoor drying area for hanging tie-dyed fabrics, immersing guests in the atmosphere of collective labor.

Table 2. Tie dyeing techniques

Spiral method		Tying method	
Clipping method		Ripple method	
Jiu Zha Fa		Electric shock	

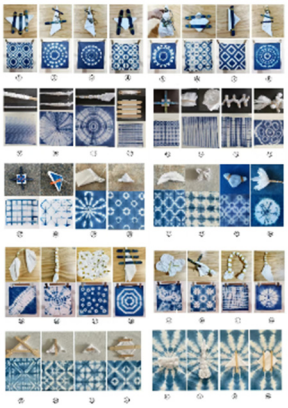


Figure 2. Different tie dyeing techniques and corresponding finished product images

2.2.3. Abstract Expression of Tie-Dye Cultural Ambience

Color Ambience: Employ indigo blue as the primary hue, complemented by natural wood tones (symbolizing the timber structures of Bai architecture) and warm yellow lighting to evoke the "serene + cozy" aesthetic of Bai life. For instance, a Xizhou homestay uses walls with deep-to-light indigo gradients to mimic Erhai Lake, paired with wooden furniture and warm-toned table lamps to recreate the Bai tradition of "dwelling by the water."

Symbolic Metaphor: The "uncertainty before unraveling" inherent in tie-dyeing translates to the spatial concept of "negative space"—exhibition halls avoid full-wall decoration, reserving blank sections for visitors to mentally complete cultural scenes; guesthouse common areas feature "unfinished tie-dye display zones" to embody culture's evolving nature.

2.2.4. From Spatial Practice to Cultural Identity Communication

Reconstructing Local Identity: Integrate tie-dye symbols with Bai architectural vocabulary to avoid symbolic fragmentation—for instance, the indigo-dyed guesthouse juxtaposes tie-dye patterns with traditional wooden lattice windows, while its exterior walls combine "white walls with indigo patterns," preserving the "three courtyards and a screen wall" architectural form while incorporating tie-dye culture.

Sustainable Dissemination: Stimulating visitor sharing through engaging spatial experiences—such as guesthouses featuring "dyeing art walls" (displaying visitors' tie-dye creations), encouraging photo and video sharing on social media to generate secondary dissemination and expand the influence of tie-dye culture.

2.3. Translation and Application of Tie-Dye Symbols

2.3.1. Behavioral Layer: Spatial Narrative and Interactive Tie-Dye Experiences for Visitors

Circulation Design: Plan spatial flow based on the tie-

dyeing process—for instance, establish a "Tie-Dye Culture Gallery" in the guesthouse that sequentially displays the steps from "fabric preparation → tie-dyeing → dyeing → untying → finished product." Pair this with illustrated explanations and physical exhibits to guide visitors through the craft step by step. Install interactive screens at key points (such as the dye vat area) to play videos featuring artisan demonstrations.

Participatory Spaces: Create an open-concept dyeing workshop offering the full experience from tying patterns to untying threads. Visitors can choose mediums like handkerchiefs or T-shirts to create their own pieces under artisan guidance, with finished works displayed in guest rooms or public areas. Regularly host "Batik Culture Festivals" featuring live demonstrations of intricate techniques like "butterfly tie-dye" and "chrysanthemum tie-dye" to enhance visitor engagement.

2.3.2. Material Layer: Scenario-Based Integration of Tie-Dye Materials and Unique Textures

2.3.2.1 Space Division and Decoration

Walls and Partitions: Flexible partitions (e.g., gauze tie-dye curtains) crafted from tie-dye fabrics utilize translucency to create indigo gradient effects, separating public and private zones. Walls feature tie-dye pattern reliefs or hand-painted designs to amplify cultural ambiance.

Ceiling Design: Guest room ceilings feature tie-dyed fabric suspended ceilings, where pleated textures add spatial depth; exhibition hall ceilings display hanging tie-dyed fabric drapes that flutter with air currents, simulating the scene of "drying fabrics."

2.3.2.2 Furniture Design and Application

Surface Decoration: Wooden furniture surfaces feature carved tie-dye "wrinkle textures," such as wavy patterns on tabletops and chair seats; sofa backs and headboard upholstery use tie-dyed fabrics printed with butterfly and floral motifs.

Form Design: Furniture shapes draw inspiration from tie-dye folds—chairs feature undulating backrests, while coffee table edges mimic fabric-folded curves, blending aesthetics with ergonomics.

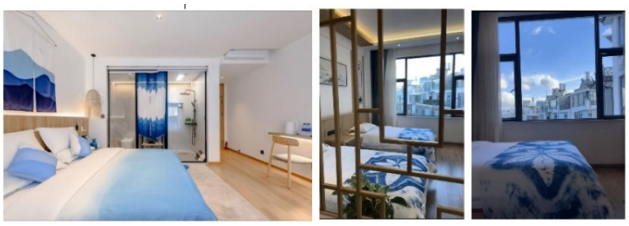


Figure 3. Schematic diagram of indoor soft decoration in homestay

2.3.2.3 Soft Furnishings and Accessories

Decorative Fabrics: Custom tie-dyed throw pillows, rugs, and curtains featuring local motifs (e.g., snow-capped Cangshan Mountains, moon over Erhai Lake). Bedding employs "blue background with white floral" color schemes to recreate traditional Bai ethnic living scenes.

Decorative Accents: Tie-dyed fabric ornaments (wind chimes, tapestries) and repurposed dye vats as planters adorn guest rooms and public areas. Display stands showcase miniature tie-dyed items (handkerchiefs, sachets) explaining pattern symbolism to visitors.

2.3.2.4 Landscaping and Outdoor Spaces

Shade Structures: Courtyards and terraces feature parasols and canopies crafted from tie-dyed fabrics, blending functionality with artistic appeal. Railings incorporate openwork tie-dye patterns, creating unique visual effects through light and shadow projections.

Landscape Features: Place tie-dyed sculptures (e.g., butterfly or octagonal flower shapes) in courtyards. Create a "dye plant zone" with indigo plants (the raw material for tie-dyeing), accompanied by signage explaining botanical dyeing principles—combining aesthetic appeal with educational value.



Figure 4. Schematic diagram of tie dye themed landscape sketches in public spaces

3. Application Strategies for Regional Culture in Spatial Carriers

3.1. Pathways for Constructing and Extracting Regional Cultural Symbolization Systems

3.1.1. Pathways for Decoding Cultural Genes and Extracting Symbols

Establish a three-tier symbol extraction model: "Patterns-Techniques-Narratives":

Pattern Layer: Classify and organize tie-dye patterns into categories such as "natural imagery (snow-capped mountains, moon over Erhai Lake)," "daily life scenes (farming, weaving)," and "spiritual beliefs (blessings, fertility worship)." Analyze their stylistic characteristics (symmetry, abstraction) and symbolic meanings to establish a pattern database.

Technique Layer: Extract core actions and visual traits from the dyeing process—folding and binding, indigo immersion and gradient dyeing, unraveling threads (random or leaving blank spaces)—transforming them into geometric symbols (triangles, wavy lines), color symbols (indigo gradients), and texture symbols (wrinkles, roughness).

Narrative Layer: Uncover cultural narratives (e.g., Tang Dynasty Nanzhao dance costumes made with tie-dye) and life scenarios (family collaboration) behind the craft, translating them into spatial narrative threads (e.g., historical timelines in cultural galleries, collective experience zones in dye workshops).

Simultaneously develop a cultural anthropology-based database of tie-dye symbol systems, digitally storing pattern parameters (line lengths, angles), craft videos, and narrative texts for easy access by designers and researchers.

3.1.2. Three-Dimensional Presentation of Regional Culture in Landmark Spaces and Experiential Venues

Landmark Spaces: Construct tie-dye themed landmarks in village squares and scenic area entrances—such as large-scale sculptures modeled after the "octagonal flower," crafted from stainless steel (simulating fabric folds) with indigo-blue coating and illuminated at night. Interactive screens at the base explain tie-dye history and pattern symbolism, creating visual focal points for regional culture.

Experience Venues: Establish demonstration zones within tie-dye workshops and thematic museums following the craft's workflow: - "Raw Materials Zone" displays indigo

root and indigo mud; - "Binding Zone" provides hands-on tools for various stitching techniques; - "Dyeing Zone" recreates traditional vat scenes; - "Finished Products Zone" showcases tie-dye works from different eras. Through physical exhibits, scene reconstructions, and multimedia demonstrations (such as 3D animations depicting the dyeing process), visitors gain an immersive understanding of the craft.



Figure 5. Schematic diagram of the three-dimensional presentation of tie dye culture in landmark spaces and experiential venues

3.1.3. Village Landscape Design: Creating Poetic Spaces

Architectural Facades: Village dwellings feature "white walls with indigo-blue patterns" on exteriors, adorned with tie-dye motif wood carvings on doors and windows. Pavilions and towers sport indigo-blue glazed tiles, with floral and geometric patterns painted on columns, harmonizing with natural landscapes (Cangshan Mountains, Erhai Lake).

Planting Scheme: A "Batik Plant Garden" cultivates dye plants like indigo root and indigofera, with signage explaining botanical dyeing principles. Courtyards and pathways feature local flowers (e.g., Dali chrysanthemum), echoing botanical motifs in batik patterns.

Recreational Facilities: Benches and parasols incorporate tie-dye motifs—chair seats feature carved pleated textures, while umbrella canopies display tie-dye patterns. Rest areas include a "Tie-Dye Culture Wall" showcasing villagers' life photos and stories of tie-dye production, fostering cultural belonging.



Figure 6. Schematic diagram of incorporating tie dye cultural elements into village landscape planning

3.2. Symbolic Communication Application Strategy for Travel-Residence Spaces

3.2.1. Creating Immersive Cultural Environments

Developing a hybrid learning space combining "batik workshop + homestay":

Spatial Design: Blending traditional and modern elements—utilizing wooden structures and blue-brick walls to evoke rustic charm, complemented by modern equipment like temperature-controlled dye vats and interactive screens. Features include a "Craft Demonstration Zone" (live artisan demonstrations), "Experience Zone" (hands-on visitor activities), and "Exhibition Zone" (finished product displays), forming a complete "observe-learn-create-appreciate" experience chain.

Activity Design: Launch a "Tie-Dye Experience Package"—covering basic stitching techniques (1 hour) to creating a complete piece (half-day), paired with cultural insights (pattern symbolism, historical narratives). Host evening "Tie-Dye Story Sessions" featuring veteran artisans sharing their craftsmanship heritage to deepen cultural resonance.

3.2.2. Branded Space Operation System

Themed Homestay Cluster: Integrate multiple traditional Bai ethnic dwellings into a tie-dye-centric homestay cluster—exteriors uniformly feature "white walls with indigo patterns," while interiors categorize rooms by distinct motif themes (Butterfly Pattern Room, Octagonal Flower Pattern Room), with furniture and soft furnishings incorporating tie-dye elements; Complemented by a "Batik Cultural & Creative Store" selling customized batik products (e.g., guesthouse-exclusive patterned pillows and scarves).

Educational Travel System: Develops "batik study tours" for students, encompassing three key stages—"Fieldwork" (collecting indigo root to understand raw materials), "Workshop" (learning techniques and creating pieces), and "Museum" (exploring history and interpreting culture). Collaborates with universities to host "batik design workshops," encouraging students to integrate batik elements with modern design to drive cultural innovation.

3.3. Application of Digital Technology

3.3.1. Virtual Experiences and Exhibitions

VR Technology: Create a "Virtual Tie-Dye Museum" where users can "step into" Tang Dynasty dyeing workshops and Zhoucheng Village studios via VR devices, viewing the tie-dye production process in 360°. Develop "Virtual Homestays" allowing users to "experience" tie-dye themed guest rooms online, previewing spatial layouts and cultural ambiance.

AR Technology: Integrating AR into the tourist accommodation wayfinding system—visitors scan directional signs with their phones to view dynamic demonstrations of tie-dye patterns (e.g., butterflies "fluttering") alongside cultural explanations (audio + text). Scanning murals featuring tie-dye patterns triggers animations narrating related historical stories.

3.3.2. Digital Management and Traceability

Develop a blockchain-based traceability system for tie-dye works: Generate a unique "digital ID" for each handmade piece, recording artisan details, production processes (including videos of key steps), and pattern symbolism. Visitors can scan codes to verify authenticity, enhancing product credibility. Simultaneously establish a digital copyright repository for tie-dye patterns to protect traditional designs and prevent misuse.

3.4. Integration of New Materials and Techniques

Decorative Materials: Apply tie-dye techniques to eco-friendly materials—such as translucent plastic panels (printed with tie-dye patterns) for partitions, and biodegradable fibers (dyed indigo blue) for wall decorations. Develop "tie-dye textured coatings" that mimic fabric wrinkles for building exteriors and interior walls, reducing maintenance costs.

Furniture Materials: Craft furniture from recycled wood

with laser-engraved tie-dye patterns on surfaces; utilize eco-friendly foam and tie-dyed fabrics for sofas and mattresses, balancing comfort with cultural expression.

3D Printing Technology: Precisely replicates the textures and forms of tie-dye patterns to produce architectural decorative components (e.g., wall reliefs, lampshades) and landscape features (e.g., butterfly sculptures), balancing mass production with personalized customization.

Smart Technology: Develops "smart dye vats" controlled via app to regulate temperature and immersion time, ensuring color consistency; installs "smart lighting systems" in guest rooms that adjust hues to simulate indigo shades at different dyeing stages, enhancing spatial interactivity.



Figure 7. Tie dye products combining new materials and processes

3.5. Multi-Stakeholder Collaborative Development Strategy

3.5.1. Cultural Community Cultivation Mechanism

Village Participation: Establish an "Oral History Video Database" featuring interviews with Zhoucheng Village's veteran artisans (documenting skill inheritance) and young practitioners (recording innovative practices). Produce documentaries for screening in guesthouses and museums to strengthen villagers' cultural identity. Create a "Community Tie-Dye Cultural Forum" for regular discussions on inheritance plans (e.g., skill training, festival activities) to boost engagement.

New Local Leaders: Invite tie-dye experts, designers, and entrepreneurs to form a "New Local Leaders Team," establishing an innovation workshop to collaborate with local artisans on developing "tie-dye + modern design" products (e.g., cultural notebooks and apparel featuring tie-dye patterns). Conduct skill training to cultivate young artisans (targeting 50 trainees annually), addressing the skills gap.

3.5.2. Pathways for Building an Industrial Ecosystem

Industry-Academia-Research Collaboration: Universities (e.g., Yunnan University, Dali University), research institutions (e.g., Yunnan Provincial Intangible Cultural Heritage Protection Center), and enterprises (batik workshops, cultural tourism companies) jointly establish a "Batik Innovation Platform." Universities handle cultural research and design innovation, research institutions tackle technical challenges (e.g., developing eco-friendly dyes), while enterprises manage production and market promotion, forming a closed-loop "R&D-Production-Sales" system.

Brand Collaboration: Facilitate partnerships between cultural tourism enterprises and tie-dye businesses—tourist attractions incorporate tie-dye experiences into itineraries, while travel agencies launch "Tie-Dye Cultural Tours." Homestays and tie-dye workshops jointly offer "Accommodation + Experience" packages, allowing guests to participate in free tie-dye workshops during their stay, achieving resource sharing and complementary advantages.

4. Summary and Outlook

4.1. Summary

4.1.1. Symbolic Extraction and Spatial Translation Outcomes

This study completed the symbolic extraction of Bai ethnic tie-dye culture: core symbols were extracted from patterns (butterfly motifs, octagonal floral designs), techniques (tie-knotting, dyeing, unraveling), and narratives (family collaboration, blessings, and auspicious meanings). These core symbols were transformed into spatial design elements—such as converting tie-knotted folds into wavy curtains, indigo gradients into wall paints, and collective labor scenes into open-plan dyeing workshops. These symbols achieve a translation "from abstract to concrete" within the residential space, preserving cultural essence while meeting modern spatial functionalities.

4.1.2. Application of Tie-Dye Symbols in Travel Accommodations

At the material level, tie-dye symbols are applied to spatial division (tie-dyed fabric partitions), furniture design (pleated-textured tabletops), soft furnishings (tie-dyed throw pillows), and landscape features (octagonal flower sculptures), enhancing the space's cultural distinctiveness. At the behavioral level, the "Batik Culture Corridor" circulation design and open-access dyeing workshop experiences deepen visitor engagement and cultural understanding, addressing the issues of "symbolic hollowing" and "superficial experiences" in traditional cultural transmission.

4.1.3. Innovative Application of Regional Culture in Spatial Carriers

Proposing an innovative application model for regional culture in residential spaces: Establish a standardized recognition system through "symbolic system construction," deepen cultural experiences via "immersive communication," expand dissemination channels using "digital technology," achieve craft innovation with "novel materials," and ensure sustainable development through "multi-stakeholder collaboration." This model has been preliminarily implemented in Zhoucheng Village, Dali, exemplified by tie-dye themed homestays and virtual museums, offering insights for the living transmission of regional culture.

4.2. Outlook

4.2.1. Directions for Theoretical Research

Future research should expand through interdisciplinary perspectives: - In cultural communication, explore cognitive differences and emotional resonance of tie-dye symbols among diverse cultural groups (e.g., international tourists, youth demographics), using empirical studies (e.g., cross-border surveys) to inform global dissemination strategies; In spatial design, construct an integrated model linking "regional culture-spatial function-contemporary needs" to enhance design scientific rigor and foresight, avoiding forced combinations of symbols and spaces.

4.2.2. Digital Technology Application Upgrades

Expand digital application scenarios: Develop a "Batik Metaverse Community" where users create and exchange batik works in virtual spaces; optimize blockchain traceability systems by adding a "Work Story" module, enabling users to upload their batik experience narratives to form a "digital + emotional" dissemination chain; explore AI design assistance where users input requirements (e.g., "Cangshan Snow

Theme") and AI automatically generates batik pattern designs, driving cultural innovation.

4.2.3. Refining Multi-Party Collaboration Mechanisms

Define responsibilities for government, enterprises, and communities: - Government increases policy support (e.g., establishing a tie-dye special fund, implementing tax incentives), investing 1 million yuan annually in skill preservation and talent development; - Enterprises strengthen collaborations with designers to develop high-end tie-dye products (e.g., luxury apparel, hotel soft furnishings), enhancing product value; Communities will refine villager participation mechanisms, allocating 10% of tie-dye industry revenues to community cultural development (e.g., establishing tie-dye libraries) to enhance villagers' sense of fulfillment.

4.2.4. Deepening the Role in Rural Revitalization

Expand the application of tie-dye culture in rural revitalization: Integrate with local specialty agriculture to develop "tie-dye + agricultural products" packaging (e.g., wrapping Dali milk curd or tea in tie-dyed fabrics) to increase agricultural product value; Combine with other crafts to create integrated handicrafts like "tie-dye + embroidery" or "tie-dye + wood carving," diversifying the industry landscape; Promote the integration of tie-dye culture with rural governance. Through activities like "Tie-Dye Culture Festivals" and "Artisan Awards," cultivate civilized rural customs to achieve the goal of "cultural revitalization driving industrial and talent revitalization."

In summary, the symbolic expression and dissemination of Bai tie-dye culture within travel spaces represent a vital pathway for the dynamic preservation of regional culture. Future efforts should focus on deepening theoretical research, innovating technological applications, and refining collaborative mechanisms. This will ensure tie-dye culture both "preserves its roots" and "breaks out of its circle," contributing to rural revitalization and the development of a culturally strong nation.

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