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Construction of Multilingual Parallel Term Base for Naxi Dongba Hieroglyphic Characters

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Abstract: The Naxi people, an ethnic minority in China, have fostered a distinctive Dongba culture, with Dongba hieroglyphs standing as the only living hieroglyphic system worldwide. In 2003, ancient 9Dongba manuscripts were inscribed on UNESCO's "Memory of the World" Register, underscoring their significance as an "encyclopedia" documenting ancient Naxi society. Research on Dongba hieroglyphs constitutes a vital branch of Chinese ethnic minority historical and cultural studies, and the development of a multilingual parallel term base serves as an effective means to advance this field. Amid the digital age, integrating modern information technology into the processing of Dongba characters and the research, organization, and preservation of ancient Dongba literature can substantially enhance the efficiency of ethnic minority literature research and promote interdisciplinary development between ethnic minority studies and information technology in China, thereby holding considerable academic value and practical prospects. This study focuses on original Dongba hieroglyphic texts and their corresponding Chinese and English translations, establishing parallel correlations among multilingual terms. It elaborates on the background, significance, and specific construction process of the Dongba hieroglyphic multilingual parallel term base, encompassing term collection and selection, definition and annotation, and multilingual alignment. Furthermore, the study equips the term base platform with translation functionalities, expands the construction model of deeply processed term bases, and provides essential terminological resources for literary and linguistic research on Dongba culture. This work aims to facilitate the vigorous development of digitalization for ethnic minority historical documents in the information era.

Keywords: Dongba Hieroglyphs; Multilingual Parallel Term Base; Term Base Construction; Naxi Culture; Digital Preservation

1. Introduction

1.1 Research Background

The Naxi people in Yunnan have created unique Dongba culture centered on Dongba hieroglyphs—the only surviving living hieroglyphic system globally, inscribed in UNESCO's Memory of the World Register in 2003. Amid the digital shift in Dongba hieroglyph research, challenges persist: ideographic ambiguity and cross-cultural complexity hinder translation (especially underdeveloped English translation) [1,2], and the lack of a unified multilingual parallel term base causes inconsistent terminology and barriers to international dissemination. Furthermore, the physical degradation of original Dongba manuscripts—such as stroke breakage, ink fading, and local occlusion—exacerbates the difficulty of term extraction and interpretation [3]. The absence of standardized digital resources also limits the integration of Dongba studies with emerging fields like digital humanities and artificial intelligence-driven language processing. Drawing on global experience [4], this study focuses on building such a term base for Dongba hieroglyphs to fill the digital gap.

1.2 Research Status at Home and Abroad

1.2.1 Domestic research status

Domestic Dongba hieroglyph research has a long history, covering text interpretation, Chinese translation, cultural analysis, and character recognition. Mature Chinese translation paradigms and works exist, with recent English translation studies using eco-translatology [2] and oral poetics theories [1]. Digital research has achieved progress in

character recognition and machine translation (e.g., Dongba Corpus 1.0) [5], and domestic terminology research has developed mature term base construction principles [6,7]. Moreover, recent studies have explored the cultural connotations embedded in Dongba glyphs—such as color symbolism (black vs. white) and sacrificial terms—which provide rich semantic layers for term base annotation [8]. However, these cultural insights have not yet been systematically integrated into a multilingual term base. However, unified multilingual parallel term base integrating Dongba hieroglyphs, Chinese, and English remains underdeveloped.

1.2.2 Foreign research status

Foreign research originated from Dongba document collection by Western explorers and scholars, with Joseph Rock's *Naxi-English Encyclopedic Dictionary* as a core resource [9,10]. Recent studies focus on character form analysis, cultural connotation research, and ritual manuscript translation [11], but suffer from the "ideographic myth" and fragmented translation [11]. In addition, foreign scholars have emphasized the ecological wisdom and ritual functions embedded in Dongba texts, such as the "brotherhood between humans and nature" concept, which has direct implications for term definition and cross-cultural alignment [8]. Despite rich multilingual term base experience (e.g., Canada's Termium [4], EU's IATE [12]), dedicated Dongba hieroglyph multilingual parallel term base is lacking.

1.3 Research Content and Methods

1.3.1 Research content

Taking original Dongba hieroglyph texts and their Chinese/English translations as objects, this study includes: sorting out the background and significance of term base construction; formulating scientific construction plans; elaborating key processes (term collection, definition, annotation, multilingual alignment); designing functional modules (translation, retrieval); and analyzing application value and optimization strategies.

1.3.2 Research methods

A combination of qualitative and quantitative methods is adopted: literature review for theoretical foundation; field investigation for first-hand data; comparative analysis for unified translation standards and optimized plans; and information technology (computer, database, natural language processing) for digital term base construction. In addition, insights from cultural linguistics are employed to analyze how time-sensitive cultural information (e.g., funeral practices, zodiac systems, color symbolism) can be encoded into term annotations, thereby enhancing the diachronic validity of the term base [13].

1.4 Research Innovations

Three main innovations are achieved: first, constructing the first Dongba hieroglyph-Chinese-English multilingual parallel term base to fill the digital gap; second, integrating term base construction with translation functions for dual roles as resource library and practical tool; third, cross-integrating ethnic culture, translation studies, terminology, and information technology to provide a new digital path for ethnic cultural protection.

2. Construction Principles of the Multilingual Parallel Term Base for Dongba Hieroglyphs

2.1 Principle of Authenticity and Accuracy

Authenticity and accuracy are fundamental principles for constructing the multilingual parallel term base for Dongba hieroglyphs. In term collection, the study takes original Dongba hieroglyphic texts and authoritative translations as the main sources, combined with field investigation results to ensure the authenticity of term origins. In term definition and annotation, the connotations and extensions of terms are accurately defined by integrating the linguistic characteristics and cultural connotations of Dongba hieroglyphs [10]. Ambiguous terms are verified and confirmed with Dongba priests and professional researchers to ensure the accuracy of term explanations. In multilingual term alignment, parallel correspondences between Dongba hieroglyphs and Chinese/English terms are established based on accurate translations, and the one-to-one or one-to-many correspondence relationships of terms are clearly defined to avoid inconsistent term translations.

2.2 Principle of Standardization and Unification

Standardization and unification are core principles of term base construction, reflected throughout the entire process of term collection, selection, definition, annotation, and alignment.

In term selection, a unified selection standard is formulated to identify core terms that reflect the characteristics of Dongba culture and academic research usage habits, unifying the writing forms of terms. As the Dongba writing system developed in layers over time—with some glyphs emerging earlier (e.g., zodiac-related terms) and others later (e.g., burial-related loanwords) —the term base must distinguish between core archaic terms and later additions to maintain historical consistency [13] . In term definition and annotation, the study adheres to national standards and industry norms for terminology construction [6,7], adopting a unified definition format and annotation content to ensure the standardization of term information. In multilingual term alignment, unified translation standards for Dongba hieroglyphic terms are established by referring to authoritative translation results and translation theories, forming a unified multilingual term parallel correspondence table to ensure consistent term usage in research. (e.g., Table 1. The Examples of Principle of Authenticity and Accuracy)

Table 1. The Examples of Principle of Authenticity and Accuracy

Dongba script	Chinese-English bilingual translation	Annotation
	Zulaoapu, the Heavenly God (The supreme deity in the creation myth and Dongba religion of the Naxi people.)	Zulaoapu originates from *The Genesis*, the original classic document of the Dongba hieroglyphs, and the authenticity of this term is guaranteed.
	The Divine Golden Giant Frog (the Divine Founder of the Five Elements and Global Directions of Naxi Dongba Culture)	The Divine Golden Giant Frog comes from the original Dongba hieroglyphic document *White Bat Fetches the Divination Scriptures*, which ensures the authenticity of the term.
	Chongren Li'en (It is said that he is the only surviving human ancestor after the flood)	It also originates from *The Genesis*, the original classic document of the Dongba hieroglyphs

Based on the *Naxi Hieroglyphic Spectrum*, core terms that reflect the characteristics of Dongba culture and conform to the usage conventions of academic research are selected. (e.g., Figure 1. Standardized Core Terms)

Figure 1. Standardized Core Terms

2.3 Principle of Cultural Embeddedness

Dongba hieroglyphs serve as the carrier of Naxi Dongba culture, with each term embodying rich cultural connotations [9-11]. Thus, the principle of cultural embeddedness must be followed in term base construction. In term definition and annotation, the study not only explains the literal meanings of terms but also fully explores their underlying cultural connotations, including the religious beliefs, living customs, and historical stories of the Naxi people. Relevant cultural notes are added to the term base to help users understand the cultural background of terms. In the English translation of terms, simplistic literal translation is avoided. Instead, cultural differences between Chinese and Western cultures are fully considered, and appropriate translation methods are adopted to accurately convey the cultural connotations of terms [1,2], ensuring that translated terms can be understood and accepted by foreign readers while retaining the cultural characteristics of the original text. (e.g., Table 2. The Examples of Principle of Cultural Embeddedness)

Table 2. The Examples of Principle of Cultural Embeddedness

Dongba script	Chinese-English bilingual translation	Annotation
	The nine-headed serpent (a manifestation of the Naxi god Shu)	"Shu" refers to the nature gods of the Naxi people. Such annotations can reflect the religious beliefs.

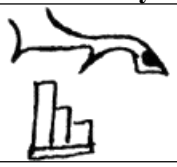
	Gu'e Bird. (The tragic story of a suffering daughter-in-law who was tormented and abused to death by her cruel mother-in-law, then transformed into a Gu'e Bird.)	Annotations from folk legends have concretized the image of Gu'e Bird.
	Mount Junasheluo (The supreme holy mountain of the Dongba faith)	This annotation reflects Mount Junasheluo religious status.

2.4 Principle of Practicality and Scalability

Practicality and scalability are important principles to ensure the application value and sustainable development of the term base. In terms of practicality, the functional modules of the term base platform are designed according to the actual research needs of scholars at home and abroad, including basic functions such as term retrieval, browsing, and downloading, as well as extended functions such as term translation and cultural note query to meet diverse user needs. Furthermore, as digital memory frameworks emphasize the importance of multi-perspective narrative and user interaction, the term base platform incorporates user feedback mechanisms and allows for community-contributed annotations, thereby enhancing its practical utility for both researchers and cultural practitioners [14]. The term base platform features a simple and user-friendly interface to enhance the user experience. In terms of scalability, a modular design is adopted in term base construction, leaving extended interfaces for the term base database and platform. New terms, languages, and functional modules can be added according to subsequent research needs, such as Japanese, Korean, and other language translations of Dongba hieroglyphic terms, and term similarity retrieval functions, to realize the sustainable development of the term base [12]. In line with the file continuum theory's emphasis on continuous capture and organization, the term base is designed to support the incremental addition of newly discovered or newly interpreted Dongba terms without disrupting existing structures [14].

(e.g., Table 3. The Examples of Principle of Practicality and Scalability) The following classification terms facilitate the construction of an animal classification system.

Table 3. The Examples of Principle of Practicality and Scalability

			
Horned beast	Clawed beast	Hooved beast	Striped beast

3. Construction Process of the Multilingual Parallel Term Base for Dongba Hieroglyphs

The construction of the multilingual parallel term base for Dongba hieroglyphs is a systematic project [12], the process is following: Term collection and selection → Term definition and annotation → Multilingual term alignment → Term base construction → Term base platform development.

Each link is closely interconnected and mutually restrictive, and the scientific and standardized operation of each link is crucial to ensuring the quality of term base construction.

3.1 Term Collection and Selection

3.1.1 Determination of term collection scope and sources

The term collection scope of the multilingual parallel term base for Dongba hieroglyphs mainly covers core terms in Dongba hieroglyphic texts, spanning fields such as Naxi Dongba religion, sacrificial rituals, living customs, historical geography, natural objects, and human relations, which can fully reflect the linguistic characteristics and cultural connotations of Dongba hieroglyphs. Term collection sources are divided into three categories: the first category includes original Dongba hieroglyphic text materials, such as *Complete Translations of Naxi Dongba Ancient Books*, various Dongba scripture manuscripts collected by museums and cultural research institutions at home and abroad [9], and first-hand text materials collected through field investigations, serving as the main sources of term collection; the second category consists of authoritative research results and translation

works on Dongba hieroglyphs, including works by domestic and foreign scholars such as Joseph Rock [10], Fang Guoyu, and Li Lincan, such as *Naxi-English Encyclopedic Dictionary* and *Naxi Hieroglyphic Spectrum*, providing important references for term translation and collation; the third category comprises digital corpora of Dongba hieroglyphs, such as Dongba Corpus 1.0 constructed based on transfer learning [5], which provides digital data sources for automatic term extraction.

3.1.2 Term collection methods

Term collection adopts a combination of automatic extraction and manual collection to improve the efficiency and comprehensiveness of term collection [15,16]. On one hand, natural language processing technology is used for automatic term extraction from digital Dongba hieroglyphic text corpora: first, text preprocessing is performed on the corpus, including text segmentation, noise reduction, and part-of-speech tagging; second, a hybrid term extraction method combining linguistic and statistical approaches is used to extract candidate terms from the preprocessed corpus; finally, term frequency-inverse document frequency (TF-IDF) is used to calculate the weight of candidate terms, and high-weight candidate terms are selected as preliminary collected terms. On the other hand, manual collection is used to gather terms that are not easily extracted automatically, such as terms with strong oral cultural characteristics and those related to field investigations: professional researchers collate and collect terms from original Dongba scripture manuscripts and field investigation materials, supplementing terms extracted by automatic methods to ensure the comprehensiveness of term collection.

3.1.3 Term selection standards and processes

Given the large number of collected candidate terms, including duplicates, ambiguities, and non-core terms, standardized selection of candidate terms is necessary in accordance with unified selection standards [12]. Term selection standards mainly include four aspects: first, the core nature of terms, i.e., selected terms must be core vocabulary that reflects the characteristics of Dongba culture and the basic connotations of Dongba hieroglyphs, excluding non-essential auxiliary vocabulary; second, the academic nature of terms, i.e., selected terms must conform to the usage habits of academic research on Dongba hieroglyphs, excluding dialect words and non-standard vocabulary with strong regional characteristics; third, the uniqueness of terms, i.e., duplicate terms are merged, and the same concept is expressed with a unified term; fourth, the practicality of terms, i.e., selected terms must meet the actual research needs of scholars at home and abroad, and rare and unused terms are appropriately screened based on usage frequency.

The term selection process is divided into three steps: first, researchers conduct preliminary screening, eliminating duplicate and obviously incorrect terms according to selection standards to form a candidate term list; second, expert review is conducted, inviting Dongba priests, professional researchers of Naxi culture, and terminology experts to review the candidate term list, verify and confirm ambiguous terms, and screen out non-core terms; third, the final term list is determined by summarizing and sorting out review opinions, revising and improving candidate terms to form the final term list of the multilingual parallel term base for Dongba hieroglyphs, laying the foundation for subsequent term definition and annotation.

3.2 Term Definition and Annotation

Term definition and annotation are key links to ensuring the accuracy and comprehensiveness of term base information [12]. They involve accurately defining the connotations and extensions of selected Dongba hieroglyphic terms and adding detailed annotation information, including the pronunciation, part of speech, cultural connotations, and usage context of terms, to help users correctly understand and use the terms.

3.2.1 Term definition

The definition of Dongba hieroglyphic terms adheres to the national standard *Terminology - Principles and Methods of Term Formation* (GB/T 10112-2009) and relevant norms of terminology construction, combining the linguistic characteristics and cultural connotations of Dongba hieroglyphs for accurate and concise definition. For terms with clear connotations and fixed usage, the genus-species definition method is adopted, defining terms by indicating their genus concept and specific species characteristics that distinguish them from other concepts of the same genus, thereby clearly defining the connotations and extensions of terms. For terms closely integrated with Naxi culture and rich in

cultural connotations, the descriptive definition method is used, defining term connotations by describing their characteristics, usage, and cultural background to avoid incomplete definitions caused by simplistic genus-species division. For ambiguous terms with multiple meanings, the classified definition method is employed, sorting out different meanings of terms according to different usage contexts, defining their connotations one by one, and indicating the scope of use for each meaning.

e.g. Data derived from Naxi Hieroglyphic Spectrum.

The genus-species naming method is dominant, accounting for 89.5%, followed by the descriptive method (8.1%) and the classified method (2.4%). Genus-species naming covers most themes, while descriptive and classified naming are concentrated in a few categories like Celestial Phenomena, Botany, Beast, Insects & Fish, and Human. (e.g., Figure 2. Data Derived from Naxi Hieroglyphic Spectrum)

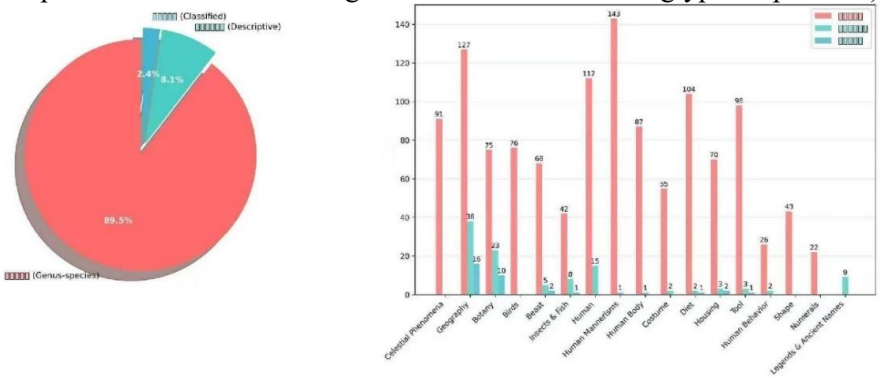


Figure 2. Data Derived from Naxi Hieroglyphic Spectrum

In the process of term definition, it is necessary to fully consider the original characteristics of Dongba hieroglyphs, not only explaining the literal meanings of terms but also combining the writing forms and usage characteristics of characters to reflect the ideographic features of Dongba hieroglyphs [10]. Meanwhile, the cultural connotations behind terms are fully explored, clarifying the connections between terms and Naxi Dongba religion, sacrificial rituals, and living customs to ensure that term definitions can reflect the cultural characteristics of terms.

3.2.2 Term annotation

On the basis of clear term definitions, detailed annotation information is added to each term to form a complete term information record, including basic information annotation, linguistic information annotation, and cultural information annotation. The annotation content is standardized and unified to ensure the comprehensiveness and readability of term information.

Basic information annotation mainly includes the term serial number, original Dongba hieroglyphic character, and Chinese and English translations of the term, serving as the basic information of the term and the basis for multilingual term alignment. Linguistic information annotation includes the pronunciation of the term (International Phonetic Alphabet notation of the Naxi language), part of speech, word formation, usage context, and collocation, helping users understand the linguistic characteristics and usage rules of terms. Cultural information annotation is a key part of Dongba hieroglyphic term annotation, including the cultural connotations behind terms, related Naxi folk customs, historical stories, and religious beliefs [9-11]. Relevant cultural notes and reference materials are added for terms with rich cultural connotations to help users deeply understand the cultural background of terms. In addition, for translated terms, the translation method and basis are annotated, including referenced translation works, translation theories, and relevant explanations, to ensure the traceability of term translations.

3.3 Multilingual Term Alignment

Multilingual term alignment follows the principles of semantic equivalence, cultural consistency, and usage normalization [11].

The principle of semantic equivalence means that translated terms must be semantically equivalent to original Dongba hieroglyphic terms, and the accurate transmission of the semantic connotations of original terms is a basic requirement of term alignment.

The principle of cultural consistency requires

translated terms to maintain consistency with the cultural connotations of original terms, ensuring that cultural information behind original terms is not lost or distorted during translation.

The principle of usage normalization stipulates that translated terms must conform to the usage habits of the target language, selecting standardized and commonly used vocabulary of the target language for translation to ensure the readability and acceptability of translated terms. (e.g., Table 4. The Examples of Multilingual Term Alignment)

Table 4. The Examples of Multilingual Term Alignment

The Principle	Example	Translation	Annotation
Semantic equivalence		Traditional Naxi land-measuring surveyor	Accurately describe its duties to achieve semantic equivalence.
Cultural consistency		Fortune (with many sheep being a sign of good fortune)	It reflects the cultural connection between sheep and blessings.
		Sea (In the Naxi language, lakes and marshes are referred to as "sea")	It illustrates the special semantic meaning of "sea" in the Naxi language and maintains cultural consistency.
Usage normalization		Horn	Originally translated as "angle", it has been revised to "horn". The mistranslation is corrected to conform to the norms of zoological terminology.
		Clerk	Originally translated as "official", it has been revised to "clerk" to distinguish the hierarchical differences between an official and a clerk, conforming to the norms of sociological terminology.

3.4 Term Base Construction

The term base serves as the data storage carrier of the multilingual parallel term base for Dongba hieroglyphs. It involves storing sorted and aligned multilingual term information in a standardized database in accordance with database design principles, realizing the efficient management and quick retrieval of term information. The construction of the term base database adopts a relational database management system, using SDL Multiterm as the database development tool, which offers advantages such as open source, high efficiency, good scalability, and ease of operation [16].

3.4.1 Database design

3.4.1.1 Format conversion of the terminology List

For the Hieroglyphic Characters-Chinese-English multilingual Naxi Dongba script termbase in SDL MultiTerm, convert the Excel/TXT terminology list via the Convert component (e.g., Figure 3. Term Table Conversion Options). Select MultiTerm XML format, verify settings and execute conversion to generate an XML output file and an XDT termbase definition file (e.g., Figure 4. Term Table Conversion Summary). Pre-conversion: place Chinese/English terms in Columns A/B of the Excel sheet and label the header with "Chinese" and "English" [17].

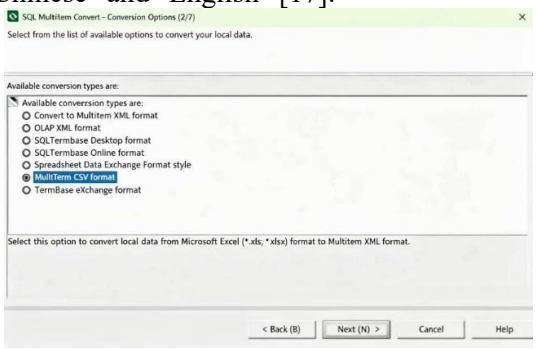


Figure 3. Term Table Conversion Options

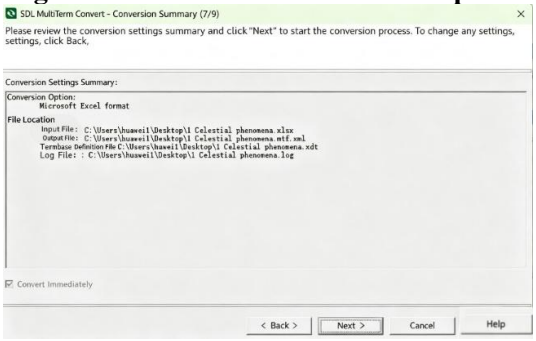


Figure 4. Term Table Conversion Summary

3.4.1.2 Newermbasereation & efinitionileoading Launch SDL MultiTerm, create a blank termbase and enter the wizard. Check *Load an existing termbase definition file*, select the above XDT file, and follow the wizard to complete setup, building a basic structure for the Hieroglyphic Characters-Chinese-English multilingual Naxi Dongba script termbase. (e.g., Figure 5. Load XDT Format Termbase Definition File) [17]

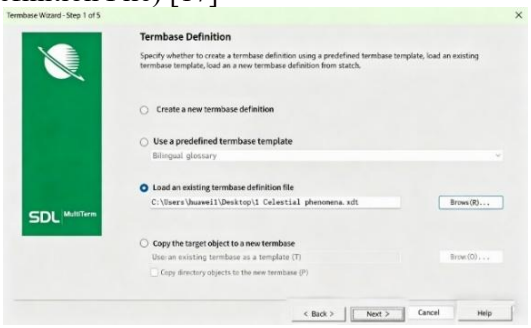


Figure 5. Load XDT Format Termbase Definition File

3.4.1.3 Terminology data import & information refinement

Data Import: Open the termbase with the loaded definition file, launch the import wizard and select the converted XML file (e.g., Figure 6. Create Termbase and Import XML File). Check *Fully optimize after import* if needed, complete batch import, and switch the termbase between Chinese-English and English-Chinese modes via the Reverse button [17].

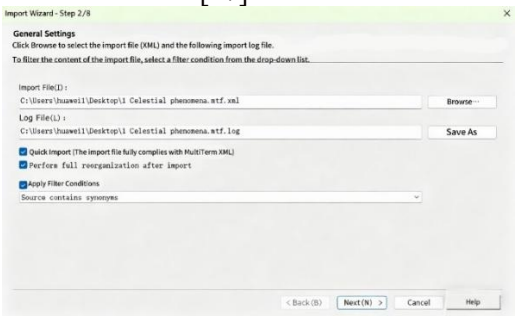


Figure 6. Create Termbase and Import XML File

Information Refinement: Based on Naxi Dongba script term features and *A Glossary of Naxi Hieroglyphs*, add the original sources and modern Chinese explanations to terms, and set extended fields (audio-visual materials, contextual examples, etc.) as required. Use the tool's management functions to classify, tag, add, edit and delete terms, ensuring accurate, complete and readable terminology information**.** (e.g., Figure 7. SDL MultiTerm Termbase Marked with Descriptive Fields) [17].

Figure 7. SDL Multi Term Termbase Marked with Descriptive Fields

3.4.2 Data entry and verification

On the basis of the completed database design, standardized multilingual term information is entered into the term base database in accordance with the relational table structure of the database. Data entry adopts a combination of batch entry and manual entry: structured term information in the multilingual term parallel correspondence table is converted into a data format supported by the database, and batch entry of term data is realized using database data import tools to improve data entry efficiency; for unstructured annotation information and reference material information, manual entry is performed to ensure the accuracy of data entry. After data entry is completed, comprehensive data verification is conducted on the database, including verification of data integrity, accuracy, and consistency, elimination of incorrect, missing, and duplicate data, and revision and optimization of abnormal data to ensure the quality of term base database data.

3.5 Term Base Platform Development

The term base platform is the application carrier of the multilingual parallel term base for Dongba hieroglyphs. Built with computer and network technologies, it supports online retrieval, browsing, downloading and translation, providing a convenient tool for global scholars. Adopting the B/S architecture, it requires no client installation, is easy to operate and maintain, and can be accessed via a browser [12].

3.5.1 Functional module design

The term base platform features a modular structure with independent basic and extended function modules that can be flexibly expanded and updated [12]. The basic modules, as the core, consist of term retrieval, browsing, and download functions. Retrieval supports keyword, fuzzy, and classified searches using Dongba characters, Chinese, or English. Browsing is

available by field and part of speech, while download supports Excel and PDF formats for offline use.

The extended modules include translation between Dongba hieroglyphs and Chinese/English, cultural note query for background information, and a backend update module for administrators. This module allows adding, deleting, and revising term data to ensure the term base remains timely, accurate, and comprehensive.

3.5.2 Interface design and development implementation

The term base platform's interface adheres to simplicity, practicality and user-friendliness, with clear hierarchical pages (homepage, retrieval, detail, download, admin) for easy operation. The homepage shows basic info and module entrances; the retrieval page supports multi-condition searches; the detail page displays full term data; the admin page enables easy maintenance [12].

Developed with HTML/CSS/JavaScript (frontend), PHP (backend) and Apache (server), the platform undergoes functional, performance and compatibility testing post-development. Bugs are fixed to ensure stability, efficiency and compatibility for normal use.

4. Functional Application and Value of the Multilingual Parallel Term Base for Dongba Hieroglyphs

4.1 Core Functional Application of the Term Base

4.1.1 Term retrieval and query

Term retrieval and query is the most basic and commonly used function of the multilingual parallel term base for Dongba hieroglyphs [4]. The term base platform provides a variety of flexible and convenient retrieval methods to meet different user retrieval needs. Users can perform keyword precise retrieval by entering the complete Dongba hieroglyphic character, Chinese translation, or English translation of a term to quickly obtain accurate term information; they can also perform fuzzy retrieval by entering partial keywords of a term, which is suitable for situations where users only remember part of the term information; in addition, the platform provides classified retrieval according to the field, part of speech, and cultural category of terms, allowing users to retrieve term information in the corresponding category by selecting relevant retrieval conditions to improve retrieval relevance. The retrieval result page of the platform displays the matching term list in the form of a list, and users can click on the corresponding term to view complete term information, including basic information, definitions, annotations, translation basis, and cultural connotations, facilitating users to deeply understand and use the term.

4.1.2 Term conversion

Term conversion serves as the core extended function of the term base, developed in response to the practical demands of international communication of Dongba culture and cross- language academic research [5]. Based on a standardized multilingual term parallel correspondence table, the term base platform enables mutual conversion between Dongba hieroglyphs and Chinese/English terms. Users may input a Dongba hieroglyph, its Chinese equivalent, or its English equivalent in the platform's conversion module; the platform then generates the corresponding converted output in real time, along with the conversion scheme, supporting evidence, and relevant annotations for the term, so as to guarantee the accuracy and traceability of the output. The term conversion function not only provides a convenient research tool for scholars engaged in the study of Dongba hieroglyphs both at home and abroad, but also removes linguistic barriers in the international dissemination of Dongba culture, assisting international readers and researchers in comprehending the connotations of Dongba hieroglyphs and their underlying cultural significance.

4.1.3 Term management and update

Term management and update is an important guarantee for the sustainable development of the term base, mainly completed by professional administrators through the background management module of the term base platform [16]. Administrators can perform addition, deletion, modification, and query of term information through the background management page, timely adding newly discovered Dongba hieroglyphic terms and their translations to the term base, deleting obsolete and unused terms, modifying incorrect and inaccurate term information, and querying relevant term information according to different conditions. Meanwhile, administrators conduct regular updates and maintenance of the term base, timely collecting the latest research results

and translation achievements of Dongba hieroglyphs, updating the term definitions, annotations, and translation information of the term base, and adding new reference materials and cultural notes to ensure the timeliness, accuracy, and comprehensiveness of term base information, keeping the term base in line with the development of academic research on Dongba hieroglyphs.

4.2 Application Value of the Term Base

4.2.1 Academic research value

The multilingual parallel term base for Dongba hieroglyphs provides standardized terminological resources for studies on Dongba and Naxi culture with high academic value [7]. It unifies research terms, reduces inconsistent translations and explanations, and enhances the accuracy and comparability of research. It offers scholars abundant reliable multilingual terms, annotations, and cultural information, improving research efficiency and lowering costs. It also serves as a key tool for teaching and academic research in universities, supporting the training of professionals in ethnic culture and language translation.

4.2.2 Cultural protection and inheritance value

Dongba culture is a vital part of Chinese ethnic minority culture, with Dongba hieroglyphs as its core carrier. The multilingual parallel term base enables the digital collection, collation and preservation of Dongba terminological resources, which is of great value for cultural protection and inheritance [11].

It digitally stores precious term data via database technology, avoiding information loss and distortion, and achieves long-term preservation. Meanwhile, the term base platform offers a convenient way for the spread and inheritance of Dongba culture, raising public awareness and promoting its inheritance among young people. Furthermore, it provides data support for the digital protection of other ethnic cultural heritages in China.

4.2.3 Cultural communication and exchange value

Against the background of economic globalization and cultural diversity, the international exchange of Chinese ethnic minority cultures is important for the global communication of Chinese culture. The multilingual parallel term base for Dongba hieroglyphs overcomes language barriers and carries significant value for cultural exchange [11].

It provides foreign readers with standardized English translations and cultural explanations, helping them understand Dongba culture accurately and reducing misunderstandings. As an international display window, the platform enhances Dongba culture's global influence and promotes cross-cultural communication. Moreover, it offers a reference for the international promotion of other ethnic cultures, helping to spread Chinese ethnic culture worldwide and strengthen China's cultural soft power.

4.2.4 Technological application and promotion value

The construction of the multilingual parallel term base for Dongba hieroglyphs integrates ethnic culture research and modern information technology, with important technological application and promotion value [16].

It applies natural language processing, database and network technologies to explore a digital construction path for ethnic language term bases, providing technical references for other minority languages.

The machine translation and term alignment technologies can be optimized and applied to other endangered ethnic languages [15].

In addition, the platform model can be extended to other fields, helping improve the informatization and intelligence of terminology construction [12].

5. Conclusion

5.1 Research Findings

This study aims to establish a multilingual parallel terminology database for Dongba hieroglyphs, drawing on Dongba texts and their Chinese and English translations as the primary research materials. Both qualitative and quantitative methods are employed.

First, the development of such a terminology database addresses the needs of digitizing Dongba culture and facilitating its international dissemination, while resolving issues such as inconsistent terminology and low efficiency.

Second, the database should be grounded in terminology and translation theories, adhering to the principles of authenticity, standardization, cultural relevance, practicality, expandability, and a hybrid manual-automatic approach.

Third, the construction follows a systematic procedure: term collection → definition and

annotation → multilingual alignment → database construction → platform development. Finally, the resulting terminology database offers comprehensive functions and holds significant value for academic research, cultural preservation, international exchange, and technological applications. It also serves as a reference model for the digitization of other ethnic cultural heritage resources.

5.2 Development Prospects

With the development of digital humanities and increasing attention to ethnic minority cultural heritage protection, the multilingual parallel term base for Dongba hieroglyphs enjoys broader development and deeper research prospects. Based on its current construction and research needs, its development prospects are as follows:

5.2.1 Expansion of term base resources

The current term base covers core Dongba hieroglyphic terms in Naxi religion, rituals and customs, but its term scope and language types need further expansion. Future research will enrich terms in history, geography, literature and art to make it more comprehensive. It will also add Japanese, Korean, French, German and other major international languages on the basis of Chinese and English, thus improving its international communication capacity.

5.2.2 In-depth integration with artificial intelligence technology

With the rapid development of AI, future research will deepen the integration of the term base with artificial intelligence to realize its intelligent upgrading.

First, advanced deep learning algorithms will be adopted to refine models for term extraction and translation, which helps boost accuracy and efficiency while cutting down on manual input.

Second, a new module for intelligent analysis of cultural implications will be introduced, enabling automatic interpretation of the cultural significance behind Dongba-related terms.

In addition, an intelligent updating mechanism powered by big data will be established to support real-time and automated maintenance, so as to guarantee the timeliness of content in the term base.

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