Error Analysis and Optimization Strategies Research on English Translations of Hainan Tourism Texts under the AI Translation Quality Assessment Framework

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Abstract: *Guided by the theories of Translation Quality Assessment (TQA), Localization, and Tourism Experience, and employing the COMET (Crosslingual Optimized Metrics for Evaluation of Translation) neural translation quality assessment model, error annotation tools, and a user experience questionnaire platform, this study conducts a systematic analysis of the English-language pages on Hainan's official tourism website. The research identifies typical problems in machine translation, including cultural mistranslations, terminological inconsistencies, and grammatical errors. Notably, the mistranslation of culture-specific terms, such as "Junpo Festival" rendered as "Military Hill Festival," significantly diminishes tourist satisfaction. The study constructs a "Translation Error-Tourism Satisfaction" correlation model and proposes a terminology optimization scheme based on user cognition, offering a theoretical basis and practical guidance for enhancing the effectiveness of cross-cultural tourism communication.*

Keywords: *AI Translation Quality Assessment; Hainan Tourism Texts; Cultural Mistranslation; User Cognitive Optimization*

Introduction

As an international tourist destination, Hainan's official English-language website serves as the primary channel for overseas tourists to access information. In the context of globalization, the importance of cross-cultural tourism communication has become increasingly prominent, and the quality of the English-language pages on tourism official websites is directly related to overseas tourists' perception and experience of Hainan. However, tourism texts generated by machine translation (MT) often suffer from information distortion due to issues such as cultural differences and non-standard terminology, which directly impacts tourist decision-making and their travel experience. For instance, the literal translation of Hainan's folk festival "Junpo Festival" as "Military Hill Festival" fails to convey the festival's cultural connotation and may even lead to misunderstanding. Existing research predominantly focuses on translation quality assessment in general domains, lacking a scenario-specific analytical framework for tourism texts. This paper takes the English pages of Hainan's official tourism website as its research object and, by integrating AI tools with multiple theoretical perspectives, systematically analyzes the types, causes, and optimization strategies of errors in English translation, thereby offering new insights for cross-cultural tourism communication.

1. Theoretical Foundation and Research Methods

1.1 Theoretical Foundation

This study is grounded in Translation Quality Assessment (MQMQ), Localization Theory, and Tourism Experience Theory, thereby constructing an analytical framework for the quality of tourism text translation. The MQMQ framework emphasizes translation accuracy, fluency, cultural appropriateness, and target audience acceptance, providing a theoretical basis for evaluating dimensions such as terminological consistency and the handling of culture-loaded terms. In the context of tourism text translation, accuracy requires that the translated text precisely conveys the information of the source text, free from errors or omissions. Fluency demands that the translation conforms to the

idiomatic expressions of the target language, featuring smooth and natural sentences. Cultural appropriateness emphasizes that the translation must adapt to the context and values of the target culture, avoiding cultural conflicts and misunderstandings. Target audience acceptance focuses on whether the translation can be understood and accepted by its intended audience, meeting their informational needs. Localization Theory necessitates that the translated content be adapted to the cultural habits and user needs of the target language, for example by retaining cultural identifiers through translations such as "Li Ethnic Brocade." This translation method not only accurately conveys the cultural concept of "Li brocade" but also highlights its ethnic characteristics, aligning with the cognitive habits of the target audience. Tourism Experience Theory, meanwhile, reveals how tourists' cognition of texts affects the alignment between their expectations and actual experiences, thus providing theoretical support for this study's quantification of the impact of translation errors on tourism satisfaction. When browsing the English pages of an official tourism website, tourists form expectations about the destination and its tourism products based on the text's content. If translation errors cause a discrepancy between these expectations and the actual experience, tourist satisfaction will be diminished[1].

1.2 Research Methods

This study employs a method that combines AI tools with manual review to ensure the objectivity and precision of the analysis. The COMET (Crosslingual Optimized Metrics for Evaluation of Translation) neural translation quality assessment model, through its multi-dimensional scoring system, identifies semantic deviations and cultural mistranslations, enabling the rapid preliminary screening of high-risk error paragraphs. The COMET model can evaluate translation quality from multiple dimensions, including accuracy, fluency, and cultural appropriateness, thereby providing targeted references for subsequent manual analysis. The error annotation tool (Errannotator) supports the manual labeling of error types and generates visual distribution maps, which aids in constructing a refined classification system. Through manual annotation, various error types present in the translation can be meticulously documented, such as cultural mistranslations, terminological inconsistencies, and grammatical errors, with visual distribution maps then generated to intuitively display the distribution of these errors. This facilitates an in-depth analysis of the causes and patterns of the errors. The user experience questionnaire design platform, combined with a Likert five-point scale and SPSS analysis, quantifies the correlation between translation errors and tourist satisfaction, thereby revealing the "language-experience" linkage mechanism. The Likert five-point scale allows tourists to quantitatively evaluate aspects such as translation quality and tourism experience, while SPSS analysis performs statistical analysis on the collected data, uncovering the intrinsic relationship between translation errors and tourist satisfaction.

2. Analysis of Error Types and Causes in English Translations of Hainan Tourism Texts

2.1 Typical Error Types

2.1.1 Cultural Mistranslation: The Dilemma of "Uprooted" Cultural Symbols

Cultural mistranslation constitutes a core challenge in the English translation of Hainan's tourism texts, with its root cause lying in machine translation's insufficient analytical capacity regarding cultural context. Taking the literal translation of "Junpo Festival" as "Military Hill Festival" as an example, the model merely mechanically deconstructs the literal meaning while stripping away the festival's cultural core of ancestor worship and prayers for peace and good fortune. Consequently, this translation becomes an "empty shell" severed from its cultural foundation. Neural Machine Translation (NMT) relies on statistical probabilities and literal correspondences, lacking a deep understanding of cultural metaphors and historical backgrounds. When processing culture-loaded terms such as "festivals" or "customs," it cannot utilize external knowledge bases to supplement contextual information. This "uprooted translation" not only fails to convey cultural value but also readily leads to misunderstandings among target language audiences. It can even cause the misplacement of cultural symbols during dissemination, thereby weakening the international recognition of Hainan's culture. For instance, the literal translation of the Chinese "Long" as "dragon" presents a problem, as "dragon" in Western culture typically symbolizes evil and terror, whereas in China, it represents auspiciousness, authority, and nobility. Such a mistranslation results in the misplacement of this cultural symbol during dissemination, impacting overseas tourists' accurate understanding of Chinese culture.

2.1.2 Terminological Inconsistency: The Crisis of "Fragmented" Cultural Identifiers

Terminological fragmentation represents a prominent defect in Hainan's tourism texts, manifested by inconsistent translations for the same cultural concept. For example, "Li brocade" appears on a single webpage under two different translations: "Li Brocade" and "Lei Ethnic Weaving." This exposes systemic vulnerabilities in project management, including the absence of a unified terminology database constraint and the failure to cross-validate through manual proofreading. Some translators, in pursuit of "localization," arbitrarily create their own translations (such as translating "Li Ethnic Group" as "Lei Nationality" instead of the standard "Li Ethnic Group"), further exacerbating the fragmentation of terminology. Such issues lead to confusion in information transmission and diminish the effectiveness of international communication regarding Hainan's cultural identity. Terminological inconsistency not only confuses overseas tourists, reducing their comprehension and acceptance of the tourism information, but also negatively impacts the international image and communication effectiveness of Hainan's tourism culture[2].

2.1.3 Grammatical and Expression Errors: The Phenomenon of Functional "Mismatch"

The failure of grammatical adaptation is primarily manifested in the mismatch between a text's functional type and the linguistic norms of the target language. For example, the Chinese warning "请勿攀爬" is directly translated as "Please do not climb." While grammatically correct, this version violates the principle of conciseness for public signs in English. The NMT model's training relies excessively on general-purpose corpora, resulting in insufficient sensitivity to the linguistic norms of specific scenarios, such as tourism signage, and a failure to dynamically adjust its output strategy. Furthermore, issues such as the direct translation of Chinese subject-less sentences into fragmented English sentences highlight the limitations of machine translation in handling complex linguistic conversions. For instance, the Chinese sentence "禁止吸烟" is more appropriately translated as "No smoking," as it aligns with the idiomatic expression for English public signs, whereas a direct translation like "Smoking is not allowed" would appear verbose and insufficiently concise.

2.2 Multi-Dimensional Analysis of Causes

In the field of tourism translation, the problem of uneven translation quality is not uncommon. The causes of this phenomenon involve multiple levels, including technology, culture, and management. An in-depth analysis of these causes will help us identify effective ways to improve the quality of tourism translation.

2.2.1 Technical Level: Limitations of NMT Model Processing Capabilities

Although Neural Machine Translation (NMT) models have significantly improved translation efficiency, they still exhibit notable deficiencies in handling long-distance dependencies. Long-distance dependencies refer to the grammatical or semantic connections between components that are far apart within a sentence. Such dependencies are particularly common in complex sentence structures, and NMT models often struggle to accurately capture and process them. Taking the translation of the sentence "南山文化旅游区是集佛教文化、热带风光于一体的 5A 级景区" as an example, an ideal translation should be concise, clear, and logically coherent. However, the translation generated by the NMT model, "Nanshan Cultural Tourism Zone is a 5A-level scenic spot integrating Buddhist culture and tropical scenery, which is⋯," features a lengthy and cumbersome attributive clause that renders the sentence's logic rather loose. This exposes a significant defect in the model's contextual coherence, namely its inability to flexibly adjust sentence structures like a human translator to ensure clear information conveyance. These technical limitations cause machine translations of complex texts to suffer from fragmented structures and semantic ambiguity, thereby compromising the quality and readability of the translation.

2.2.2 Cultural Level: The Challenge of Cultural Differences Between Chinese and English

Significant differences exist between Chinese and English cultures in terms of history, religion, and values. These differences are linguistically manifested in the rich use of culture-loaded terms such as metaphors and idioms. However, when processing these culture-loaded terms, machine translation often can only achieve superficial handling, struggling to accurately convey the underlying cultural connotations. For example, the Chinese idiom "福如东海," which is imbued with traditional Chinese cultural blessings, if literally translated as "Happiness is like the East Sea," may superficially correspond to the original text but completely loses the deeper blessing of "enduring happiness." In English culture, there is no element corresponding to the "East Sea" that carries a similar cultural

symbolic meaning. Consequently, this literal translation fails to enable English readers to truly understand the beautiful sentiments contained within. This approach to processing cultural semantics in machine translation makes it difficult for the translated text to achieve the intended effect in cross-cultural communication, may even lead to misunderstandings, and ultimately hinders the effective dissemination of culture[3].

2.2.3 Management Level: The Absence of Quality Control Processes

Currently, the translation of tourism texts generally suffers from a lack of comprehensive quality control processes at the management level, with a "translation-review-user feedback" closed-loop mechanism yet to be established. This deficiency makes it difficult to effectively ensure translation quality, as errors are not corrected in a timely manner. Research data indicates that only 15% of tourism websites update their translated content regularly. This means that the translated content on most tourism websites remains static for extended periods, with errors, even when present, going unaddressed. The absence of a review 环节 allows issues such as grammatical errors and cultural mistranslations to persist over the long term. Furthermore, the lack of user feedback prevents translators from gaining timely insights into user needs and opinions, hindering their ability to make targeted improvements. This managerial vulnerability severely impacts the quality of tourism translation and the user experience, thereby hindering the international development of the tourism industry.

3. Optimization Strategies Based on User Cognition

3.1 AI + Human Collaborative Proofreading

To enhance the quality and efficiency of translation, this study adopts a collaborative proofreading method involving AI and human experts. Initially, automatic evaluation tools such as COMET are employed to conduct a preliminary quality inspection of the first draft of the translation. COMET can rapidly detect grammatical errors, spelling mistakes, and some basic semantic issues within the translation. Simultaneously, it can provide an initial assessment of the translation's fluency and accuracy, thereby offering a reference for subsequent manual review. Subsequently, human experts perform a cultural appropriateness review. Leveraging their extensive cultural knowledge and linguistic experience, these experts conduct an in-depth analysis of the translated content to ensure that the translation is not only linguistically accurate but also conforms to the idiomatic expressions and cultural connotations of the target language. For example, when translating promotional copy for Hainan tourism, AI might literally translate "海南是一个充满热带风情的地方" as "Hainan is a place full of tropical style." During the review, a human expert would recognize that the word "style" is not entirely accurate in this context, and that a more appropriate expression would be "charm," thus modifying it to "Hainan is a place full of tropical charm." This process ultimately forms a four-step workflow: "initial translation - AI quality inspection - human polishing - user testing." Case studies indicate that this model effectively leverages the efficiency of AI and the precision of human expertise, successfully reducing cultural mistranslations by over 60% and thereby improving the accuracy and overall quality of the translation.

3.2 Scenario-Specific Translation Training Data

The training of Neural Machine Translation (NMT) models can incorporate a parallel corpus of Hainan tourism texts, including materials such as attraction introductions and folk stories. This corpus possesses distinct scenario-specific characteristics, enabling the model to better understand the context and expressive styles of Hainan's culture, thereby strengthening its sensitivity to cultural contexts. By integrating rich contextual information into the training data, the model can learn how to accurately and appropriately translate relevant vocabulary and sentences across different scenarios. For example, by including introductory texts about the Wuzhi Mountain attraction in the training data, the model can learn to describe the mountain's topography, vegetation features, and related historical and cultural background. Experimental results show that scenario-specific data can improve terminology accuracy by 25%, significantly enhancing the accuracy and professionalism of translations and making the output more aligned with the characteristics of Hainan's tourism texts and user needs. Furthermore, the training data can be categorized and optimized according to different tourism scenarios, such as beach vacations, cultural experiences, and ecotourism, to further improve the model's translation capabilities in various contexts[4-6].

3.3 Real-Time Feedback Mechanism

Embedding a translation quality feedback portal on the official tourism website provides users with a convenient channel for their input. Users can evaluate and provide feedback on aspects such as terminology comprehension and cultural expression, offering their opinions and suggestions for improvement. This feedback portal can be designed in a simple and intuitive format, utilizing methods such as star ratings and written comments. Combined with A/B testing, different translation versions can be comparatively analyzed, and translations can be optimized based on user feedback and test results. For example, regarding the translation of "椰子鸡," both "Coconut Chicken" and "Chicken Stewed with Coconut" could be presented simultaneously, allowing users to select and evaluate their preferred version. By collecting user votes and comments, it might be discovered that "Chicken Stewed with Coconut" receives a higher selection rate, with users indicating that this version more accurately conveys the dish's cooking method and characteristics. Consequently, this version would be adopted as the final recommended translation. This real-time feedback mechanism enables translators to gain timely insights into user needs and opinions, facilitating continuous improvement of translation quality and enhancement of user satisfaction. Simultaneously, periodic analysis of user feedback data can be conducted to summarize prevalent concerns and requirements, providing valuable reference and guidance for subsequent translation efforts.

Conclusion

This study innovatively employs AI tools and integrates multiple theoretical perspectives, successfully transcending the constraints of traditional translation quality assessment, which is often limited to a single linguistic dimension. By incorporating the two key elements of cultural appropriateness and tourism experience into its analytical framework, this research conducts an in-depth analysis of the English translation of Hainan's tourism texts. It precisely reveals the underlying patterns of cultural mistranslation and the indirect influence mechanism of translation errors on tourists' behavioral intentions.

The detrimental impact of cultural mistranslation in the English translation of tourism texts is significant. It not only directly reduces tourist satisfaction but also negatively influences the decisions of potential tourists through the intangible yet powerful force of word-of-mouth communication, thereby hindering the expansion of Hainan's tourism industry in the international market. In response to these issues, this study proposes optimization strategies based on user cognition, charting a clear course for improving translation quality. In practical application, the dual model combining the COMET automatic evaluation system with manual cultural review has achieved remarkable success, significantly enhancing translation quality and, consequently, improving tourist satisfaction.

Looking ahead, numerous unexplored areas remain within the field of tourism translation awaiting further investigation. Future research could delve deeper into multimodal translation, examining, for instance, the unique impact of the synergistic translation of images and text on the tourism experience, as well as the significant application potential of cross-linguistic large language models in culturally appropriate translation.

In the current era of rapid technological advancement and increasingly frequent cross-cultural communication, the enhancement of tourism translation quality has become a core element in promoting the international development of the tourism industry. As a renowned tourist destination, Hainan bears the responsibility of showcasing its unique charm to the world. We must keep pace with the times, continuously explore innovative translation methods and strategies, and improve the accuracy, quality, and personalization of tourism translations, thereby providing overseas tourists with more considerate and comprehensive tourism information services. Only by doing so can we propel Hainan's tourism industry to flourish on the international stage and achieve sustainable development.

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