Multimodal Translation Model of Chinese Culture Based on SPSS Cluster Analysis

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Abstract. The dissemination of national culture is a form of expression in global communication. In the early years, international media often communicated specific cultural values to the world through "soft cultural" content such as American movies and Japanese cartoons, but the one-way communication is gradually being changed. Currently, China's soft power is increasing, and Chinese culture is also spreading to the world. In cultural research, SPSS (Statistical Product and Service Solutions) is a very important tool. It can be used for the transmission of information such as text, sound, and video data. This article aims to propose an effective method for accurately translating Chinese culture into English through the study of a multimodal translation model of Chinese culture. This article adopts methods such as case analysis and experimental research to study the multimodal translation model of Chinese culture. The results indicate that by using the multimodal translation model for materials of Chinese culture, the accuracy is relatively high, about 98%, and the error rate is relatively low.

Keywords: SPSS Clustering · Chinese Culture · Multimodal Analysis · Translation Model

1 Introduction

With the acceleration of globalization, and communication between different countries and cultures is becoming increasingly frequent. As a medium of communication, language plays an important role [1]. In multilingual communication, translation has become increasingly important as an important tool. In the field of Chinese culture, there have been a large number of articles and materials that need to be translated, and it is very important to translate classic works of Chinese culture accurately into English.

Culture is the spiritual and material civilization of a country. Its significance is immeasurable. Rana Saeed Al Maroof et al. believe that culture is an important expression of a country's soft power. Language is not the sole mode in a discourse or a text. In this regard, studying multimodality is important. This article uses SPSS software to analyze the common word frequency, vocabulary structure, and semantic connections between sentences in traditional cross domain nonlinear models in China.

This article first briefly discusses existing problems in translating Chinese culture. Secondly, the application analysis of SPSS clustering analysis and Chinese cultural translation based on SPSS clustering analysis method is conducted. The article summarizes the results of research from three aspects: cultural factors, word order quality, and consistency, by conducting semantic connections between different discourses from multiple dimensions. It focuses on the cultural dimension and interdisciplinary perspective to extract, analyze, and establish a model of cultural factors in Chinese language. Cluster analysis of cultural dimensions using multiple linear regression methods. Finally, the multimodal model is tested through experiments.

2   Multimodal Translation of Chinese Culture Based on SPSS Cluster Analysis

2.1   Translation of Chinese Culture

Translation is an important means of cultural dissemination [2]. Multimodal translation refers to the use of multiple modalities in translation process. Through this approach, translation can be more accurate, rich in content, and easier to understand. In translation, a single mode may not accurately convey information, so multimodal translation is a very effective translation method [3]. In the field of Chinese culture, there are many materials and articles that need to be translated into English. By using various modes, one can more accurately convey the meaning in the original text.

In English, there are many grammar rules that can be used to explain the semantic relationships between sentences, phrases, and syntax. In translation process, there are many factors that affect the expression of translation [4]. Therefore, it is difficult to accurately grasp the meaning of the original text. In order to solve this problem, it needs to be adjusted and modified to a certain extent. From a cultural perspective, traditional Chinese translation uses language as a tool and has certain limitations in terms of expression. However, it can be found that the multimodal corpus of Chinese culture has the characteristics of combining "form" and "meaning". When studying multimodality, some commonly used and effective translation methods and techniques, such as vocabulary matching and syntactic integration, are often used. These translation techniques can be repeatedly applied to achieve the expressive effect of the translation. Most translation systems are trained by maximizing the probability of the target sequence:

$$Q(\mathrm{w}_1, ..., w_S | \mathrm{p}_1, ..., p_U, \varepsilon_s) \tag{1}$$

Among them, $\mathrm{w}_1, ..., w_S$ and $\mathrm{p}_1, ..., p_U$ are paired sequences. The probability of selecting a language is directly proportional to its number of sentences N:

$$\mathrm{q}\varepsilon = \frac{N_i}{\sum_\lambda N_i} \tag{2}$$

Feed back the target language to the decoder and sequentially generate the target token sequence:

$$W = \mathrm{w}_1, ..., w_S \tag{3}$$

In the process of translation, the main factors that affect the effectiveness of text expression are language environment, context, and discourse structure [5, 6]. Among them, language environment includes vocabulary system, grammar system, etc. Sentence system refers to the discourse methods used for converting speech information between sentences. Semantic network refers to the changes in the relationship between words and the meanings contained in words. Sentence structure refers to a thinking mode that, under certain conditions, consists of independent and meaningful statements that form a whole and express their ideological and emotional characteristics. Chinese and English are different language families, and each language has its own unique phonetic system characteristics, semantic structure characteristics, and grammar rules. There are many factors that affect the multimodal translation of Chinese culture. These factors have differences in the same word or phrase across different dimensions.

2.2 SPSS Cluster Analysis

In traditional translation models, cultural differences are mainly studied based on text and words. Since Chinese information source, Language construct and other factors have a greater impact on the translation, SPSS22.0 analysis software is needed [7]. Cluster analysis is an important application that can classify each sample and classify it into different categories based on similarity. In the field of language research, the theoretical models and methods of SPSS are widely applied [8]. It has good universality and operability, and can be dynamically modified according to different contexts and cultural backgrounds. SPSS clustering analysis can group datasets into similar categories [9]. Using SPSS clustering analysis method for text extraction, classification, and prediction. When classifying data, this method is often used to find hidden structures in the data. Applying it to multimodal translation can improve the accuracy of translation results. The multimodal translation model consists of three main parts. Firstly, extract the content that needs to be translated from the original text and segment it into words. In addition, relevant images are obtained through remote sensing technology and tested and processed using image processing technology. Audio acquisition technology or artificial audio transcription are used for audio processing. Finally, these multiple pieces of information are merged, filtered, and classified through SPSS clustering analysis to obtain the final translated text.

In the field of cultural research, language is a very important tool that can provide various information and knowledge. In traditional cultural research, the main focus is on clustering analysis of texts. This article uses methods such as principal component analysis and common factor analysis to cluster and extract the multimodal corpus of Chinese culture, and establishes a model to determine its category, feature structure, and classification range. The principal component clustering analysis model is shown in Fig. 1.

After the model was established, this article conducted clustering analysis on the text and used relevant data processing tools of SPSS software for calculations. Using SPSS clustering analysis method, classify and study some classic and difficult to express things in traditional Chinese culture [10]. Effective high-frequency words are extracted through word frequency statistics and principal component Spatial analysis. Then select
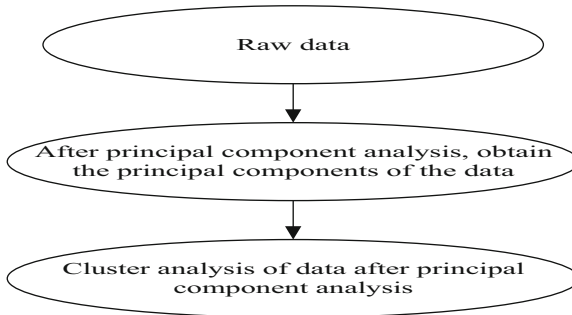
Fig. 1. Principal component cluster analysis model

appropriate samples based on the number of keywords in the subject corpus to form key sentence groups.

The main tool of this translation model is SPSS, which can also be referred to as "word frequency analysis". It is a feature extraction method based on specific discourse text data for recognition and research of speech and semantic differences. The most important thing in this process is to choose the appropriate language grammar pattern. SPSS is a commonly used statistical analysis software that can perform descriptive statistics, hypothesis testing, regression analysis, factor analysis, cluster analysis, and other multiple analyses on data. Among them, cluster analysis is one of the commonly used analysis methods in SPSS, which can classify samples based on similarity and identify potential population structures. In translation models, SPSS clustering analysis can be used to cluster multimodal information to improve the accuracy and robustness of translation.

Before conducting cluster analysis, it is necessary to standardize or normalize the data to avoid differences between different variables affecting the clustering results. The choice of clustering methods includes Hierarchical clustering and non Hierarchical clustering. Among them, Hierarchical clustering can be divided into two types: condensing and splitting. The evaluation of clustering results can be achieved by observing indicators such as inter cluster distance, intra cluster distance, and contour coefficient. The interpretation of clustering results needs to be combined with domain knowledge and practical application needs. In translation models, SPSS clustering analysis can be used to cluster multimodal information. In the translation between Chinese and English, multiple modal information such as Chinese text, English text, images, and sounds can be clustered to find similar clusters, and the information in the same cluster can be combined for translation.

Distance calculation is one of the core processes of clustering analysis, implemented through various distance measurement methods. Clusters are merged and divided according to the Distance matrix, and different clustering methods and distance thresholds are selected to achieve. The evaluation of clustering results needs to be combined with multiple indicators. In SPSS clustering analysis, K-means clustering is a non hierarchical clustering method that requires specifying the number of clusters and multiple iterations

to find the optimal solution. Hierarchical clustering is a bottom-up or top-down clustering method that can generate clustering trees to represent clustering results at different levels. Fuzzy clustering is a clustering method based on Fuzzy set theory, which allows samples to be classified into multiple clusters and indicates each sample belongs to the probability value of each cluster.

2.3 Multimodal Translation Model

Text is the theme of cultural translation, and in multivariate statistics, there is a certain connection between multimodal morphemes and parts of speech. Therefore, key vocabulary in the cultural dimension can be extracted by analyzing the sentence structure, meaning relationships, and other information between words and sentences in different language forms. The multimodal translation model is shown in Fig. 2.

Multimodal translation refers to the method of effective communication and translation between different languages and cultures through the comprehensive use of various modes such as images, sound, and text [11]. Multimodal translation technology is applied in audio translation, subtitle translation, visual translation, and other aspects. Driven translation refers to the comparison, differentiation, and mutual understanding between the original language information of a text and the target language information. When translating from source language text to target language text, differential translation uses data models such as images, sounds, and text for information integration, allowing lower models to gradually evolve into higher models. Sensitivity based translation uses two or more forms of information to generate relevance and improve communication and understanding between languages by comparing information between different modes. The ultimate key to multimodal translation lies in the integration of different modes.

Translation is a complex system that converts a large amount of data into understandable and controllable language information. During this process, translators can use language or symbols to express the meaning of the original content. By filtering information such as language and vocabulary, it can choose the content that is suitable for this template expression. Then, after extracting the word frequency and corresponding words, calculate the weight vector to obtain the corresponding Chinese word segmentation rules.
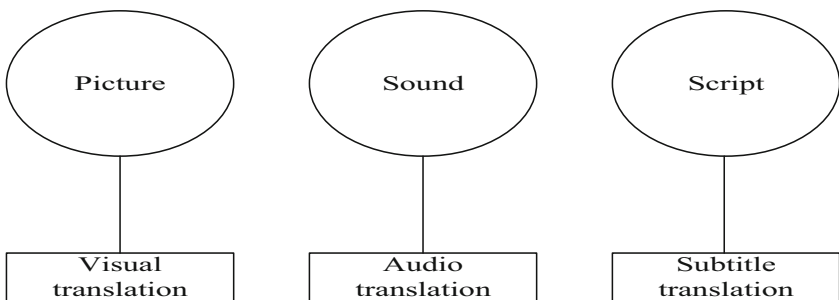

Fig. 2. Multimodal translation model composition

The multimodal translation model of Chinese culture is a translation model that contains multiple modal information. It can fully handle the mutual conversion between Chinese and English. Compared with traditional single modal translation, multimodal translation can more fully express the original information, supplement different modes, and jointly improve the accuracy. Multimodal translation includes speech recognition, natural language processing, computer vision, machine learning, etc. China's cultural heritage and traditional art can also be better disseminated and promoted through multimodal translation techniques. Utilizing multimodal translation for cross-cultural communication can achieve effective communication and understanding between different languages and cultures, and promote the dissemination of China's cultural heritage and traditional art.

3   Chinese Culture Multimodal Translation Model Experiment

3.1   Experimental Background

Due to differences between languages and cultures, translation is often a complex and challenging process. In order to get better translation, multimodal translation technology has been widely applied. The goal of this article is to construct a multimodal translation model for Chinese culture based on SPSS clustering analysis. This model can simultaneously handle translation tasks of images, text, and speech, and can better adapt to the Chinese cultural background. The weight of cultural dimensions in cluster analysis is determined by the text and word frequency coefficients, and there is also a certain degree of correlation between variables.

3.2   Environmental Construction

The construction of a cultural multimodal translation model is a complex and challenging issue. It not only needs to consider objective factors such as language and environment involved in the translation process, but also needs to pay attention to the translator's subjective initiative during translation. Testing the designed multimodal translation model requires the use of some standard datasets for experimentation. These datasets would include images, text, and speech, covering different themes and scenarios.

In order to build the environment for the multimodal translation model, the following tools are needed: the Python programming language, which provides many libraries and frameworks for deep learning and machine learning. The TensorFlow framework can be used to train deep neural networks. SPSS statistical software is used for clustering analysis. During this process, it is necessary to install Python and TensorFlow and configure their corresponding environment variables. At the same time, it is also necessary to install SPSS statistical software and be familiar with its operating methods.

3.3   Experimental Testing

On the basis of traditional translation models, the influence of cultural differences on the expression effect of the translation is considered. This article studies clustering

analysis methods based on factors such as text normalization, semantic similarity, and contextual distance. When studying multimodality, vocabulary can be selected from a text library and a sentence structure network graph can be established using SPSS 22.0 statistical software. Provide corresponding syntactic components and part of speech information based on the author's translated work. Then compare it with the semantics of a standard corpus to determine the differences between languages. In the process of constructing cultural models, language and semantic differences result in different ways of text expression. Calculate and compare the modulus values obtained from text clustering analysis and make evaluations. This article conducts multimodal translation of images, text, and audio from dramas, national spirits, and poetry collections in Chinese culture, and translates them into English to express and promote Chinese culture. By using a multimodal translation model of Chinese culture based on SPSS clustering analysis, more accurate and fluent translation results can be obtained. This article adopts a method that combines word frequency and sentence number to extract feature values, select corpus, and construct a hierarchical structure of sentences. During the experiment, the total number of test samples was 250, and subjective evaluation methods were used for comparative testing. The construction of a cultural multimodal model is mainly aimed at describing the semantic relationships between different discourses, thereby ensuring a certain degree of coherence in the translation. The way of expression is the most important factor affecting the style, structure, and semantics of the translation.

4   Translation Experiment Results

As shown in Fig. 3, this article can find that the accuracy of image translation reaches 98.6%. The accuracy of text translation reached 99.3%. The translation accuracy in terms of audio has reached 98.3%. The use of multimodal translation models can provide richer and more complete text content. Because the model contains not only textual information, but also relevant image and audio information, it can obtain more comprehensive content.
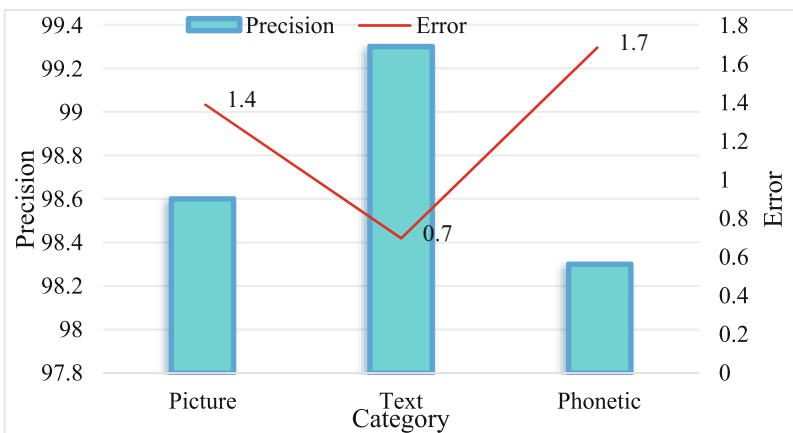

Fig. 3. Accuracy of translation in ethos

Table 1. The translation accuracy of the drama

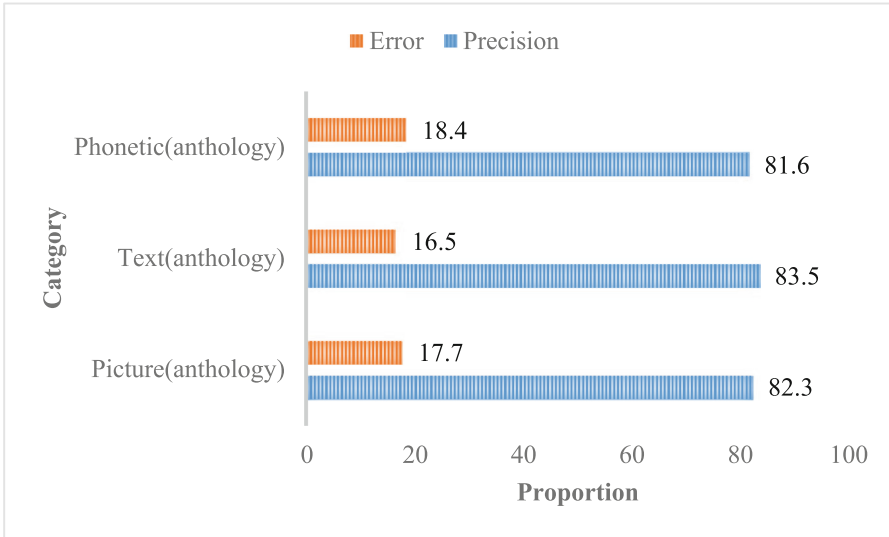|	Precision	Error
Picture(drama)	78.5	11.5
Text (drama)	79.1	10.3
Phonetic(drama)	78.2	11.8

Fig. 4. The translation accuracy of the anthology

As shown in Table 1 and Fig. 4, through statistical and cluster analysis, it can be found that the translation accuracy in terms of drama and poetry collection is lower compared to the translation accuracy in terms of national spirit. The highest accuracy of drama translation is only 79.1%, which is in textual translation, and the lowest is 78.2%. The translation in the poetry collection is slightly higher than in the drama. The highest accuracy reached 83.5%, while the lowest was 81.6%. It can be seen that in today's cultural diversity, multimodal translation still needs improvement. Due to the large cultural differences and the influence of subjective factors, Analysis of algorithms should be strengthened in the SPSS cluster analysis, and the related images, words and audio with Chinese characteristics or other national characteristics should be further understood, so as to improve the accuracy of translation.

5   Conclusions

The study of culture and translation is a complex and massive project that requires continuous exploration in order to better and faster grasp its technical knowledge. This article proposes a multimodal translation model for Chinese culture based on SPSS clustering

analysis, which can obtain more accurate and complete translated texts. This model can comprehensively process multiple modal information such as language, images, sound, etc., to achieve translation between Chinese and other languages. The experimental results indicate that the model has very high translation accuracy in some aspects. This provides a new solution for the accurate translation of Chinese culture. Using SPSS software for clustering analysis of the model requires further improvement of the algorithm to further improve the accuracy of translation and provide strong support for cross-cultural communication and translation work.

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