Research on Cultural Values in Chinese Literary Texts from the Perspective of Multimodal Discourse Analysis

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Abstract　Currently, Chinese literary texts mainly convey information through a single modality, which makes readers less interested in literary texts, resulting in the cultural value of literary texts being in a situation of "high and low". In this paper, the cultural value of Chinese literary texts is studied with the help of multimodal discourse analysis, and through the design of multimodal transformation and multimodal semantic matching of literary texts, the cultural value of the texts is presented in a richer form. Finally, taking Dream of the Red Chamber as an example, the cultural attributes and cultural value of Dream of the Red Chamber are explored. The results show that the score of the cultural value of this literary text is 69.8663, which indicates that the content base of this literary text is rich and complete, has high authenticity and historical value, and has been handed down more completely until now. This study can provide support for the construction of meaning and quantitative assessment of cultural value of Chinese literary texts.

Index Terms　discourse analysis, multimodal transformation, semantic matching, Chinese literary texts

I. Introduction

As an important medium of communication between Chinese and foreign literature and culture [1], Chinese literature promotes cross-cultural communication between China and foreign countries in two ways: firstly, it greatly stimulates and satisfies the foreign readers' demand to read, understand and experience Chinese literature and culture, so that a real and contemporary China can be presented [2]–[4]. Secondly, a group of Chinese and foreign translators have gathered under Chinese literature, practicing, sharpening and promoting each other, forming a favorable atmosphere of cross-cultural exchange, which in turn ensures the continuous upgrading of the translation realm [5]–[7].

The object of literary theory is the literary text, which is simple and easy to understand, but we have forgotten this fundamental issue in the construction of literary theory, which makes literary theory become "pulling and pulling" from the text [8].

Literary text is the foundation of knowledge production in literature and art, and it is also the precondition for the generation of localized theoretical discourse [9]. Especially when the contemporary literary knowledge production is in the post-theoretical era of the spatial superiority of the electronic mode of communication, the digitalization of information compilation, and the networkization of communication and dialogue, the importance of the study of literary text for the production of literary knowledge is becoming more and more prominent [10]–[12].

Emphasizing the "text" as the field of knowledge production, strengthening the practicality and operability of the theory itself, avoiding cross-contextual [13], supra-temporal discourse collage in the process of literary construction, as well as the phenomenon of multi-dimensional rupture of literary theory, literary criticism, and creative practice caused by horizontal transplantation, so as to make the contemporary literary science form a continuous and effective discourse and knowledge construction method. This will enable contemporary literature and art to form a continuous and effective discourse and knowledge construction mode [14]–[16], effectively solving the problem of empty and random transplantation of theories, so that the theoretical construction is never detached from the specific text [17]. The real meaning of the century of practice called "the century of criticism" is that Western theories are generated on the basis of textual research, with a solid foundation of textual close reading [18]. The significance of advocating the study of textual issues lies in the ability to use the text as a bridge to carry out an all-round dialogue and exchange with Western theories, and to promote the production of knowledge in literature and art with Chinese characteristics [19].

In this paper, image and Chinese literature text features are first labeled, and the most suitable synthesis kernel for Chinese literature text and image features is obtained by genetic algorithm tuning. After mapping the high-dimensional image features to the high-dimensional Chinese literary text space based on partial squares regression, the semantic expressions

in the text space are analyzed by logistic regression in order to complete the multimodal semantic matching of Chinese literary texts. Secondly, through the multimodal transformation of literary texts, a multimodal discourse analysis framework combining phonological, phonemic and semantic levels is proposed. The framework is applicable to the aesthetic mining of literary texts of various genres, focusing on the analysis of thematic meaning. Finally, taking the classical Chinese literature Dream of the Red Chamber as a research case, a specific analysis is conducted based on the multimodal semantic matching and cultural value assessment methods to explore the cultural attributes and cultural value of Dream of the Red Chamber.

II. Multimodal Discourse Analysis of Chinese Literary Texts

A. Multimodal semantic matching

The image and Chinese literature text features are denoted as $I \in R^{di}$, $T \in T^{dt}$ respectively, where di and dt are their corresponding dimensions and the sample size is n. Because the order of magnitude is obviously different between the features, this section first needs to normalize the data matrices I and T.

In the partial squares regression algorithm, the normalized data matrices are related by the matrix of regression coefficients $P \in R^{di \times dt}$:

$$T = IP + E, \qquad (1)$$

where, $E \in R^{dt}$, the purpose of the partial squares regression model is to find the maximum correlation between subspaces U and V, a process that can be realized by the following equation:

$$U = VQ + F, \qquad (2)$$

where $Q \in R^{m \times m}$ denotes the matrix of regression coefficients in the subspace and $F \in R^{m \times n}$ denotes the matrix of residuals in the subspace.

Thus, (2) can be rewritten as:

$$T = II^T U \left(V^T II^T U \right)^{-1} V^T T + E. \qquad (3)$$

At this point, P becomes the matrix of regression coefficients in orthogonal space.

In the KPLSR method, the two data matrices are first mapped by the kernel function into a higher dimensional space, which allows us to obtain the kernel matrix $K\left(I, I^T\right)$. This is then treated similarly to partial squares regression, so that the final orthogonal space can be expressed as:

$$T = KU \left(V^T KU \right)^{-1} V^T T + E. \qquad (4)$$

The essence of linear multi-kernel learning is actually a linearly weighted combination of different kernels. In this chapter, a linear combination of radial basis (RBF) kernel functions and polynomial kernel functions is used in the following way:

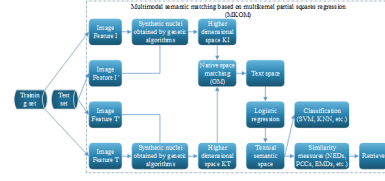$$K = \lambda K_{poly} + (1 - \lambda) K_{rbf}. \qquad (5)$$

Figure 1: Multimodal semantic matching of Chinese literary texts

$$K_{poly}\left(X, X^T\right) = \left(XX^T + 1\right)^d, d = 1, 2, 3 \ldots, n. \qquad (6)$$

$$K_{rbf}\left(X, X^T\right) = \exp\left(\frac{-\left\|X - X^T\right\|}{2\sigma^2}\right), \qquad (7)$$

where d and σ are the parameters of the polynomial and radial basis kernel functions, respectively, and λ is the weight parameter of the additive kernel.

Adaptive Genetic Algorithm (AGA) is used to select the parameters $\{d, \lambda, \sigma\}$ and encode and decode them using the commonly used binary coding system. It automatically adjusts the crossover probability and mutation probability according to the fitness function.The AGA algorithm aims to minimize the error between the output and the actual value of KPLSR by parameter selection with the following fitness function:

$$Fitness(\lambda, d, \sigma) = \sqrt{\frac{1}{n} \sum_{i=1}^{n} \left\| y_i - \hat{y}_i \right\|^2}, \qquad (8)$$

where n and $\hat{y}_i$ are the number of validation samples and the predicted value, respectively.

The deep learning network can be understood as a subset of machine learning, with multi-layer nonlinear transformation, complete large amount of data, and can extract the deep abstract representation of the number of Numbers.

The overall framework of multimodal semantic matching is shown in Figure 1, which obtains the most suitable synthetic kernels for Chinese literary text and image features respectively through genetic algorithm tuning. Then, the synthetic kernel is utilized to map them to the high-dimensional space. Then, the native space matching (OM) method based on partial squares regression maps the high-dimensional image features into the high-dimensional Chinese literature text space. Finally, the semantic expressions in the text space are analyzed by logistic regression. By now, the multimodal semantic matching process of Chinese literary texts has been basically completed, and multimodal data classification and retrieval can be carried out in the transformed text semantic space.

B. List of stylistic meanings and stylistic forms

1) List of stylistic meanings
Analyzing Chinese literary texts based on functional stylistics, a comprehensive list of stylistically assessed languages can be constructed for Chinese literature through traditional rhetoric,
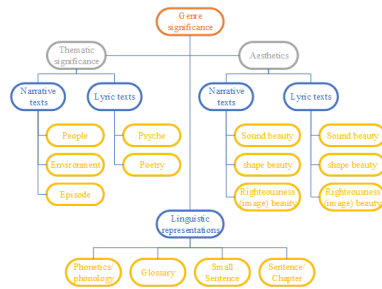
Figure 2: Schematic diagram of the stylistic meaning list

Figure 3: Evaluation framework of cultural value in Chinese literary texts

functional stylistics, discursive stylistics, cognitive stylistics and narrative stylistics as shown in Figure 2. Among them, Unified Rhetoric pays more attention to the aesthetic and thematic effects of language due to formal deviations, with the aesthetic effects being the main focus. Functional stylistics, pragmatic stylistics, and cognitive stylistics are more devoted to the analysis of thematic meaning. Narrative stylistics, on the other hand, takes care of both.

2) List of stylistic forms

The multimodal discourse analysis framework constructed in this paper further subdivided literary texts into narrative texts, including those covering narrative prose, novels, plays, etc., and lyrical genres, including poetry, lyric prose, etc.

At the same time, two points need to be clarified:

1) The list of stylistic forms is not a closed list, but an open system, and when the evaluator finds a linguistic form that has stylistic significance while evaluating a translation but cannot be clearly categorized under any of the categories in the Table 1, it can also be included in the framework on a temporary basis as one of the items for that particular evaluation act.

2) Generally speaking, in the study of cultural values in Chinese literary texts, literary text types are treated as a whole and are not subdivided. In contrast, in the multimodal discourse analysis framework of this paper, literary texts are further divided.

C. Assessment of Cultural Values in Chinese Literary Texts

1) Framework for assessing cultural values

As mentioned above, the core element of a literary text is stylistic meaning, which encompasses thematic and aesthetic meaning. Stylistic meaning is manifested in various layers of language, mainly phonological, phonemic and semantic layers. This division is similar to the three-beauty theory of poetry, i.e., phonological, semantic, and morphological beauty, which is in line with the aesthetic nature of literary works. However, the multimodal discourse analysis framework of phonological, phonological and semantic layers proposed in this study is not only applicable to the aesthetic excavation of poetry genre, but also to the analysis of thematic meanings,
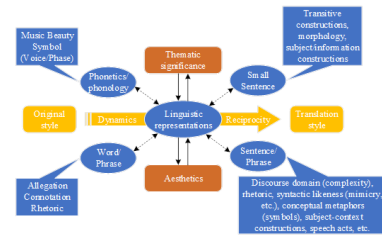
which is more emphasized in narrative genres, such as novels, than the three-beauty theory.

The main goal of a literary work is to express the cultural value through the three levels of phonology, morphology and semantics of the stylistic meaning dynamics. The assessment of literary cultural value should also follow this path, and according to the above list of linguistic assessment based on the perspective of each genre, an assessment framework of literary cultural value can be constructed as shown in Figure 3. Among them, the stylistic meaning consists of thematic and aesthetic meanings, which permeate the linguistic representations at the phonological, phonological and semantic levels. The semantic and syntactic aspects cover several specific linguistic levels of vocabulary, phrases, clauses and parts of speech.

2) Steps in the assessment of cultural values

1) Genre Analysis

Different genres such as narrative and lyrical have different stylistic tendencies, and will show their own characteristics in terms of the components of thematic and aesthetic significance. At the macro level, lyrical genres focus on aesthetic meaning more than thematic meaning. The opposite is true for narrative genres such as novels and dramas, so that aesthetic significance should be given greater weight when assessing lyrical genres, mainly poetry. On a micro level, poetry focuses on phonetics and phonology, novels focus on narrative perspective, materiality system and other related techniques, and drama favors the use of discursive devices.

2) Comparative Assessment

Analyze the thematic and aesthetic significance of the text under the umbrella of genre, examine the linguistic details one by one, and make a detailed assessment against the translated text. The linguistic details are weighted according to the relevance of the genre and theme. For example, in the assessment of the cultural value of poetry, phonological rhetoric and the quality of its communication in the translation should be given greater weight. Linguistic details with higher thematic relevance should be given higher weight.
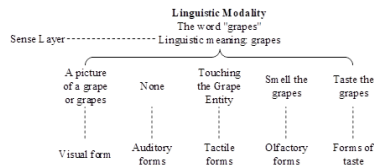
Figure 4: Schematic diagram of referential transformation

Figure 5: Schematic diagram of homogeneity transformation

Figure 6: External formalization diagram

D. Multimodal Transformation of Chinese Literary Texts

Human beings perceive the world through their five senses. Literature, as a language art that reflects objective reality and expresses the inner world, contains the perception of the external world by various senses. However, due to the generalization and abstraction of language, the language symbols themselves do not directly stimulate our visual and auditory organs to perceive the artistic images like other art forms such as painting, sculpture and music. Instead, it indirectly induces readers to imagine and thus produce aesthetic imagery, and then to appreciate the mood or rationality contained in the imagery. Therefore, the reader's reading is not just a simple superimposition of word meanings, but a secondary creation, that is, on the basis of existing knowledge and experience, through imagination and association, evoking in the mind a concrete and palpable picture of life.

1) Symmetrical transformation

In the process of social communication, the object of communication this mutual exchange is meaning, and this meaning can be embodied not only by language, but also by other modalities. Referential transformation mainly focuses on the meaning layer of textual discourse, which refers to the transformation of the literal meaning of the text into the information of the corresponding sensory channel. The schematic representation of denotative transformation is shown in Figure 4. Due to the power of linguistic denotative function, this transformation can correspond almost all the multimodal contents in the text to multiple sensory channels, such as vision, taste, touch, and so on. For example, in the two important scenes in the text of "Jing Ke Assassinate the Qin King", the author carries out a lot of descriptions about the character's demeanor, movement, and language, which involve visual, auditory, kinesthetic, and other multimodal contents.

2) Homogeneous transformation

All art is a reproduction of life, and different art forms share a common reflective content. Although literary discourse presents only a unimodal arrangement of characters, the content of its expression is often consistent with other art forms.

According to the theory of multimodal discourse analysis, the homogeneous transformation of literary text is shown in Figure 5. The same discourse meaning can be presented through different modalities, and from the expression level, writers use words as a medium, painters use brush strokes as a medium, while musicians use musical notes as a medium.
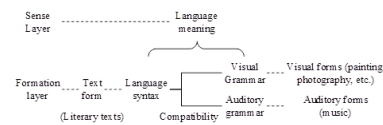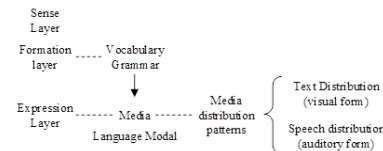
Although different mediums of expression lead to the diversity and essential difference of art forms, in their formal grammar layer, there is often a certain grammatical similarity between different art forms.

3) External formalization

The media system of language, as the dominant mode of human communication, consists of a phonological system, which is composed of a series of acoustically conducted sound symbols and belongs to the auditory symbols, and a word system, which is composed of a series of acoustically conducted sound symbols and belongs to the auditory symbols. The former consists of a series of acoustically transmitted sound symbols, which belong to visual symbols. External formalization is schematically shown in Figure 6, which refers to the visual and auditory forms of literary discourse presented within the linguistic modality with external highlighting effects. The former includes the use of punctuation, the shape of words, the length of sentences, the arrangement of rows and columns, and visual repetition. The latter includes the combination of tones, the length of sentences, and the repetition of speech.

If a certain external formalization of a text presents a very distinctive feature, such as the multiple occurrence of the same word, then this creates a formal characteristic of the text as a whole. The "form" is the "genre", which is divided into "inner" and "outer" layers. The inner genre reflects "the author's style and personality", while the outer genre includes "the length and complexity of the sentences and the style of the poem".

III. Case studies of cultural values in Chinese literary texts

The rich modal expressions in the Chinese classical masterpiece Dream of Red Mansions put, the relationships between characters and their delicate personalities vividly in front of the readers. Taking Dream of Red Mansions as a research case, this paper carries out a specific analysis based on multimodal semantic matching and cultural value assessment methods in order to explore the cultural attributes and cultural value of Dream of Red Mansions.
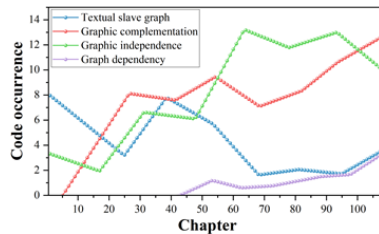
Figure 7: Statistical results of the graphic state of A Dream of Red Mansions

Figure 8: The number of images corresponds to the statistical results

A. Multimodal analysis of the literary text Dream of the Red Chamber

1) Statistical analysis of graphic status

Graphic state refers to the correspondence between image modality and textual modality in the original. Among the graphic state relations, they can be categorized into equal and unequal relations. Graphic-independent and graphic-complementary are graphic-equal relations, while text-subordinate to graph and graph-subordinate to text are unequal relations.

In this paper, we have analyzed the graphic states of the original 108 chapters of Dream of the Red Chamber with 235 pictures through multimodal semantic matching, and obtained the graphic state statistics as shown in Figure 7. As a whole, Graphic independence is the most common graphic state in the Chinese literary text Dream of Red Mansions, with an average of about 9 occurrences per turn. Followed by Graphic complementation of 8.07 and Textual slave graph of 3.68, Graph dependency is less common.

In terms of the different chapters, Textual slave graph and Graphic independence are the main graphic state relations in this literary text from the 1st to the 20th time, accounting for more than 80% of the total. Graphic independence becomes the main coding of graphic status from the 50th episode onwards ($\geq$60%). This reflects the fact that graphic subordination to text is not the main graphic state of Dream of Red Mansions, and pictures frame a part of the text. When the information carrying capacity of the text decreases, the length and comprehension difficulty of the text can be effectively controlled. Especially when the text is subordinate to the picture, the text only needs to refer to something in the picture or elaborate the actions of some characters in the picture.

2) Corresponding statistical analysis of the number of graphics and texts

Since the beginning and the end of a story text in Chinese literature are based on one page as a picture, while the middle page is two pages synthesized into one picture. In this paper, the pages in the middle part of the text of each chapter are selected to encode the quantitative relationship between the diagrams. This paper analyzes the 108 original chapters of Dream of the Red Chamber through multimodal semantic matching, and obtain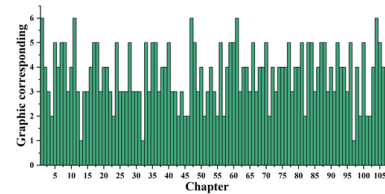s the statistical results corresponding to the number of pictures and texts as shown in Figure 8. From the overall situation, a picture corresponds to at least 1 word or phrase and at most 6 words or phrases. However, in terms of the average information provided by two pages of a picture, half of the pictures correspond to 3 sentences. Of course, in 16, 32 and 97 returns, it appears that a picture corresponds to 1 word or phrase. The ratio of the number of pictures corresponding to 1:3 dominates, with 1:2 being the most frequent of all codes.

Through the pictures, the text of Dream of the Red Chamber is actually cut effectively. If only the text is provided, ten sentences are more burdensome to be cognized once. Whereas, if segmentation is done through pictures, learners only need to decode and analyze one sentence or two sentences.

B. Analysis of the Cultural Value of the Literary Text Dream of the Red Chamber

1) Analysis of the core values of literary texts

After summarizing the cultural value assessment methods and steps in subsection 2.3.2, the cultural value assessment system in Chinese literary texts can be determined as shown in Table 1. It assesses the cultural value of Chinese literary texts in seven dimensions: historical and cultural value (X1), spiritual value (X2), scientific value (X3), artistic value (X4), educational value (X5), economic value (X6), and popularity (X7). It can be seen that among the 7 dimensions, the historical and cultural value (X1) has the highest weight of 0.3622, and the literary text Dream of Red Mansions has the lowest score in the scientific value dimension (32). In the historical and cultural value (89) dimension, the final score of the literary text is 69.8663.

2) Analysis of the results of storytelling in literary texts

Based on the above quantification and evaluation of the core values of the literary text Dream of the Red Chamber, it can be seen that the novel Dream of the Red Chamber has a good foundation and potential for dissemination, but is still deficient in quite a number of aspects. The box-and-line diagram of the storytelling assessment scores of the Chinese literary text Dream of the Red Chamber is shown in Figure 9, in which the box is the 25-75% score interval and the dots are the mean values of the scores, which can be more intuitively seen as the storytelling characteristics of the text.

1) Story content dimension

Index	Symbol	Weighting	Score	Final score
Historical and cultural value	X1	0.3622	89	32.2358
Spiritual values	X2	0.1178	77	9.0706
Scientific value	X3	0.2175	32	6.9600
Artistic value	X4	0.1068	83	8.8644
Education value	X5	0.0538	78	4.1964
Economic value	X6	0.0952	48	4.5696
Popularity	X7	0.0467	85	3.9695
Total	-	1.0000	492.00	69.8663

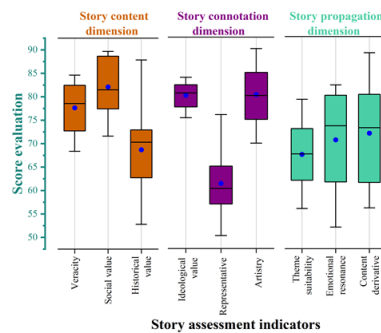Table 1: Cultural value evaluation system

Figure 9: Radar map for story assessment of literary texts

In the story content dimension, authenticity (Mean=77.84), social value (Mean=81.95), and historical value (Mean=67.92), the evaluation results all show that all have high ratings. It indicates that the content base of the story is rich and complete, has high authenticity and historical value, and has been passed down relatively intact to the present day, and has a close relationship with the daily life of the public group and personal emotions.

2) Story Connotation Dimension

In the story connotation dimension, the story also has high evaluation results in terms of ideological value (Mean=80.41), representativeness (Mean=62.04), and artistry (Mean=81.25), which fully demonstrates its diversified value and extremely high value recognition. At the same time, it also reflects that the stories and events have good cultural image and popularity. It has considerable regional and national characteristics as well as religious atmosphere, and also has its unique aesthetic characteristics and scientific value.

3) Story dissemination dimension

In the story dissemination dimension, it was found through evaluation that the story itself had a good rating for its thematic appropriateness (Mean=68.07) and emotional resonance (Mean=70.56). Its content derivativeness (Mean=71.44) was also generally recognized and acknowledged, exporting cultural values internationally.

IV. Conclusion

The current quantitative research on the cultural value in Chinese literary texts is not yet comprehensive and complete,

lacking scientific and objective standards, value perception and evaluation. In this context, this paper takes Dream of the Red Chamber as a case study, and evaluates and explores its cultural value based on multimodal discourse analysis. The main research results are as follows:

1) Graphic independence is the most common graphic state in the Chinese literary text Dream of Red Mansions, appearing about 9 times per turn on average. It indicates that when the information carrying capacity of the text decreases, the length and comprehension difficulty of the text can be effectively controlled.

2) The historical and cultural value index in the cultural value assessment system has the highest weight, which is 0.3622, while the literary text Dream of Red Mansions scored 89 points in the dimension of historical and cultural value, with a final rating of 69.8663 points. It shows that the literary text has high authenticity and historical value, and has been passed down more completely until now, which fully demonstrates its diversified value and extremely high value identity. At the same time, it also reflects that the story and events have a good cultural image and popularity.

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