A Comparative Study on Translation Strategy Orientations of *Story of Your Life* Based on Affect Intensity

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***Abstract*—This study takes the Nebula Award-winning Sci-Fi work *Story of Your Life* by Chinese-American author Ted Chiang, along with its published Chinese translation and two AI-generated Chinese translations, as research objects. It adopts a DH method of CDR, uses Voyant Tools for text visualization, and employs AI-written Python code with affect dictionaries to explore translation strategy orientations based on nodes with significant affect intensity differences. The results show that the original text has the highest lexical density, the Doubao translation has the longest average sentence length, and the DeepSeek translation has the best readability. The original text presents "high positivity-high negativity" tension, the published translation forms a "moderate intensity-dominated" balanced structure via affect adjustment, and AI translations show a "low positivity-low negativity" flat structure. In terms of affect flow, the original text has the largest fluctuation range, the published translation has an earlier peak, and AI translations suffer from reduced tension due to elevated troughs. Strategy-wise, the published translation adopts "free translation–domestication", DeepSeek tends to "literal translation–simplification", and Doubao features "combining literal and free translation". This study expands the methodological path for literary translation research from the DH perspective.**

***Key Words*—affect word intensity, digital humanities, *Story of Your Life*, translation strategy**

I. Introduction

A. Background and Significance

The rise of digital humanities has provided interdisciplinary methodological support for literary translation studies, with its core lying in the realization of precision and systematization in text analysis through data mining and visualization technologies [1]. As a core expressive dimension of literary works, textual affect directly reflects the thematic connotations and artistic characteristics of a work, and the effectiveness of affect transmission in translation serves as a crucial indicator for evaluating the quality of translated versions [2]. The quantitative methods of digital humanities provide an updating perspective in the literary and translation research. *Story of Your Life* is a medium-length Sci-Fi work by the Chinese-American writer Ted Chiang, featuring an intersecting narrative centered on linguistics, physics, and causal theory. It constructs a unique affect tension and won both the Nebula Award and the Sturgeon Award in 1998. The released Hollywood hard science fiction blockbuster *Arrival* in 2017 is adapted from this work. At present, there is one officially published Chinese translation of this work; meanwhile, with the development of AI translation technology, translations generated by LLMs such as DeepSeek and Doubao have provided diverse corpora for affect comparison.

B. Literature Review

The development of corpus linguistics drove the empirical turn in translation research. Baker [3] proposed a corpus-based translation research paradigm, laying a theoretical foundation for quantitative analysis of translation features. Wang [4] examined English-Chinese sentence correspondence using parallel corpora, while Dai and Xiao [5] studied translation explicitation via corpora. With the upgrading of digital tools, platforms like Voyant Tools enable visualization of text features (e.g., tokens, types, high-frequency words), providing preliminary data for affect analysis [6]. Textual affect analysis in translation mainly adopts three methods: affect dictionary-based, machine learning-based, and deep learning-based [7]. In literary translation, Pan [8] analyzed the implicit metaphor mechanism of affect transmission from a cognitive linguistics perspective, and Chen [9] explored affect processing in women's literature using affect narratology. However, these studies focus on human translations, lacking systematic quantitative comparisons with AI translations. Recent advances in AI translation have focused on semantic accuracy, with limited attention to affect transmission. A small number of studies indicate that AI translations tend to homogenize affect word selection and struggle with culturally loaded affect expressions [10]. No existing research systematically compares affect features between AI translations, human translations, and original texts, nor links these features to translation strategy orientations.

C. Methodology

The research questions are as follows:

1) What characteristics and differences are presented in terms of affect word density, intensity, and affect flow patterns between the original English text and the three Chinese translations?

2) What are the translation strategy orientations of the three Chinese translations based on the aforementioned characteristics and differences?

This study takes the original English text *Story of Your Life* and the three Chinese translations as the research objects. The translations include the published one by Yilin Press [11], generated ones by the DeepSeek 3.1 with 685B parameters and 128K context length, and by the Doubao 1.6 with 200-300B parameters and 256K context length.

Voyant Tools is used to extract the basic linguistic features of the texts, generate high-frequency word distribution maps, and conduct lexical density statistics. Drawing on HowNet (a Chinese-English sememe system) and SentiWordNet (which assigns affect intensity scores), and referring to the lexicon

construction method proposed by Zhou *et al.* [12], an affect lexicon adapted to science fiction texts is established. Chi-square test and correlation analysis are adopted to verify the significance of differences in affect features.

Scholars such as Zhou *et al.* [12] proposed a method for constructing a Chinese Sentiment Lexicon based on HowNet and SentiWordNet (SLHS). Their experimental results show that this lexicon outperforms general polarity sentiment lexicons, providing an effective dictionary resource for sentiment analysis research. Therefore, this study draws on the ideas and methods adopted in the construction of SLHS, and in the process of lexicon application and affect intensity calculation, employs Python code (Python 3.13 64-bit) assisted by Doubao 1.6 with specific parameters including sememe matching threshold (0.8), affect word category filtering (positive/negative/neutral), and intensity score normalization (-1 to 1), validated via 5-fold cross-validation (using 80% corpus for training, 20% for testing, repeating 5 times to calculate average accuracy) to ensure code reliability. The steps as follows:

1) SentiWordNet is used for sentiment analysis of the original English text. The value range of sentiment intensity is [-1, 1] [13]. On this basis, a sentiment intensity classification table is developed in accordance with the characteristics of the corpus used in this study.

2) HowNet is utilized to obtain the English sememes corresponding to each word in the three Chinese translations.

3) SentiWordNet is employed to derive synonym sets containing the English sememes.

4) The affect intensity score of each word in the three Chinese translations is calculated.

5) Data collation and statistics are conducted. After obtaining the affect intensity scores of four categories of words in the three Chinese translations, non-affect words with a score of 0 are filtered out. The remaining affect words are classified and counted.

6) Sections with significant differences in affect transmission are identified. A threshold for outliers is set, and sections with an absolute deviation value greater than T are selected as the core corpus for strategy analysis.

7) The correlation between strategy selection and the effectiveness of affect transmission in different scenarios is analyzed. Subsequently, the orientations of translation strategy are compared and analyzed, followed by sampling verification and analysis of cases.

II. Analysis and Discussion

This section presents research results concisely, interprets their implications, and links them to translation strategies.

A. Basic Linguistic Features

Table 1 shows significant differences in basic linguistic features among the four texts. The original text has the highest lexical density, indicating superior lexical richness. Among AI translations, the Doubao translation has the longest average sentence length, reflecting a preference for long sentences; the DeepSeek translation has the lowest readability index, making it the easiest to understand.

High-frequency word analysis further reveals textual characteristics. Original text: “like” (87 times), “heptapod” (83 times) (core sci-fi imagery); Published translation: “说” (199 times) (reflects dialogue-driven narrative); DeepSeek translation: “会” (233 times) (enhances speculative tone); Doubao translation: “窥” (37 times) (emphasizes affect expression of detailed actions).

Table 1. Basic linguistic features

Indicator	O-EN	P-CN	DS-CN	DB-CN
Token	17602	22017	18417	18051
Lexical Density	0.185	0.159	0.165	0.165
Sentence Length	14.5	28.6	334.9	2578.7
Readability	9.122	2034.252	693.738	1420.196

B. Affect Features

1) Affect word density

Chi-square tests show significant differences in positive affect word density ($\chi^2 = 14.7243$, $p = 0.0020 < 0.05$) and total affect word density ($\chi^2 = 18.5844$, $p = 0.0003 < 0.05$) among the four texts, while negative affect word density differences are non-significant ($p = 0.0754 > 0.05$). The original text and AI translations have similar total affect word density, while the published translation has the lowest (96.06) due to its longer text length, showing “high quantity but low density” affect dilution. In intensity-classified density (Table 2), the original text leads in strong_positive density, 3.6 times that of Doubao; Doubao has the highest strong_negative density, reflecting over-sensitivity to specific negative affects.

Table 2. Comparison of affect word density

Type	O-EN	P-CN	DS-CN	DB-CN
Pos	66.81	61.54	63.58	65.54
Neg	34.6	34.52	35.02	35.57
Total	101.41	96.06	98.6	101.1

2) Affect word intensity

Based on the emotional intensity assignment and sememe system of SentiWordNet and HowNet, the weighted average method is used to calculate the intensity of a single emotional word. The formula is as follows:

$$\text{Word Affect Indensity} = \frac{\Sigma_{i=1}^{n} (\omega_i \times s_i)}{n}$$

where ω_i represents the weight of the i-th sememe (based on the frequency of the sememe in the synonym set), s_i denotes the emotional intensity score of the *i*-th sememe (with a value range of [-1, 1]), and n is the total number of sememes contained in the word.

All texts are dominated by positive affects, but their intensity structures differ. Original text: “high positivity-high negativity” tension, reflecting the core contradiction of “foresight of fate vs. love for life”; Published translation: “moderate intensity-dominated” balance, with weakened negative intensity showing human translators’ affect adjustment awareness; AI translations: “low positivity-low negativity” flat structure, with positive intensity only 75% of the original text, leading to insufficient tension.

The contribution degree of affect words at different levels to the total intensity presents distinct subjective characteristics (Table 3). The intensity advantage of the original text mainly relies on high-intensity affect words; the contribution proportion of high-intensity affect words reaches

11.2%. The published translation has constructed a "medium-intensity dominated" contribution model. It achieves affect balance through the accurate transmission of medium-intensity affects. Weak_positive affect words serve as the largest source of contribution, with the contribution degree ranked as follows: original text > Doubao translation > DeepSeek translation > published translation. This ranking is basically consistent with that of weak_positive word density. The contribution degree of weak_negative affect words shows a gradient of "original text > published translation > AI translations".

Table 3. Comparison of affect word intensity

Text	Pos	Neg	Total
O-EN	423.37	-302.69	120.68
P-CN	373.70	-237.11	136.59
DS-CN	319.72	-190.51	129.21
DB-CN	317.11	-191.12	125.99

C. Affect Flow Patterns

The overall affect flow of the four texts (Fig. 1) follows the common law of "advancing with multi-peak and multi-valley fluctuations" and shows no unidirectional linear trend. It mainly fluctuates around the "moderate positive intensity" range and exhibits affect transitions at key plot nodes, reflecting the correlation between affect flow and the progression of the novel's plot. The original English text has the strongest affect tension, which aligns with the thematic contradiction of "foresight of fate and love for life". The published translation achieves affect reconciliation through "peak advancement" and "negative weakening", showing an overall "balanced positive" trend. The affect flows of the two AI translations are smoother. The former has no obvious negative valleys, while the latter only shows an extreme valley of -2.57 in Section 35 without coherence. Their peaks are concentrated in Section 18, indicating that AI can synchronously identify the "affect outburst in core plots" but lacks the affect impact of the original text.

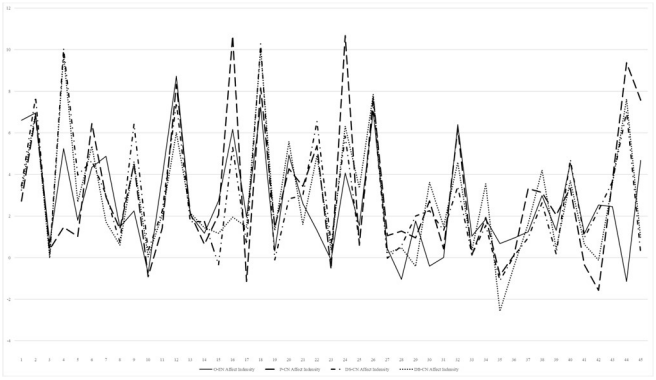

Fig. 1. Comparison of affect flow patterns.

The positive and negative affect flows of the four texts follow a "plot-driven multi-peak & multi-valley" trend. Their core peaks/valleys are synchronously concentrated in key scenarios such as "contact and exploration", "dilemma breakthrough", and "cognitive conflict", showing a degree of synchronization in trend. However, significant differences exist in affect tension and synchronization level. In the positive affect flow (Fig. 2), the original text has the most drastic fluctuations, with a large gap between peaks and the strongest affect tension. The published translation shows relatively high synchronization and ranks second in affect tension. The two AI translations have weak synchronization, gentle fluctuations, and insufficient affect tension. In the negative flow (Fig. 3), the original text also has the strongest tension, with a significant gap between valleys. The published translation maintains high synchronization but "valley elevation", resulting in weakened affect tension. The two AI translations have weak synchronization and gentle fluctuations, with no coherent strong negative intervals and insufficient tension. Overall, the characteristics are consistent with the finding in this study that "the affect intensity of translations is lower than that of the original text". The AI translations further reveal limitations in grasping affect layers.

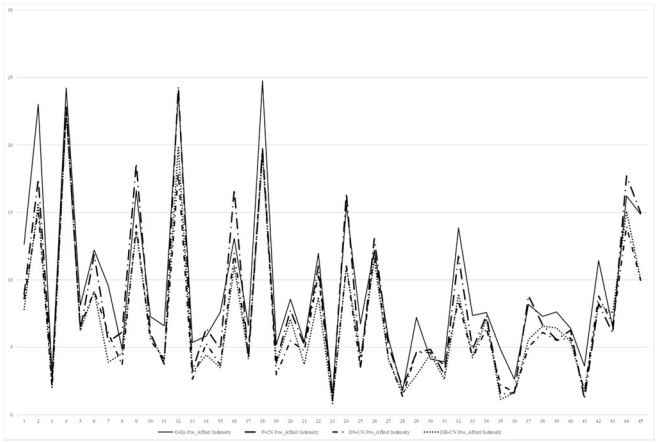

Fig. 2. Comparison of positive affect flow patterns.

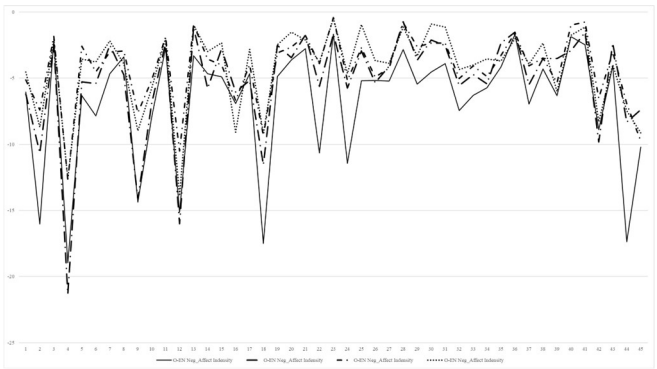

Fig. 3. Comparison of negative affect flow patterns.

D. Translation Strategy Orientations

This section focuses on 17 bilingual parallel corpus sections where the absolute values of affect intensity differences are the largest between the original English text and its three Chinese translations. Based on "Trinity Model of Translation Strategies" [14], it analyzes and explores the correlation between differential words and strategies, as well as the translation strategy orientations of the three texts.

To further identify the sections with the most significant differences in affect intensity based on the preceding descriptive analysis, this study takes the affect intensity values of the "original English text" as the benchmark. First, it calculates the difference values between the published Chinese translation, DeepSeek translation, Doubao translation, and the original English text respectively. Then, it sorts the 45 sections in descending order of the sum of absolute values of the three groups of difference values.

Using the "affect intensity of the original English text" as the benchmark, the study first calculates the affect deviation

values of the three Chinese translations. It then determines the outlier identification criteria through a method of "mean value-standard deviation-threshold value", and finally identifies the sections where affect transmission deviates significantly from the original text, providing empirical evidence for subsequent translation strategy analysis.

The deviation values of the 45 sections across the three translations are integrated into a "total deviation value dataset". After substituting the data for calculation, the average deviation degree of all deviation values is 0.52. The standard deviation is a core indicator for measuring data dispersion; the calculation shows that the dispersion degree of all deviation values around the mean value is 3.28. An outlier threshold (T) is set and the final threshold T is 4.92, which with an absolute deviation value greater than 4.92 are "sections with significant differences in affect transmission", and a total of 17 such sections exceed the threshold.

1) Correlation between affect differences and translation strategies

By analyzing the distribution of translation strategies and the variation characteristics of affect words across the 17 sections, the following correlations are derived (Table 4).

Table 4. Correlation between affect intensity difference words and translation strategies

Translation Strategy Orientation	Typical Manifestations of Words with Affect Intensity Differences
Literal Translation	1. Deviation of affect word density from the original text < 5%; 2. Absolute value of affect intensity score deviation < 0.1; 3. No part-of-speech conversion
Free Translation	1. Significant change in affect word density, with frequent addition of weak-category affect words; 2. Affect intensity mostly "weakened", especially for negative affect words; 3. Frequent part-of-speech conversion
Zero Translation	1. Increased affect word density; 2. Large fluctuation in affect intensity deviation; 3. Mostly culture-specific affect words

2) Strategy orientations of the 3 translations

Based on the strategy distribution and affect word processing characteristics of the 17 high-difference sections, and with reference to the "Trinity Translation Strategy Framework Diagram" [14], the strategy orientations of the three translations are analyzed and summarized (Table 5). For the published translation: it frequently uses the "weakening" technique; adds weak-category positive words; and combines multiple words into one. For the DeepSeek translation: it strictly retains the part of speech of the original text; performs low-frequency addition of words and occasional omissions; and shows small deviation in affect intensity but rigid collocations. For the Doubao translation, it weakens strong-category affect words without excess; achieves natural part-of-speech conversion; and ensures intensity matching of explanatory words in zero translation.

Table 5. Comparison of translation strategy orientations

Version	Strategy Orientation	Strategy Distribution in 17 Sections
P-CN	Free Translation-Domestication	3:13:1 (17.6%:76.5%:5.9%)
DS-CN	Literal Translation-Simplification	7:9:1 (41.2%:52.9%:5.9%)
DB-CN	Integration of Literal & Free Translation	5:10:2 (29.4%:58.8%:11.8%)

3) Qualitative case analysis

Three cases were randomly selected from the 17 high-difference sections. From three dimensions—"affect word processing techniques", "strategy orientation characteristics", and "affect intensity difference results"—the differences in translation strategy orientations outlined in Table 5 were verified and analyzed:

Case 1 (Family Affection Scene, Section 15)

O-EN: I can't believe that you, a grown woman taller than me and beautiful enough to make my heart ache…

P-CN: 我简直不敢相信，你，一个成熟女人，个子比我还高，美得让我心疼……

DS-CN: 我无法相信，你，一个比我高、美丽得让我心痛的成年女性……

DB-CN: 我简直不敢相信，你已经长成了一个比我还高的成年女人，漂亮得让我心疼……

The original text uses "heart ache" (strong_positive, 0.8) to convey the tender affection between mother and daughter. The published translation adopts "心疼" (strong_positive, 0.7), which aligns with Chinese affect expression habits. It adopts "free translation - communicative translation" to achieve cultural adaptation. DeepSeek incorrectly translates it as "心痛" (medium_negative, -0.4), leading to affect reversal due to literal translation. Doubao translates it as "心疼" and optimizes the collocation with "漂亮" (weak_positive). Its "integration of literal & free translation" balances affect accuracy and contextual adaptation.

Case 2 (Sci-fi Professional Scene, Section 18)

O-EN: Now is that highly neat, or what?

P-CN: 这算不算超级漂亮?

DS-CN: 现在这是高度整洁，还是什么?

DB-CN: 这是不是超棒的?

The original text uses "highly neat" (weak_positive, 0.2) to express admiration for physical principles. The published translation strengthens the affect to "超级漂亮" (medium_positive, 0.4) through addition. It adopts "free translation - instrumental translation" to convey the scientists' affect. DeepSeek literally translates it as "高度整洁" (neutral, 0), failing to recognize the implicit affect. Doubao translates it as "超棒的" (medium_positive, 0.3). Its "integration of literal & free translation" achieves affect equivalence and colloquial expression.

Case 3 (Life-and-Death Affect Scene, Section 14)

O-EN: I'm fine. I was just startled; I didn't recognize where I was for a moment.

P-CN: 只是惊了一下，一时想不起自己在什么地方.

DS-CN: 我只是吓了一跳；我一时没认出我在哪里.

DB-CN: 只是吓了一跳，一时没认出这是哪儿.

The original text uses "startled" (strong_negative, -0.6) to express fear. The published translation weakens it to "惊了一下" (weak_negative, -0.2). It adopts "free translation – domestication" to adapt to Chinese expression habits for life-and-death topics. DeepSeek literally translates it as "吓了一跳" (medium_negative, -0.4), ignoring cultural psychology. Doubao balances the affect intensity and converts "我在哪里"

to “这是哪儿”. Its “integration of literal & free translation” balances affect retention and thematic adaptation.

The analysis further validates the rationality of the comparison of translation strategy orientations among the three translations.

III. Conclusion

This study compares the English original text of *Story of Your Life* and three Chinese translations using digital humanities methods. Key conclusions are as follows: 1) The original text has the highest lexical density; Doubao prefers long sentences; DeepSeek has the best readability. 2) The original text shows “high positivity - high negativity” tension; the published translation forms a balanced structure via affect adjustment; AI translations present a flat structure with insufficient tension. 3) The published translation adopts “free translation–domestication”; DeepSeek tends to “literal translation–simplification”; Doubao uses “combining literal and free translation”. It expands DH applications in the study of literary translation. It also provides a measurable dimension for translation quality evaluation. For further study, it is expected to expand the corpus to other literary genres, or improve affect dictionary adaptability to special texts using deep learning.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

Boyi He conducted the research and wrote this paper; Prof. Yu Sun contributed a lot in academic assistance; Qionglin Liu proposed valuable ideas. All the authors had approved the final version.

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