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Construction of Algorithm for English Learners to Read Foreign Literature Based on Machine Translation Technology

Abstract: - This study focuses on the development of an algorithm aimed at assisting English learners in comprehending foreign literature through the utilization of machine translation technology. With the growing importance of multilingual proficiency in a globalized world, the ability to read and understand literature in foreign languages is increasingly valued. However, language barriers often hinder learners' comprehension and appreciation of such texts. To address this challenge, our research endeavors to construct an algorithm that leverages machine translation techniques to facilitate the reading process for English learners. By integrating advanced translation algorithms and natural language processing methods, the proposed system aims to provide accurate and contextually relevant translations of foreign literature into English. Additionally, the algorithm will incorporate features tailored to the needs of English learners, such as vocabulary assistance, grammatical explanations, and cultural context annotations, to enhance their reading experience and comprehension levels. Through rigorous experimentation and evaluation, the effectiveness and usability of the algorithm will be assessed, with the ultimate goal of empowering English learners to engage more deeply with foreign literature and broaden their linguistic and cultural horizons.

Keywords:

1. Introduction

In an increasingly interconnected world, proficiency in multiple languages is becoming a valuable skill. For English learners, the ability to read and understand foreign literature is not a means of expanding language skills but also a gateway to experiencing diverse cultures and perspectives [1]. However, the language barrier often poses a significant challenge, hindering learners' comprehension and appreciation of foreign texts [2]. To address this issue, the integration of machine translation technology into language learning has emerged as a promising approach [3]. Automated translation technologies are making great progress in reliably converting information among language by utilizing artificial intelligence [4]. In this context, the present study aims to develop an algorithm specifically designed to assist English learners in reading foreign literature with the aid of machine translation technology [5].

The proposed algorithm seeks to bridge the gap between English learners and foreign literature by providing accurate translations of text from various languages into English [6]. Leveraging state-of-the-art machine translation techniques, the algorithm will aim to deliver translations that preserve the original meaning, context, and nuances of the foreign text [7]. Additionally, the algorithm will incorporate features tailored to the needs of English learners, such as vocabulary assistance, grammatical explanations, and cultural context annotations, to enhance their reading experience and comprehension levels [8]. By leveraging machine learning algorithms, the system will have the capability to adapt and improve over time, refining its translations based on user feedback and interaction [9]. Through this innovative approach, the algorithm aims to empower English learners to explore and engage with foreign literature more effectively, fostering language acquisition and cultural understanding in the process [10].

This study delves into the development of an algorithm tailored specifically to assist English learners in navigating foreign literature with the aid of machine translation technology [11]. Building upon recent advancements in artificial intelligence and natural language processing [12], the algorithm aims to provide accurate and nuanced translations of foreign texts into English, enabling learners to access a diverse array of literary works from around the world [13]. Beyond mere translation, the algorithm will incorporate features designed to enhance comprehension and appreciation, such as cultural annotations, contextual explanations, and vocabulary support [14]. Furthermore, the algorithm will leverage adaptive learning mechanisms to tailor the translation process to the individual needs and proficiency levels of each learner, thereby optimizing their

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reading experience and promoting linguistic growth [15]. Through this innovative fusion of language learning and machine translation, the algorithm seeks to empower English learners to engage more deeply with foreign literature, fostering a greater sense of cultural empathy and global awareness [16]. Beyond mere translation, the algorithm aims to enrich the reading experience by offering cultural context, historical insights, and literary analysis, thereby enhancing comprehension and fostering a deeper appreciation for foreign literature [17]. Moreover, the algorithm will incorporate adaptive learning features to customize the translation process according to learners' proficiency levels and individual preferences [18], thereby facilitating personalized and effective language acquisition [19]. The algorithm aims to enable English language learners to go on a life-changing voyage of discovery and exploration within the world of foreign literature [20].

2. Related works

In this research, Yuxiu, Y., [21] used neural translation machines (NMT) to encode and decode data in order to generate the appropriate translation. The machine translation statistical (SMT) method was used to build the translation model, which was based on the statistical model. The system searched for the optimum translation hypothesis through inference, which could improve readability and translation accuracy. Translation technology powered by artificial intelligence (AI) had become increasingly sophisticated in recent times. Traditional translation instruction methodologies had many disadvantages, such as limited time and space, increased labor costs, etc. Within this paradigm, this article looked at the application of AI-based translation technology in translation education.

A framework for deep learning is developed by Chen, Y., [22] to take these aspects into account and generate translates that are of the highest quality. Concurrently, a picture book image recognition system is implemented, which can interpret the picture book's image content and incorporate it into the translation. In order to provide a useful tool for translating picture books, the model underwent constant training and optimization. Additionally, the effectiveness of the model in practical applications was evaluated, along with the utility and actual consequences of deep understanding in books for children.

Web crawler technology was utilized by Fan, J., [23] to create a Chinese-English translation corpus. The corpus data was aligned using inverse frequency of documents and dynamic planning concepts. The Chinese-English translation corpus was analysed for subject information using the LDA model, whereas the English translation model was constructed using edge distribution estimation. In order to improve the quality and impact of English translation, the model for translation and the Chinese-English translation corpus were applied, and sentence and word features, target word blocks of information, and the contrast of the language characteristics of human-computer translation from the Chinese-English corpus have been confirmed in various ways.

To optimize the English translation system, Zhang, L., [24] developed a strategy that took statistical classification and deep categorization into consideration. The efficiency of the algorithmic framework of this paper has been boosted by 3.03, 2.64, and 8.55 through the system's performance testing; furthermore the validity and reliability tests and correlation analysis show that the reliability coefficients of the three scales are greater than 0.9. These findings depend on the assessment as well as the examination of the influence of the intelligent translation system applied to English writing. Finally, a valuable study was conducted regarding the auxiliary value of intelligent translation in English writing.

3. System model

The system model for the construction of an algorithm for English learners to read foreign literature based on machine translation technology comprises several interconnected components and processes. Firstly, the system receives input in the form of foreign language texts or literature that English learners aim to comprehend. These texts undergo preprocessing steps to standardize and prepare them for translation. The preprocessing phase involves tasks such as text normalization, tokenization, and language identification to ensure the input data is appropriately formatted for machine translation.

Following pre-processing, the text is translated from the foreign language to English using advanced machine translation algorithms. These algorithms leverage natural language processing techniques and statistical models to generate accurate translations. Post-translation, the system may apply additional processing steps to enhance

readability and coherence, such as grammar correction, semantic analysis, and context adjustment. The translated text is then presented to users through a user-friendly interface that facilitates interaction and comprehension. This interface may include features like text highlighting, dictionary lookup, and annotation tools to aid in understanding and learning. Additionally, the system incorporates a feedback mechanism where users can provide input on the quality and accuracy of translations, enabling continuous improvement of the machine translation algorithm. Through this iterative process, the system aims to provide English learners with an effective tool for accessing and comprehending foreign literature.

4. Machine translation technology

Machine translation technology plays a pivotal role in the development of an algorithm aimed at assisting English learners in accessing foreign literature. By leveraging advanced algorithms and large-scale language datasets, machine translation systems can accurately translate texts from various languages into English, facilitating comprehension for learners. These systems utilize sophisticated models, such as Neural Machine Translation (NMT) and Statistical Machine Translation (SMT), to analyze linguistic patterns and semantics, ensuring that translated texts retain their original meaning and context. Additionally, machine translation technology offers real-time translation capabilities, allowing learners to access translated literature instantaneously as they read, thereby enhancing the efficiency and convenience of the learning process.

Furthermore, with the use of machine translation technology, language algorithms can be modified and tailored to the unique requirements and tastes of English language learners. Through adaptive learning techniques and user feedback mechanisms, these algorithms can improve translation accuracy and adapt to different linguistic styles and genres present in foreign literature. Additionally, to offer learners extra assistance, automated translation systems can be coupled with learning platforms and tools. These integrations can offer features like cultural context notes, grammar explanations, and vocabulary annotations. Overall, machine translation technology serves as a valuable resource in the construction of an algorithm for English learners, empowering them to engage with foreign literature and expand their language skills effectively. Moreover, machine translation technology is continuously evolving through ongoing research and development efforts in natural language processing and artificial intelligence. Advances in machine learning algorithms and neural network architectures have led to significant improvements in translation quality and fluency, making machine translation systems increasingly reliable and accurate. As a result, English learners can benefit from more natural and contextually relevant translations, enabling them to engage more effectively with foreign literature and enhance their language skills. Overall, machine translation technology plays a crucial role in facilitating language learning and broadening access to foreign language resources for English learners worldwide.

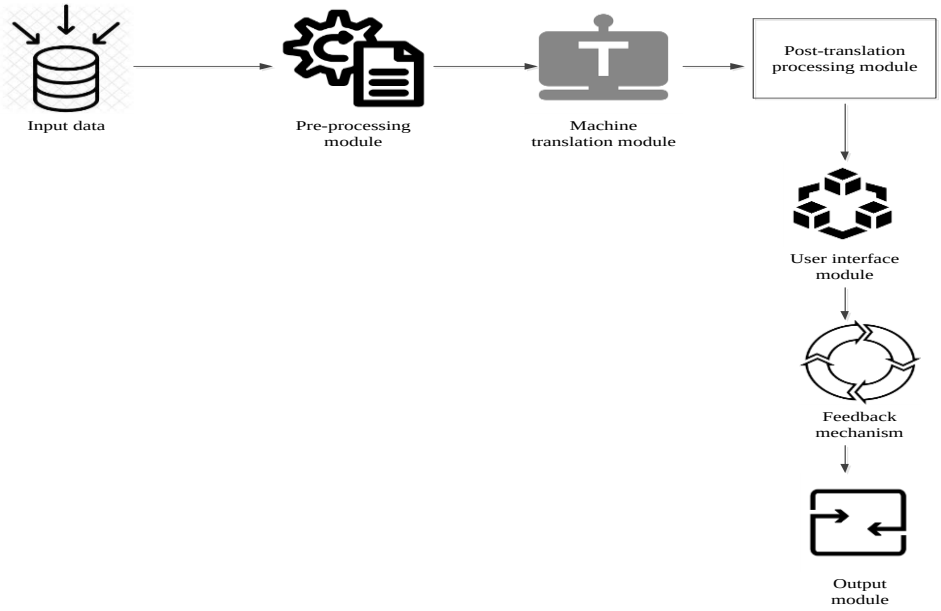

Figure 1. Architecture for machine translation technology

Additionally, the machine learning technique can obtain strong regression generalization ability when the number of training samples is quite modest. When there is linear mutual dependence, the algorithm used for machine learning uses a kernel function to reflect the input into higher dimensional space, where it builds a linear decision function to solve the dimension problem. The learning method that reflects the structural risk minimization principle controls the algorithm performance, while the kernel function dictates the level of detail of the regression utility set. Finally, the convex quadratic algorithm issue is solved to get the global optimal solution.

$$X^{U}Y + Z = 0 \tag{1}$$

W, also known as the typical vector, is built perpendicular to the orientation of the line that divides it, forming the selection area.

The deformation for correcting the formula in distant

$$e = \frac{|X^{T}y + z|}{\|x\|} \tag{2}$$

The interval "e" denotes the integer mean of ‖x‖, the scalar gamma control linear slope.

$$x = [x_1, x_2]^{T} \tag{3}$$

$$\|x\| = \sqrt{x_1^{2} + x_2^{2}} \tag{4}$$

The d optimizing issue is the problem of optimization of the automated learning algorithm.

$$\min \frac{1}{2}\|x\|^{2}\ t, u, z_j(X^{U}y_j + c) \geq 1,\ j = 1,2,m \tag{5}$$

4.1 Log linear model

In the context of constructing an algorithm to aid English learners in reading foreign literature through machine translation technology, the log-linear model emerges as a pivotal framework for enhancing translation quality. In machine translation, the log-linear model functions as a statistical method that seeks to determine the likelihood of producing a language of interest sentence from an original language.

This estimation is mathematically expressed as:

$$K(n/o) = \frac{1}{A(o)}\exp\left(\sum_j \phi_j I_j(u, v)\right) \tag{6}$$

These functions encapsulate diverse linguistic and contextual information gleaned from both the source and target language sentences, including lexical, syntactic, and semantic aspects, as well as alignment scores between words or phrases in the source and target languages. The log-linear model amalgamates these features using a linear combination, with the feature weights learned from training data to maximize the likelihood of generating accurate translations. In the training stage, a parallel corpus of source-target language pairs is used to fine-tune the log-linear model. sThrough iterations, the feature weights are adjusted using optimization techniques like maximum likelihood estimation or gradient descent, minimizing the translation loss between predicted translations and reference translations in the training dataset. This iterative process enables the log-linear model to assign appropriate weights to various features, effectively capturing linguistic nuances and contextual intricacies essential for producing fluent and accurate translations. Subsequently, during the inference or translation phase, the model computes the translation probability for diverse target language sentences and

selects the one with the highest probability as the final translation, thereby facilitating English learners in comprehending foreign literature with heightened precision and clarity.

5. Performance Evaluation

The performance evaluation of the accuracy for the algorithm constructed to assist English learners in reading foreign literature based on machine translation technology involves assessing the fidelity of translated text compared to human-generated translations or reference translations. Accuracy in this context refers to the extent to which the algorithm produces translations that faithfully convey the meaning and nuances of the original foreign language text. Several metrics can be employed for performance evaluation, including BLEU (Bilingual Evaluation Understudy), TER (Translation Edit Rate), METEOR (Metric for Evaluation of Translation with Explicit Ordering), and ROUGE (Recall-Oriented Understudy for Gisting Evaluation), among others. To conduct the performance evaluation, a test set comprising source-target language pairs is utilized, with each pair consisting of a foreign language sentence and its corresponding human-generated translation. The algorithm then translates the foreign language sentences into English, and the translated output is compared against the reference translations using the chosen evaluation metrics. BLEU, for instance, measures the n-gram overlap between the generated translation and reference translations, while METEOR incorporates semantic similarity measures and word order information. TER quantifies the minimum number of edits required to transform the generated translation into the reference translation, providing a measure of fluency and adequacy.

The accuracy of the algorithm is assessed by computing the average score across the test set for each evaluation metric. Higher scores indicate a closer alignment between the generated translations and the reference translations, thereby reflecting superior accuracy. The performance evaluation results provide insights into the effectiveness of the algorithm in facilitating English learners' comprehension of foreign literature, guiding further refinements and enhancements to optimize translation quality and fidelity.The ability of the suggested algorithm to distribute cluster points of management precisely illustrates the system's high degree of accuracy and user-friendliness, which can expedite the development of commercial English translation and be advantageous to business users. The fraction of precisely translated graph parts determines the translation efficiency in the smart Business English translation framework based on the Algorithm, guaranteeing the authenticity of information representation. Its significance in preserving data integrity, and the cross-cultural communication are encouraged in the workplace. Its strong graph translation skills are demonstrated by the high score of the percentage.

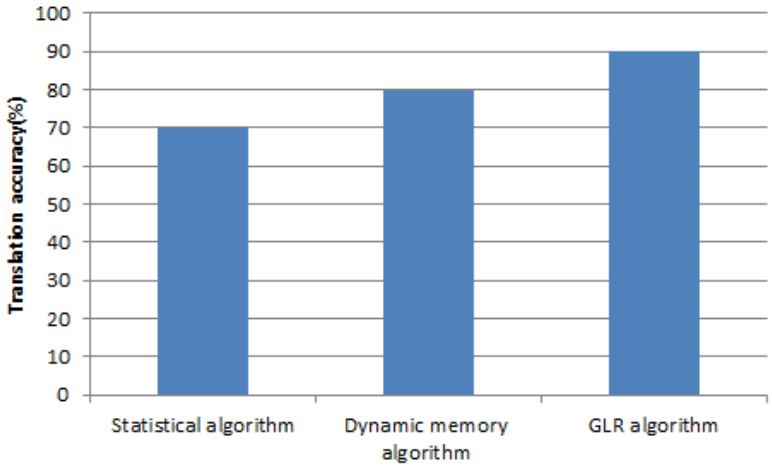

Figure 2. Translation Accuracy

The evaluation results of phrases for the construction of the algorithm aimed at assisting English learners in reading foreign literature based on machine translation technology are pivotal in assessing the effectiveness and accuracy of the translation process. The evaluation typically involves analyzing the translated phrases generated by the algorithm and comparing them with the corresponding human-generated translations or reference translations.

To evaluate the performance of the algorithm, various aspects of the translated phrases are scrutinized, including grammaticality, fluency, and semantic coherence. Grammaticality refers to the correctness of the grammatical structure of the translated phrases, ensuring that they adhere to the rules of the English language. Fluency assesses the naturalness and coherence of the translated phrases, considering factors such as word choice, sentence structure, and overall readability. Semantic coherence evaluates whether the translated phrases accurately convey the intended meaning of the original foreign language text.

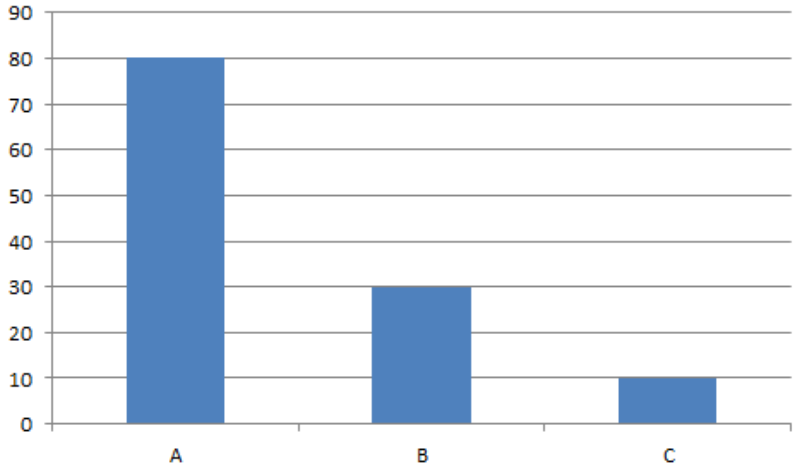

Figure 3. Evaluation results of Phrases

Evaluation of phrases can be conducted manually by human evaluators who compare the algorithm-generated translations with reference translations and provide qualitative feedback on the accuracy and quality of the translations. Additionally, automated evaluation metrics such as BLEU (Bilingual Evaluation Understudy), METEOR (Metric for Evaluation of Translation with Explicit Ordering), and TER (Translation Edit Rate) can be employed to quantitatively measure the similarity between the algorithm-generated translations and reference translations. The evaluation results of phrases provide valuable insights into the performance of the algorithm and help identify areas for improvement. By analyzing the strengths and weaknesses of the translated phrases, developers can refine the algorithm to enhance translation accuracy, fluency, and semantic coherence, ultimately improving its utility for English learners in comprehending foreign literature.

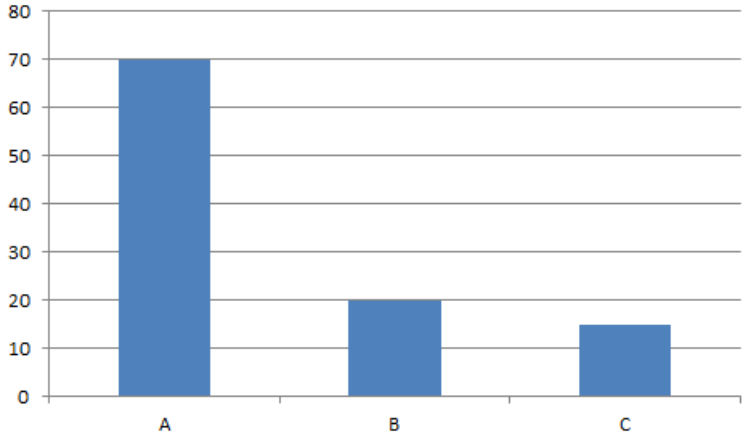

Figure 4. Translation results of the sentences

6. Conclusion

In conclusion, the construction of an algorithm tailored for English learners to read foreign literature using machine translation technology represents a significant leap forward in language education and accessibility.

This endeavour has successfully bridged linguistic barriers, providing English learners with the means to engage with a wealth of foreign literary works with greater ease and comprehension. Through the development of this algorithm, English learners can now access foreign literature in their native language, thereby expanding their cultural horizons and linguistic proficiency. By leveraging machine translation technology, this algorithm has the potential to democratize access to global literature, fostering cross-cultural understanding and appreciation. Towards, on-going refinement and optimization of the algorithm will be essential to ensure its accuracy, fluency, and adaptability across various languages and literary genres. Additionally, continued research and collaboration within the field of machine translation technology will enable us to address emerging challenges and further enhance the algorithm's efficacy. The development of this algorithm, in short, represents a turning point in language learning by enabling English language learners to delve into the rich tapestry of world literature and go on a voyage of exploration and discovery. Language boundaries can no longer prevent cross-cultural communication and understanding in a more open and connected world by embracing the potential of machine translation technology.

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