

## *Retraction*

# **Retracted: Implementation of Language Appropriateness in Intercultural Communication Based on Distributed Control System**

### **Security and Communication Networks**

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This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

### **References**

- [1] L. Liu, D. Xue, Y. Zhang, and X. Huo, "Implementation of Language Appropriateness in Intercultural Communication Based on Distributed Control System," *Security and Communication Networks*, vol. 2022, Article ID 4577411, 11 pages, 2022.

## Research Article

# Implementation of Language Appropriateness in Intercultural Communication Based on Distributed Control System

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In recent years, with the increasingly close international communication, the importance of intercultural communication language has become more and more important. Proficiently mastering the appropriateness of intercultural communication language is an important part of national etiquette, which can represent the self-cultivation of a country. However, in reality, many students cannot master language appropriateness very well. Therefore, it is necessary to retrieve and classify intercultural communication languages based on distributed control systems, so as to improve language appropriateness and national comprehensive strength. This study proposed a language processing method based on distributed computing, which solved the problems of a large amount of computation and low accuracy in traditional language processing methods and simply designed a distributed control system, which could process language for intercultural communication. The results of this study showed that the language appropriateness score of the respondents was 53 points before the system developed in this study was used. After using the system developed in this study to retrieve and correct the language errors, the language appropriateness score of the respondents was 95 points, which was 42 points higher and also showed that the system developed in this study could effectively improve Language appropriateness.

## 1. Introduction

Cross-cultural communication is a characteristic of the era of global integration, and it is necessary to study the differences in value orientation and thinking mode formed by different cultural backgrounds. Due to the lack of understanding of cultural differences, the phenomenon of inappropriate communication caused by international students in the actual cross-cultural communication process is relatively common, and the adverse effects caused by communication errors are often more serious than grammatical errors. The inability to understand the language will affect the emotional attitude of both parties, resulting in the negation of cross-cultural communication activities by both parties. Therefore, in the process of cross-cultural communication of international students, language appropriateness is particularly important. In cross-cultural communication, appropriateness must be observed,

otherwise, the ideal communication effect may not be obtained and then the communication failed. So far, there are more than 2000 languages in the world. Although great progress has been made in multilingual information processing including machine translation and other technologies, many fundamental problems are faced with regard to multilingual information processing and cross-lingual communication.

Due to the lack of required corpus resources and labeled data, direct data processing cannot be performed. The construction of large annotated corpus resources for machine translation is one way and requires a large source of time and cost. Therefore, people propose to build a richer language distributed control system through resources, and the idea has been applied in many aspects. The distributed control system can effectively process a large amount of data at the same time and run fast, which improves work efficiency and this is also the innovation of this study. The

innovation of this study is also to design a simple distributed control system to solve the problem of low appropriateness of cross-cultural communication language. It is proved by experiments that the system designed in this study is effective.

## 2. Related Works

With the development of the country's comprehensive strength, the cross-cultural communication has become more and more, and the importance of language is highlighted at this time. Shahri examined international relations for intercultural communication. He found that the more appropriate the language is, the more popular people and countries are. Language was also an art and effective communication could effectively express one's emotions and opinions [1]. Hasler B S found that language behavior plays a crucial role in human communication, and language barriers often lead to misunderstandings among people from different cultural backgrounds. Although translation systems could be used for verbal communication, translators for nonverbal communication did not yet exist, and the application of gesture translators was a means of resolving and preventing conflicts [2]. Getta outlined the role of interpretation services and mainly introduced his experience as a freelance translator. Although most people accepted English as a necessary medium for cross-cultural communication, each country hoped that its own national language is an important part. Especially in the context of globalization, cross-cultural communication had become particularly important [3]. Qian found that the cultivation of intercultural competence has become more and more important in the current reform of the college English curriculum. Based on the data collected from the evaluation of English courses for nonlanguage majors, combined with surveys and interviews, he explored the key factors affecting students' intercultural competence in English courses, so as to promote the effective teaching of intercultural competence [4]. Merkish discussed cultural and linguistic context modeling issues for intercultural communication specialists. The premise of intercultural communication was that the interlocutor has the necessary information about cultural details in terms of mentality and value system. The simulated environment contained the necessary amount of information, the absorption of which helped international experts to succeed in cross-cultural communication [5]. The research of the above scholars all expounded the importance of the language of intercultural communication, they believed that the language of intercultural communication represented the comprehensive strength of the country. Their views are very good and have practical significance, but there is no specific case or data to support their views.

With the development of computer science and technology, the Internet has had a huge impact on people's lives, and at the same time, the network has produced a large amount of data. The distributed system can process a large amount of data at the same time and improve work efficiency. Ren et al. designed a robust adaptive sliding mode controller for the distributed control system of aero-engine

with parameter disturbance and external disturbance. The controller proposed by him can effectively reduce the influence of external disturbance on the dynamic performance of the system, and the sliding mode motion of the system presented ideal performance [6]. Zhang et al. proposed an output feedback fault-tolerant control strategy for the problem of distributed control system error when the actuator local fault occurred, and established a closed-loop system based on a dynamic output feedback controller. When the actuator decay fault occurred, the system had good fault-tolerant performance [7]. Cui et al. proposed a new distributed computing method, the results of which could be used to guide the development of newly developed software. The method proposed by him has better operability and verifiability and could be used as a technical guide for the criticality analysis of the digital control system software of nuclear power plants [8]. Wang et al. found that in many practical applications, it is necessary to process massive data sets through complex networks, in which most nodes have limited computing power, and designing efficient distributed algorithms were crucial for processing data. He proposed a distributed least squares reconstruction algorithm, which has advantages in tracking slow time-varying graph signals [9]. Scholars analyzed the distributed control system in detail, and they believed that the distributed control system can handle massive data and work more efficiently. Although their studies have experimental results, they lack experimental steps.

## 3. Distributed Control System Based on Distributed Computing

*3.1. Language Processing Methods Based on Distributed Computing.* Distributed computing decomposes the application into many small parts and distributes them to multiple computers for processing, which can save the overall computation time. Traditional natural language processing methods use a distribution of words to represent a word. Distributed representation is a high-density, low-dimensional vector representation. A typical distributed representation has hundreds of order of magnitude vector dimensions, each of which is a real number [10]. Distributed representation embeds word semantics into a low-dimensional vector space, so the distributed representation of words is also called word embedding, which is:

$$P(w_1, w_2, \dots, w_m). \quad (1)$$

The Markov model is a statistical model that is widely used in speech recognition, automatic part-of-speech tagging, phonetic-to-word conversion, probabilistic grammar, and other natural language processing applications. If the target is directly modeled, the error will become larger because the data are too sparse. Therefore, it is necessary to use a Markov model such as:

$$P(w_i|w_1, \dots, w_{i-1}) = P(w_i|w_{i-(n-1)}, \dots, w_{i-1}). \quad (2)$$

Some scholars have proposed a complete and clear method, that is, using a feedforward neural network to train

a language model and obtain word vectors at the same time [11]. This is the first way to train word vectors using a language model. This model is simply called NNLM. NNLM is a method of modeling using feedforward neural networks, as shown in Figure 1:

As shown in Figure 1: NNLM starts from the language model (that is, from the perspective of computing probability) and builds a neural network to optimize the model for the objective function. NNLM first randomly initializes the word embedding matrix and then multiplies the vector by the vector matrix. This is the same as performing a find operation to retrieve a word. The embedding corresponding to each of the above vectors will be used as the input layer. The word vector for each context obtained after the lookup operation is added to form the hidden layer vector [12].

The embedding layer, to a certain extent, is used for dimensionality reduction, and the principle of dimensionality reduction is matrix multiplication. After the embedding layer, the output is the word vector splicing result of each word, such as:

$$a = [e(w_{i-(n-1)}), \dots, e(w_{i-1})]. \quad (3)$$

After linear mapping and hyperbolic tangent activation function, equations (4) and (5) are obtained:

$$h = \tanh(b^{(1)} + Ha). \quad (4)$$

$$y = b^{(2)} + Wa + Uh. \quad (5)$$

Here,  $H$  and  $W$  are weight matrices. The vector dimension of the output layer is  $|V|$ , which is the size of the vocabulary. The second item of the output layer above represents the prototype of the remaining connections of the current neural network. The output layer is normalized by softmax operation as shown in

$$p(w_i | w_{i-(n-1)}) = \frac{\exp(b(w_i))}{\sum_j \exp(b(w_j))}. \quad (6)$$

The loss function of the model adopts the cross entropy loss function. For the entire corpus, the (7) must be optimized:

$$-\sum_{i \in D} \log P(w_i | w_{n-i+1}, \dots, w_{n-i}) \quad (7)$$

A separate multiplication operation can be performed on the matrix, followed by accumulation and summation to obtain the result of the mapping layer. It can be mathematically expressed as (8):

$$a_c = \sum_{i \in (a \ d_j(c))} e(w_i). \quad (8)$$

The output layer corresponds to the fully connected neural network computation and softmax normalized probability computation. It can be mathematically expressed as:

$$b_c = wa_c + y. \quad (9)$$

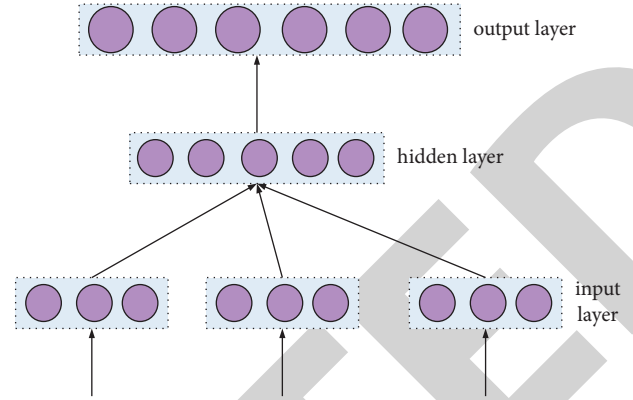


FIGURE 1: NNLM model.

**3.2. Bilinear Method Based on Distributed Computing.** Word2vec is a group of related models used to generate word vectors. These models are shallow, two-layer neural networks that are trained to reconstruct linguistic word texts. The word vectors of some synonyms in English and Spanish trained by word2vec are reduced in dimension. After visualization, it can be observed that the geometric properties of the corresponding two sets of words in the two languages are similar to each other [13].

Let  $A$  and  $Z$  denote the given word vector matrix of two languages, the  $i$  row of the  $A$  matrix and the  $i$  row of  $Z$  matrix are the word vectors represented by the  $i$  pair of synonyms in the bilingual seed dictionary [14]. The goal is to solve a linear transformation matrix  $W$  so that the matrix better fits  $Z$ , and this process is formalized as minimizing the sum of the Euclidean distances of the corresponding rows of the two matrices, in the form of:

$$\arg \min Z = \sum_i \|A_i \cdot W - Z_i\|^2. \quad (10)$$

Sometimes in order to compare the error between the real matrix and the estimated matrix value or compare the similarity between the real matrix and the estimated matrix, the Frobenius norm can be used. Equation (10) is equivalent to minimizing the Frobenius norm of the difference between two matrices as in:

$$\arg \min A = \sum_i \|AW - Z_i\|^2. \quad (11)$$

During the above linear transformation process, the semantic invariance of monolingual needs to be preserved to avoid performance degradation in monolingual tasks. This can be solved by constraining  $W$  to be a unit orthogonal matrix [15], as shown in Figure 2

As shown in Figure 2, Orthogonal matrices are special matrices of real numbers, so they always belong to normal matrices. Normalizing the lengths of word vectors in the two languages to unit length can ensure that all row vectors in the word vector matrix contribute the same to the training of the transformation matrix [16]. Due to the constraint that the transformation matrix is a unit orthogonal matrix, the above



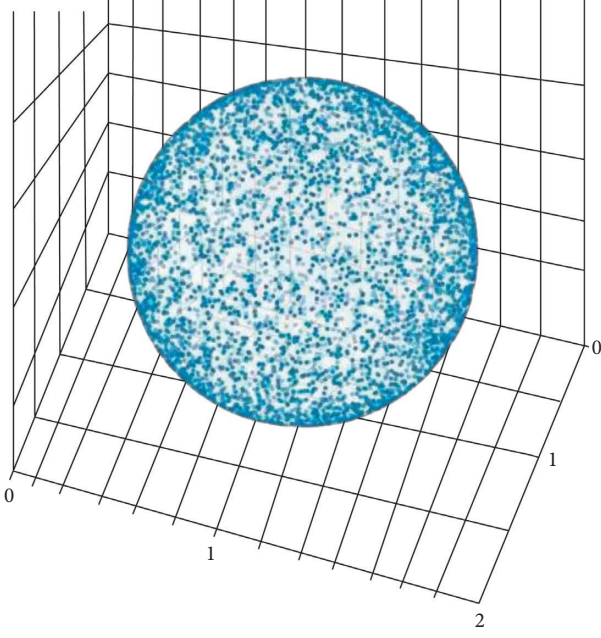


FIGURE 2: After the word vector is orthogonally unitized, it is distributed on a sphere.

matrix is equivalent to the sum of the maximum cosine similarity, expressed in:

$$\arg \min \sum_i \left\| \frac{A_{i^*}}{\|A_{i^*}\|} W - \frac{Z_{i^*}}{\|Z_{i^*}\|} \right\| = \arg \max \sum_i (A_{i^*} W, Z_{i^*}). \quad (12)$$

In mathematics, the Euclidean distance or Euclidean metric is the “ordinary” (straight line) distance between two points in Euclidean space. After unitization, all word vectors are located on the unit ball. At this time, the Euclidean distance is equivalent to the included angle. The farther the distance, the smaller the cosine similarity of the word vector. The text feature is constructed using the average perceptron to train the classifier, and the same method is used to construct the feature in the test, and the trained classifier is tested [17].

Let  $S'$  and  $T'$  be the subsets represented by  $S$  and  $T$  respectively, and any word in  $S'$  is corresponding to the word from in  $T'$ . Let  $a$  and  $b$  be the word vectors of the two corresponding words in  $S'$  and  $T'$  respectively, and  $v$  and  $w$  are the two mapping directions respectively. In this way, the scalars after the mapping are (13) and (14), respectively:

$$a' = av. \quad (13)$$

$$b' = bw. \quad (14)$$

Since  $a$  and  $b$  can change with the change of words, they can be regarded as random vectors, so  $a'$  and  $b'$  after projection can also be regarded as random numbers [18, 19], so the correlation coefficient of the two variables after projection can be written as:

$$p(a', b') = \frac{E[a'b']}{\sqrt{E[a'^2]E[b'^2]}} \quad (15)$$

Maximize  $p$  for a given  $S'$  and  $T'$ , outputting two projection vectors  $v$  and  $w$ :

$$v, w = CCA(a, b) = \arg \max p(av, bw). \quad (16)$$

The projection matrix is responsible for adding perspective to the scene. Performing the whole process can obtain pairs of projection directions, which form a pair of projection matrices. The entire vocabulary  $S$  and  $T$  matrices of the two languages can be mapped respectively with this pair of projection matrices [20, 21], and the equations are (17) and (18):

$$V, W = CCA(S', T'). \quad (17)$$

$$S^* = SV, T^* = TW. \quad (18)$$

Among them,  $V$  and  $W$  are the matrices composed of projection vectors. In order to maintain some properties after the mapping, the word vector matrix on the projected common language space is orthogonally transformed to obtain the final cross-language word vector matrix. Features are constructed. Text classifiers are trained and tested.

## 4. Design and Implementation of Distributed Control System

**4.1. System Requirements.** In order to allow users to use the system designed in this study more safely and reliably, various indicators will be constrained when the system is running, because the system needs to process text data under a large amount of data at the same time, and it needs to ensure efficiency. Therefore, the system requirements analysis mainly includes the following performance requirements:

- (1) The amount of data is processed concurrently. The system in this study mainly classifies the text data under a large amount of data automatically, which should meet the parallel processing requirements under a large amount of data. Since the maximum upper limit of the text that needs to be classified in an enterprise is generally less than 30,000, in order to ensure that the system can classify the text, it is required that the system can process no less than 50,000 text data concurrently.
- (2) Response time. The system in this study realizes automatic text categorization through the interaction between the front-end page and the back-end cluster. In order to ensure the service quality of the system and improve user satisfaction, the maximum response time of the system should not exceed 5 seconds, and the average response time of the system should be less than 2 seconds.
- (3) Extensibility. In order to ensure that the system can achieve load balancing, when the amount of data

increases, the system can realize distributed operation under a cluster composed of multiple machines by adding servers. And within a reasonable range, the operating efficiency of the system continues to improve with the increase in the number of cluster nodes.

Based on the excellent retrieval and indexing performance, the system in this study builds a distributed full-text retrieval system. There are two main design schemes of distributed retrieval system. The first is to classify the source data and distribute it to each sub-retrieval machine according to the type, and each sub-retrieval machine establishes and maintains the index of different types of data; the second system is that each sub-retrieval machine processes the query in parallel, and the returned results are processed comprehensively on the central machine and then returned to the user. Compared with the first scheme, the second scheme can take advantage of the parallel processing of the distributed system, reduce the time overhead, and improve the system performance significantly. The system designed in this study adopts the second scheme. The system structure is shown in Figure 3.

As shown in Figure 3: The main task of the central machine is to accept the retrieval request from the user and forward it to the sub-retrieval machine in the system. After the sub-retrieval machine processes the query request, the retrieval result—mainly the ID, index position, and BM25 correlation score of the document is sent back to the central machine. After sorting the retrieved data according to the relevance, the final result is returned to the front-end web interface through the JSON data format for users to browse. The function of the retrieval machine is to quickly check out the documents in the index database according to the user’s query and perform the document and query.

SpringMVC is a module of the spring framework, spring and SpringMVC do not need intermediate integration layer integration. The system in this study combines the SpringMVC framework and separates the front page and the back-end business logic through layered design, thereby reducing the coupling of each module between the systems. The system in this study is mainly divided into four layers, namely the presentation layer, control layer, business logic layer, and storage layer. The overall architecture of the system is shown in Figure 4:

As shown in Figure 4, B/S model generally refers to the B/S structure. B/S structure is a network structure model after the rise of WEB. WEB browser is the main application software of the client. The system adopts B/S mode, and the system adopts Flask + nginx + data module as the technical framework. The interface is designed with a bootstrap style. The system has a clear structure and uses data modules to process related indexes and index information. The business layer uses the Flask framework for processing, and the static file request or download is responded to through nginx to ensure the efficiency of the business logic.

4.2. *Text Preprocessing Module.* The text preprocessing module converts the uploaded unstructured data into structured data. After preprocessing the target text set, users

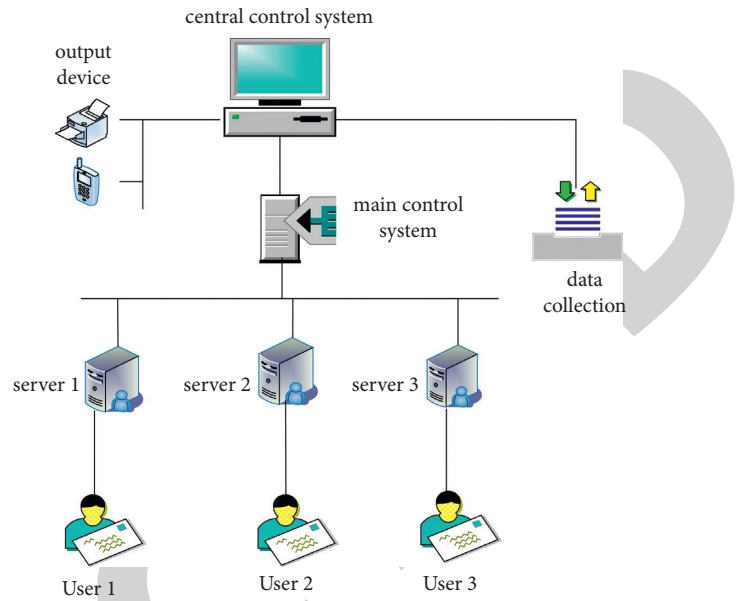


FIGURE 3: System network structure diagram.

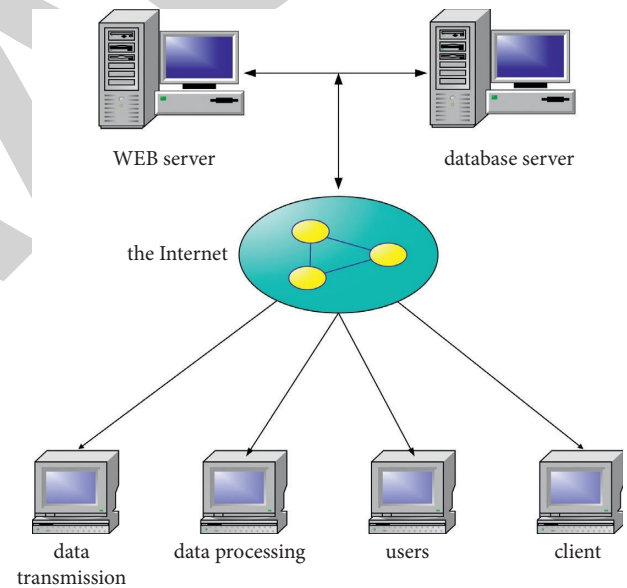


FIGURE 4: Overall system architecture diagram.

can view the category feature words in different texts, and the general content of the text can be grasped as a whole. The structured data after text preprocessing will be used as the input data for text clustering analysis. The text preprocessing module is shown in Figure 5:

As shown in Figure 5, text preprocessing mainly includes four sub-use cases, including word segmentation, feature word filtering, feature extraction, and vector establishment. These sub-use cases are carried out in sequence, and the execution process of each use case is similar. That is, corresponding requests are sent from the foreground page to the background, and then the background cluster performs corresponding business processing. After implementing the operations of word segmentation, word filtering, feature

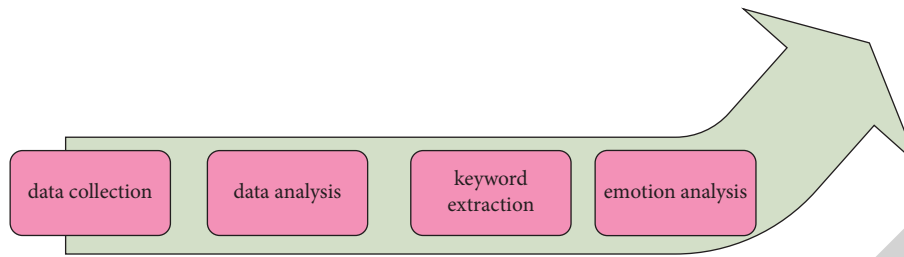


FIGURE 5: Text preprocessing module.

extraction, and establishment of vectors on the text data, users can view the category feature words. The use case of category feature word viewing is mainly to display the representative words extracted from each text to the user after the text is preprocessed. By viewing the category feature words, users can roughly understand the main content of the text.

## 5. Experiment of Language Appropriateness Based on Distributed Control System

*5.1. Survey on the Appropriateness of Intercultural Communication among International Students.* The main purpose of this survey is to investigate the appropriateness of language among international students in cross-cultural communication. The appropriateness of language includes not only the mastery of grammar knowledge but also the cultural factors in communication. This study investigates and analyzes 130 international students studying in China. Their basic information is shown in Table 1

As shown in Table 1, among the 130 international students who came to China, the male and female ratios were 51.5% and 48.5% respectively. There are 36 people aged 15–18, accounting for 27.7%, 45 people aged 18–21, accounting for 34.6%, and 49 people aged 21–24, accounting for a percentage was 37.7%. It can be seen that other countries attach great importance to cultivating international students from an early age. In terms of the length of stay in China, there are 39 people who stayed in China for less than 6 months, accounting for 30.0%, 50 people who stayed between 6 months and 1 year, accounting for 38.5%, and 41 people who stayed for more than one year, accounting for 31.5%. Overall, there are still many countries that like Chinese culture.

Intercultural communicative competence has a significant relationship with language appropriateness. In order to investigate the relationship between international students' time in China and intercultural communicative competence, this study invited 6 experts to rate the communicative competence of the respondents, as shown in Figure 6.

As shown in Figure 6, the cross-cultural communication ability of international students is generally positively correlated with the time in China. That is to say, the longer the time in China, the higher the level of cross-cultural communication. According to the survey, international students with high scores stayed in China for more than a year and a half, while those with low scores stayed in China for about a

year. Compared with other students, the scores of international students in China are lower in 5 months of communicative competence. And the education level and intercultural communication ability are also proportional. It is generally believed that cross-cultural communication activities will be affected by the cultural background of the two aspects of communication. The closeness of the mother tongue culture and the target language culture will have a positive effect and promote the smooth progress of communication. In order to properly communicate across cultures, international students need to actively integrate into the local culture and strengthen communication practices.

In order to investigate the students' awareness of language appropriateness and whether they think it is important to master language appropriateness, this study conducts a survey and analysis of them, as shown in Table 2:

As shown in Table 2, among the 130 students, 42 students think that language appropriateness is very important, accounting for 32.3%, and 38 students, accounting for 29.2%, think language appropriateness is important. There are 25 people who think sexuality is generally important, accounting for 19.2%, 15 people who think language appropriateness is not important, accounting for 11.5%, and 10 people who think language appropriateness is very unimportant, accounting for 7.8%. It can be seen that most students still think that language appropriateness is important, and a small number of people think that language appropriateness is not important.

*5.2. System Concurrent Access Capability Test.* In order to ensure the reliability and stability of the system, this study will test the performance of the system through the system response time and the number of concurrent users. As an open source project, JMeter has a graphical user interface, which is easy to learn and operate, and has good expansibility, so the system designed in this study will use JMeter to test the system's concurrent access capability.

The method of stress testing the system is: JMeter is used to simulate different numbers of concurrent users sending requests to add text and save to the system. Because the system is mainly used for subject extraction and classification analysis of language and text data. In the actual application process, it is rare that the number of concurrent users using cross-cultural languages exceeds 500. Therefore, the system designed in this study defines a maximum of 350 virtual users, which fully meets the daily

TABLE 1: Basic information of 130 international students in China.

Object	Index	Number of people	Percentage (%)
Gender	Male	67	51.5
	Female	63	48.5
Age	15–18	36	27.7
	18–21	45	34.6
	21–24	49	37.7
Time in China	Less than six months	39	30.0
	Six months to one year	50	38.5
	More than a year	41	31.5

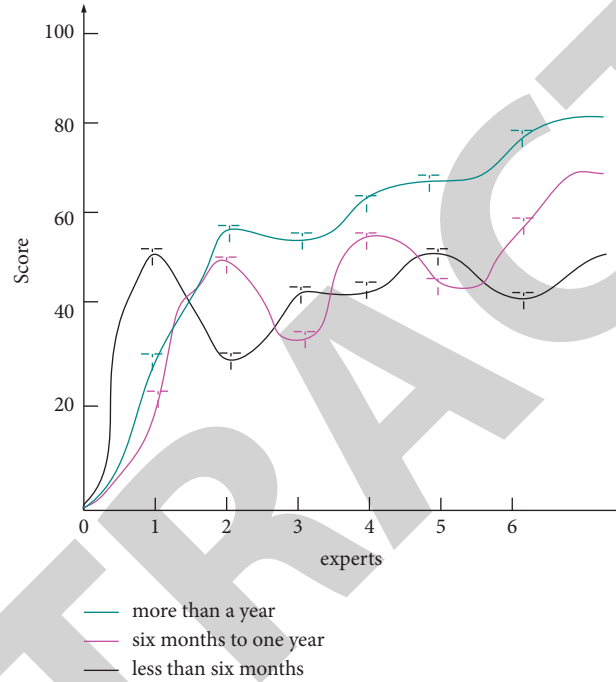


FIGURE 6: The score of communicative competence of 130 international students studying in China.

TABLE 2: Awareness of language appropriateness.

Importance	Number of people	Percentage (%)	Effective percentage (%)
Very important	42	32.3	32.3
Important	38	29.2	29.2
Generally	25	19.2	19.2
Unimportant	15	11.5	11.5
Very unimportant	10	7.8	7.8

needs of cross-cultural languages. The results of performance testing on the system conducted by JMeter are shown in Tables 3 and 4:

As shown in Tables 3 and 4, the error rate of concurrent access to the system within 350 users is 0, indicating that the work efficiency and correct rate of the distributed control system designed in this study are extremely high, and there are almost no errors.

In order to investigate the user's experience satisfaction with the system, this study conducts a survey on 100 users, as shown in Figure 7.

As shown in Figure 7, when the system response time is within 2 s, the user experience is very good. When the

response time exceeds 4 seconds, the user experience is average.

### 5.3. Cross-Cultural Language Classification Performance Test.

The parallel corpus used in the system designed in this study is the parallel corpus of 500,000 pairs from Europarl, and the language pairs are English–German language pairs. The labeled text classification dataset consists of the English–German text classification corpus of the RCV1 dataset. The tasks processed by the system are all cross-language text classification tasks, which are single-label classification and multi-label classification. Furthermore, the system designed



TABLE 3: System concurrent access capability test within 100 users.

Number of virtual users	90% response time (ms)	Maximum response time (ms)	Error rate (%)
20	32	43	0.00
40	55	98	0.00
60	86	124	0.00
80	121	156	0.00
100	155	202	0.00

TABLE 4: Concurrent access capability test of more than 100 user systems.

Number of virtual users	90% response time (ms)	Maximum response time (ms)	Error rate (%)
150	167	223	0.00
200	243	278	0.00
250	276	352	0.00
300	325	467	0.00
350	399	499	0.00

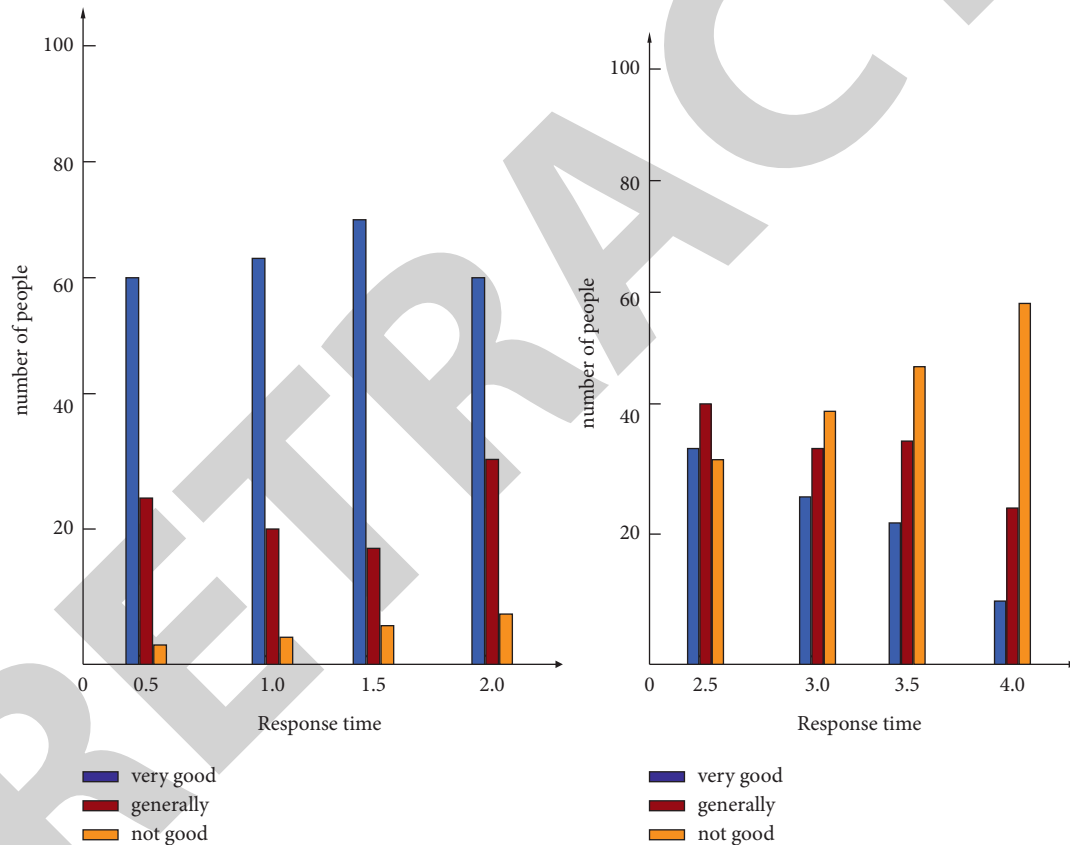


FIGURE 7: User experience satisfaction with the system.

in this study is experimented on another monolingual text classification dataset. Compared with the performance of multiple text classification models with the system designed in this study, the sentence encoder proposed in this chapter is applied to text classification tasks, as shown in Figure 8:

As shown in Figure 8, in order to verify the model of the system designed in this study, the system designed in this study has done the language pairs of English to German and German to English. Because the two languages are quite

different, the ability of the system designed in this study to capture the nonlinear relationship of language pairs can be tested. It can be seen from the experimental results that the model in this chapter also has good performance on the TED task, especially in the language pair German and English. Since the model of the system designed in this study is not based on the assumption of linear mapping, it has better performance for such language pairs with large differences in non-same language families.

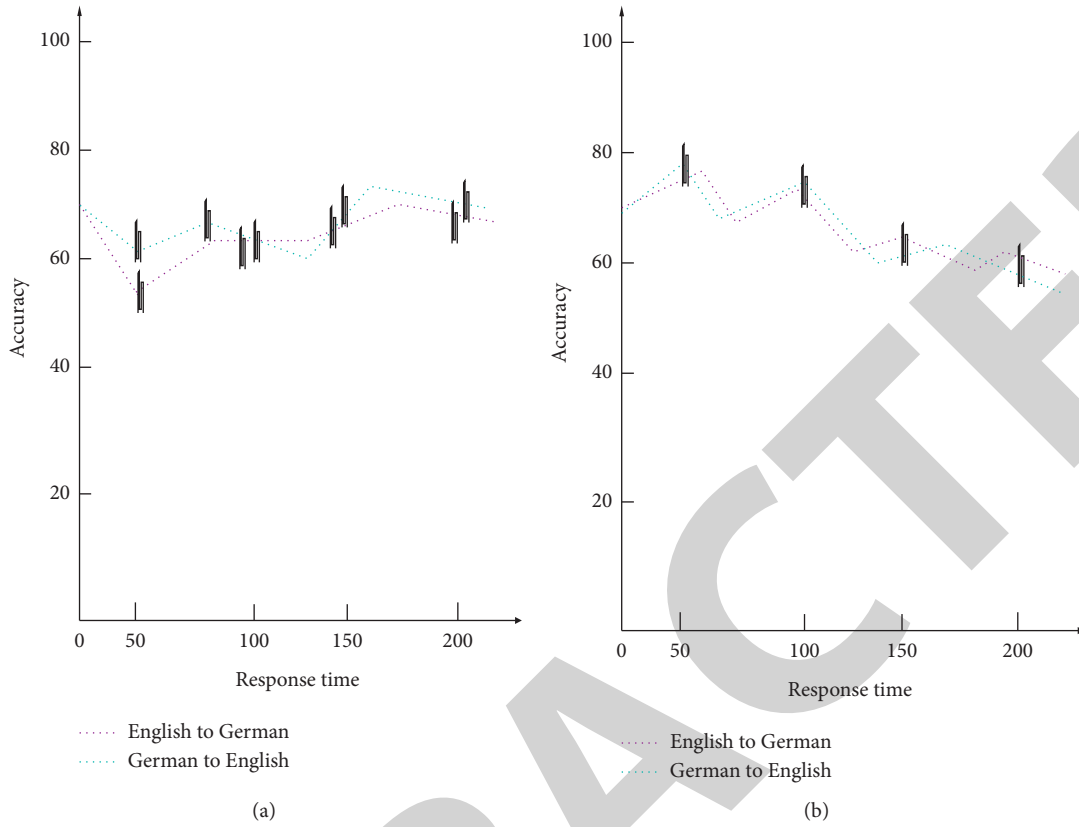


FIGURE 8: Comparison of cross-cultural language classification performance with different sentence lengths: (a) single label and (b) multilabel.

5.4. Test of the System’s Influence on the Appropriateness of Intercultural Language Communication. From the previous survey, it can be seen that most students think that language appropriateness is important in cross-cultural communication, so whether they can master language communication appropriateness well. This study also makes a general analysis of whether these international students can master the degree of communicative appropriateness, as shown in Table 5

TABLE 5: The degree to which 130 international students have mastered the appropriateness of language communication.

Mastery	Number of people	Percentage (%)	Effective percentage (%)
Very good	29	22.3	22.3
Good	20	15.4	15.4
Generally	15	11.5	11.5
Poor	36	27.7	27.7
Very poor	30	23.1	23.1

As shown in Table 5, among the 130 international students, 29 people have a very good grasp of language decency, accounting for 22.3%; and 20 people have a good grasp of language decency, accounting for 15.4%; and 15 people have an average grasp of language decency, accounting for 11.5%; and 66 people have a poor grasp of language decency, accounting for 50.8%. It can be seen that most international students do not have a good grasp of language communicative appropriateness, so there is an urgent need for a solution.

The main reason for the miscommunication in China’s cross-cultural communication lies in the language and cultural differences between the two sides in the exchange activities. The content of language and culture cannot be inherited but can be comprehended through learning. There are many factors that affect the language appropriateness of foreign students’ intercultural communication, such as the language level of the learner, the learner’s attitude towards

Chinese culture, the learner’s communication ability, the learner’s character, the influence of the mother tongue culture, etc. This study investigates whether the developed system can improve language communicative appropriateness, as shown in Figure 9:

When the system developed in this study is not used, the average score of students’ language communicative appropriateness is about 50. After using the system developed in this study, the mistakes in the language of foreign students are retrieved through the system, so as to correct the mistakes of the students and improve the appropriateness of the language. The highest score of the respondents’ language appropriateness is 53 points. After using the system developed in this study to retrieve and correct their language errors, the highest score of the respondents’ language appropriateness score is 95 points,

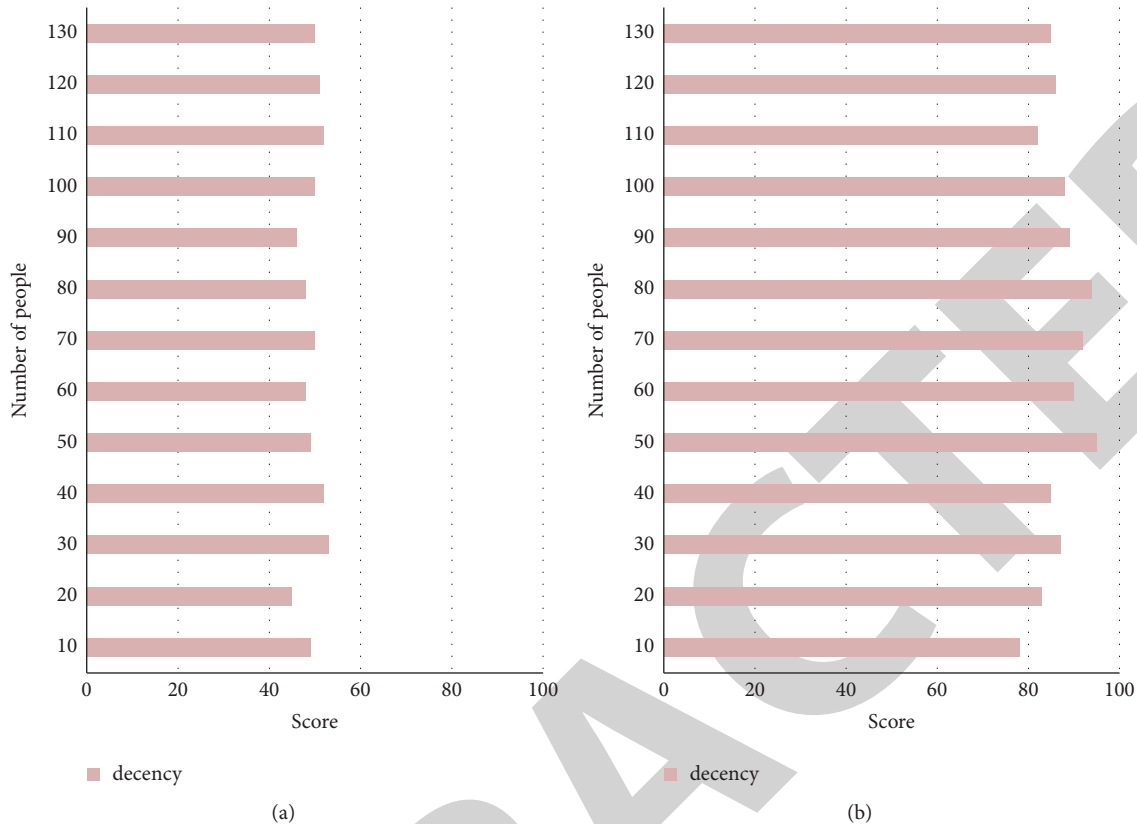


FIGURE 9: Verbal communicative appropriateness scores before and after using the system. (a) Pre-system verbal communication appropriateness score. (b) Postsystem verbal communication appropriateness score.

which is 42 points higher. This also shows that the system developed in this study can effectively improve the appropriateness of language.

## 6. Conclusions

As the exchanges between countries in the world are getting closer and closer, the exchanges between countries have also become very important. In cross-cultural communication, whether the language is appropriate or not represents the comprehensive quality of a country. If the language is decent, it will also be respected and recognized by other countries. But it is very difficult to learn the language of other countries well, especially in terms of the appropriateness of the language, so it is necessary to use technology to correct the problems that people have in the language. In natural language processing, there is a large amount of data, which also makes it more and more difficult for people to learn language. Therefore, this study proposed language processing based on distributed computing. Distributed computing could process a lot of data at the same time, which also made computing easier. On this basis, it designed a distributed control system to retrieve the language, classify, and correct the wrong places, so as to improve people's cross-cultural communication language appropriateness. This study investigated international students in the experiment and found that most international students think that language appropriateness is very important in cross-

cultural communication, but most of them could not master language appropriateness very well. It tested the performance of the proposed system and found that the parallel processing ability of the system is very high, and it could improve the language appropriateness of cross-cultural communication, so as to better promote cross-cultural communication.

## Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

## Conflicts of Interest

The authors declare that this research has no conflicts of interest. The authors confirm that the content of the manuscript has not been published or submitted for publication elsewhere.

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