Research Article

Construction of German Machine Intelligent Translation System Based on Data Mining Algorithm

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The continuous expansion of the international market makes more people pay attention to learning different languages. As one of the most popular languages, German is favored by scholars. The use of intelligent translation systems to learn German has become the main way of learning. The increasing development of science and technology is accompanied by the emergence of a large number of new German words. The traditional German intelligent translation system has a slow update speed of words and cannot recognize new words, which seriously affects the accuracy of the translation. According to these questions, in this paper, the data mining algorithm is introduced into the German machine intelligent translation system. By evaluating the German machine intelligent translation system using a data mining algorithm in four aspects: translation speed, accuracy rate, recall rate, and user satisfaction, the evaluation results found that the translation speed of the system increased by 4.68%, the accuracy rate increased by 4.2%, the recall rate has increased by 3.8%, and the user satisfaction score has increased by 0.825 points. The data mining algorithm can improve the German machine intelligent translation system and users’ interest in learning and promote German education.

1. Introduction

The translation is an important part of German learning. The use of intelligent translation software for German translation can increase interest in learning German and sustainable development. Data mining is a technique that combines traditional data analysis methods with complex algorithms that process large amounts of data. The data mining algorithm is applied to the German machine intelligent translation system, thereby increasing the user’s interest in learning German. The German autonomous learning ability is cultivated in the German machine intelligence.

An intelligent translation system is one of the main ways for people to learn German, and more scholars are devoted to the research of intelligent translation systems. Bechtis et al. designed a machine translation system based on example text and speech input, deployed and trained with finite-state sensors, to translate various languages into the corresponding English language. By solving most of the problems related to translation, user satisfaction is improved [1]. Yu et al. applied neural network technology to the English translation system, created intelligent translation templates, used machine automatic learning function, converted data into text parts in a distributed manner, and directly manipulated the source language. The final test showed that the performance of the explanation model can be improved by adding a piece of text information to ensure the efficiency of the model work progress [2]. Wen studied the design of an English multimedia translation system based on a concise algorithm. The test results showed that the performance of the translation is gradually improved when the length of the sentence is in the best position [3]. Bi developed and designed an intelligent translation system based on human-computer interaction, which can more effectively improve the effect of intelligent translation and improve the reliability and understanding of machine learning [4]. Wang brought portable languages to the real-time translation system. The system used Flex2.2 correction sensor and dual MPU6050 operation sensor to record gesture information and send it to STM32 microprocessor. Audio and text information is translated in real time through the text input unit and OLED display. The system has the
characteristics of fast processing speed, high recognition rate, strong adaptability, and simple operation [5]. Farzi et al. introduced deep neural networks into machine translation research and improved traditional machine translation systems in several ways, especially in terms of translation quality. In this paper, a neural machine translation (NMT) system for four language pairs is proposed, and it is found through experiments that it can quickly translate lengthy sentences [6]. Srivastava et al. used mathematical techniques to design a Turkish sign language translation program for elementary school students and tested the results of the program using different scoring criteria [7]. The research shows that intelligent translation systems can help people learn different languages, but with the development of the times and the emergence of new technologies, new problems have emerged. Data mining algorithms can effectively process and classify various types of data, and many researchers have cooperated in data mining algorithms. Liswaniso et al. have developed a series of integrated technologies for data mining algorithms, including full reconstruction, optimized locks, and cache sensitivity, which are suitable for multiple well-known data mining algorithms [8]. Multi-source measurements were presented that could be used as a comparison for objective evaluation of data mining algorithms (DM algorithms). Every DM algorithm always had some positive and negative properties when moving to a specific area. Data mining algorithms can improve the accuracy, understandability, interpretability, and stability of the generated results [9]. Alagras et al. designed a new genetic programming system by using a data mining algorithm and analyzed the calculation results of the automatic design algorithm.

Results show that machine-designed rule induction algorithms are competitive with state-of-the-art human-designed algorithms [10]. Taylor and Mohammed describe how to improve the efficiency of inductive data mining algorithms by replacing the center matching operation with a mark propagation technique. Breadth-first token propagation is most beneficial when the data is associated with hierarchical background knowledge, such as tree-structured attributes, or when the attributes describing the data have many values [11]. Ma and Ding emphasized the importance of data mining classification algorithms in predicting vehicle collision patterns occurring in training accident data sets and also explored feature selection algorithms including CFS, FCBF, Feature Ranking, MIFS, and MODTree to improve the performance of the classifier’s accuracy. The results show that the Feature Ranking method significantly improves the accuracy of the classifier [12]. Rodrigues et al. used a data mining algorithm to process data type conversion and converted the original data type of the data source to be exported to a common data type. During the conversion process, the user can select the appropriate mining algorithm for the application site [13]. Yunlong has added a data mining algorithm on the basis of the statistical method. The algorithm uses the statistical characteristics of the data to analyze the data in the data warehouse and classifies the different data, so as to facilitate the customer’s query of the data. The algorithm greatly improves the effective level of the data [14]. The studies show that data mining algorithms have a wide range of applications in various fields.

Data mining algorithms are widely used in the field of data mining and are also paid more and more attention by scholars. Data mining algorithms are mostly used to classify complex data and mine hidden data in data to improve work efficiency. This paper uses the data mining algorithm to improve the German intelligent translation system and uses the SVM algorithm to classify the data in the translation system database to improve users’ interest in learning German.

2. German Intelligent Translation System

2.1. German Machine Intelligent Translation System. The technical solution adopted in this paper is that the German machine intelligent translation system is a system that can be shared wirelessly. The system has a portable Wi-Fi terminal and multiple translation functions. Users can create personal information by inserting a SIM card. After successful creation, they can use different terminal converters to connect to Wi-Fi. The device can create a data connection. The transmission signal of the data connection can be a wireless Bluetooth connection or a data Bluetooth connection. After the connection is successful, the system terminal will display icons of different connection methods to remind the user that the connection is successful. After the connection is successful, the user can enter the system for the German translation, and data sharing can be realized. The application integrates the most common translation software in the industry and can translate German compatible into multiple languages for users to use, as shown in Figure 1. The portable Wi-Fi establishes a connection with the SIM server, reads the traffic card from the cloud card pool, connects to the local high-quality network, and provides Wi-Fi services for multiple Internet terminals; the intelligent hardware that has been connected to the network enters the language translation system to realize German translation.

2.2. Functional Modules of Intelligent Translation System. The intelligent translation system function module adopts the SIP signal management technology of NGN core technology, which can identify the diversity of media and signal management and support different types of multimedia access, such as pictures, audio, video, and so on. The functional understanding of the translation system is divided into three levels [15]. They are data hierarchy, logical hierarchy, and presentation hierarchy. At the same time, according to different concepts of hierarchical design, each module has different tasks, which is convenient for configuring and modifying the software according to the specific needs of different users. The design of the software architecture is divided into three stages (communication layer, CTI layer, and usage layer), specifically as shown in Figure 2.
2.2.1. Communication Layer. The communication layer is a key part to understand this system; it is the power center and unlimited service center of a system; a qualified communication layer can satisfy the access of slave networks, such as PSTN, NGN, 3G, 4G, Internet, and other users’ access. The German machine intelligent translation system in this paper can currently support access to multiple multimedia networks, such as PSTN, PLMS, NGN, and IP.

2.2.2. CTI Layer. CTI layer is mainly composed of CTI server and client interface components (OCX and DLL) and some application toolboxes. The main functions of the CTI server include the agent control unit (responsible for maintaining the agent state, responsible for setting agents and time management events), the source control unit (responsible for maintaining and managing IVR applications, etc.), and the routing processing unit (responsible for routing operations).
2.2.3. Usage Layer. Usage layer communicates with proxies via web pages and OCX controls. The VXML script file of the usage layer can interact with the IVR (provided by the multimedia server) for data interaction. In the usage layer, to guide each step of the audio process, it can be determined that the control of the entire call process would not go wrong.

2.3. Schematic Diagram of System Hardware Architecture. The hardware architecture of the intelligent translation system in this paper includes five modules: template setting module, language import module, German input module, smart selection module, and smart translation module.

2.3.1. Template Setting Module. It is used to set the template of the extensible markup language format according to the language writing requirements and set different language formats through the syntax formats of different languages so that the language import module can import smoothly.

2.3.2. Language Import Module. Words in different languages are imported into the database, and data mining algorithms are used to track the emergence of new words in different languages in real time.

2.3.3. German Input Module. The user is provided with an editing panel for language input, and the editing panel has different input methods from which the user can choose.

2.3.4. Intelligent Selection Module. It is used to select the sentence that needs to be translated into German after the user enters the language, and the intelligent selection module performs a full-text search on it and translates sentence by sentence according to the context connection, so as to avoid the occurrence of sentence confusion.

2.3.5. Intelligent Translation Module. Phrases in other languages that have the same meaning as the German phrases from the German vocabulary are matched, and the corresponding phrases are entered into the template through the German input unit and presented to the user as specifically shown in Figure 3.

As shown in the figure, the architectural features of the German machine intelligent translation system in this paper include: the intelligent translation module includes a word translation module, a sentence translation module, and an article translation module. The three modules are connected to each other. When the word translation module is performed, the system provides the corresponding sentence. In order for users to understand, when a sentence is translated, the system will provide the corresponding article.

2.4. Process of Data Mining. Data mining is a process of extracting information and knowledge hidden in it that people do not know but may be useful than a large amount of incomplete, noisy, fuzzy, and random real data. After the language data is entered into the database, the data mining algorithm is used to select the entered language data, and after selecting different data, classification preprocessing is performed, and classification is performed after classification preprocessing, and then different types of data are converted. After the conversion is successful, the extracted data is analyzed and assimilated. The data mining algorithm ensures the normal progress of the whole process and is the basis for the system to perform correct German translation. The specific process is shown in Figure 4.

2.5. Recommendation Algorithm

2.5.1. Support Vector Classifier. The "support vector machine" has been referred to as SVM (support vector machine). The SVM algorithm has the advantages of small training samples, strong generalization ability, and ease to obtain the global optimal solution and is widely used in many fields. In this paper, the support vector classifier is used to analyze the system language data [16]. The linearly separable training set is obtained as follows:

\[ T = \{(x_1, y_1), (x_2, y_2), \ldots, (x_m, y_m)\}, \quad x \in \mathbb{R}^n, y \in \{-1, 1\}. \]

(1)

Suppose that there is a discriminant function:

\[ f(x) = \text{sgn}((\omega \cdot x) + a), \]

(2)

where \( \omega \cdot x + a = 0 \) is the “hyperplane” that distinguishes two types of samples, \( \omega \) is the weight coefficient, and \( a \) is the bias term. In order to isolate the two types of samples to a greater degree by hyperplane isolation, it is necessary to increase the size of the center distance, that is, an optimization problem is proposed:
2.5.2. Nonlinear Support Vector Classifier. In fact, the occurrence of nonlinear conditions is more common, and the linear conditions need to be improved. Therefore, when dealing with nonlinear data sets, it is necessary to separate the features of the training model into a high-level line through functions, which will lead to optimization problems.

Assimilate as follows:

\[
\min \frac{1}{2}||\omega||^2 + C \sum_{i=1}^{m} \xi_i
\]

s.t. \(y_i(\omega \cdot x_i + a) \geq 1 - \xi_i\), \(i = 1, 2, k, m\).

After introducing Lagrangian multipliers, the initial optimization problem has been reduced to two problems [17].

\[
\min \frac{1}{2} \sum_{i=1}^{m} \sum_{j=1}^{m} y_i y_j \alpha_i \alpha_j (x_i \cdot x_j) + \sum_{i=1}^{m} \alpha_i
\]

s.t. \(\sum_{i=1}^{m} y_i \alpha_i = 0\), \(0 \leq \alpha_i \leq C\), \(i = 1, 2, k, m\).

By solving the equation,

\[
\omega = \sum_{i=1}^{m} \alpha_i y_i x_i,
\]

\[
a = y_i - \sum_{i=1}^{m} y_i \alpha_i (x_i \cdot x_j)
\]

Linear discriminant function:

\[
f(x) = \text{sgn} \left( \sum_{i=1}^{m} \alpha_i y_i (x \cdot x_i) + a \right)
\]

2.5.3. Linear Support Vector Regression Machine. For a set of linear data samples:

\[
T = \{(x_1, y_1), (x_2, y_2), \ldots, (x_m, y_m)\}
\]

Construct the input \(x\) and output \(y\) fitting curve equation as follows:

\[
f(x) = W^T x + a.
\]

Because the insensitive loss function is generally not a real curve equation, there will inevitably be errors, but the error should be controlled within a certain allowable range. The mathematical expression for ignorable function loss is [18].

\[
L^\varepsilon (y, f) = |y - f(x)|_{\varepsilon} = \max(0, |y - f(x)| - \varepsilon)
\]

where \(\varepsilon\) is a small positive number; the so-called negligible loss means that the difference between the corresponding function executed, and the actual value must be limited...
within this range. When the error is less than $\epsilon$, the error can be ignored. When the error is greater than $\epsilon$, the excess is calculated for "delivery." Ideally, all training data should be located on the 1-line oil pipeline, which is an area of loss or pipeline uncertainty.

In order to increase the total capacity, it is necessary to increase the area so that the probability of unknown points falling into this region is maximized. Then the regression problem is transformed into the following optimization problem:

$$\min \frac{1}{2} \|W\|^2 = \|W\|^2 + 1$$

subject to:

$$y_i - W^T x_i - a \leq \epsilon, \quad i = 1, 2, \Lambda, M,$$

$$W^T x_i + a - y_i \leq \epsilon, \quad i = 1, 2, \Lambda, M.$$  \hspace{1cm} (14)

Finally, the optimal regression function is obtained as follows:

$$f(x) = \sum_{i=1}^{m} (a_i - a_i^*) (x_i \cdot x) + a.$$  \hspace{1cm} (15)

2.5.4. Establishment of Support Vector Machine Model.

When building a model, the prognostic results to be obtained are called quality values, and each quality value has a specific corresponding data value, which are very similar. A suitable data set must meet: first, the data value and the quality value must be correlated. Configuration models are only particularly useful when the two are related. Second, the data set cannot have too few data values and must contain the data values of the problem to be solved in order for the model to have a high degree of accuracy.

Commonly used kernel functions generally include

$$K(x_i, x_j) = x_i^T x_j.$$  \hspace{1cm} (16)

Polynomial kernel function is

$$K(x_i, x_j) = (x_i^T x_j + 1)^d,$$  \hspace{1cm} (17)

where $d$ is the order of the kernel function.

The radial basis function (RBF) is [19]

$$K(x_i, x_j) = \exp\left(-\frac{\|x_i - x_j\|^2}{2\sigma^2}\right),$$  \hspace{1cm} (18)

where $d$ is the order of the RBF and $\sigma$ is the width of the kernel function.

Neural network kernel function is [20]

$$K(x_i, x_j) = \frac{1}{1 + \exp(v(x_i^T x_j - a))},$$  \hspace{1cm} (19)

where $v$ and $a$ are constants.

Hyperbolic tangent kernel function (Sigmoid) is [21]

$$K(x_i, x_j) = \tanh[k(x_i \cdot x_j) + a].$$  \hspace{1cm} (20)

Since human research on kernel work currently does not have a good, right approach to choose from, the type of kernel work to use depends entirely on what specific problems arise. However, related studies have shown that the results obtained by models with different kernel function configurations are similar, that is, the SVM model does not matter to the kernel performance [22]. This paper selects the most commonly used radial kernel function for model construction.

3. Experimental Design of German Machine Intelligent Translation System

3.1. Experimental Process.

Four German translation systems with high user usage were selected for comparison with the German machine intelligent translation system based on a data mining algorithm, among which four German translation systems were the control group, named systems 1, 2, 3, and 4. The German machine intelligent translation system based on a data mining algorithm is the experimental group, named system 5. The evaluation is carried out from four aspects: translation time, accuracy, recall, and user satisfaction. In order to avoid experimental errors, the text content of the experimental test is the same, and the test is carried out in the same network environment. After the experiment, the experimental group was compared with the control group to analyze the experimental results.

3.2. Experimental Data.

In order to avoid experimental errors, the size of the four German translation systems selected as the experimental objects of the control group is not much different. The specific data of the four traditional German translation systems are shown in Table 1.

4. Experimental Results of German Machine Intelligent Translation System

4.1. Translation Speed Test.

The experimental group system and the control group system were tested in terms of words, sentences, and paragraphs. In order to avoid experimental errors, the text content of the experimental group and the control group was the same. Among them, the number of word tests is 10; the number of sentence tests is 3; the sentence length is about 20 words; the number of paragraphs is composed of 120 words; and the number of tests is 2. The test results are shown in Figures 5–7. The word test results are shown in Figure 5; the sentence test results are shown in Figure 6; and the paragraph test results are shown in Figure 7.

Figure 5 shows that affected by the complexity of words, the translation time of each word is different. The translation time of system 5 in the experimental group is not significantly different from that of the four systems in the control group, and the average time of system 1 is 0.39 s. The average time for system 2 was 0.399 s; the average time for system 3 was 0.399 s; the average time for system 4 was 0.39 s; and the average time for system 5 was 0.357 s. Compared with the traditional German translation system, the speed of the
German machine intelligent translation system based on a data mining algorithm is increased by 0.037s.

Figure 7 shows that the time used by the experimental group to translate sentences is less than that of the control group. The average times spent translating sentences in system 4 is 0.996, and the average time spent translating sentences in system 5 is 0.946, which is 0.056s faster than the traditional German translation system based on data mining algorithms.

To sum up, the experimental group took less time for word translation, sentence translation, and paragraph translation than the control group [23, 24]. The German machine intelligent translation system based on the data mining algorithm of the traditional German translation system.

4.2. Accuracy Test. By letting the two systems translate 3 German articles, the accuracy of the system is observed. Figure 8 shows that the accuracy rate of the German translation system in the experimental group is higher than that in the control group. The average accuracy of system 1 translation was 0.92; the average accuracy of system 2 translation was 0.927; the average accuracy of system 3 translation was 0.913; the average accuracy of system 4 translation was 0.92; and the average accuracy of system 5 translation was 0.962. The application of data mining algorithm to the German intelligent machine translation system increases the accuracy of German translation by 4.2%. To sum up, the data mining algorithm can help the translation system better classify German and improve the accuracy of the translation.
4.3. Recall Test. Five hundred German words updated in the past three months were collected and divided into five groups. Searches were carried out in the experimental group system and the control group system to observe whether there were any words searched in the databases of the experimental group system and the control group system, so as to monitor the recall rate of each system. The results are shown in Figure 9.

The figure shows that the recall rate of the German system in the experimental group is higher than that in the control group. The average recall rate of German words in system 1 is 92.6, and the average recall rate of German words in system 2 is 92. The average recall rate for German words in system 3 is 92.4; the average recall rate for German words in system 4 is 92; and the average recall rate for German words in system 5 is 95.8. By applying the data mining algorithm to the German intelligent machine translation system, the recall rate of German words increase by 3.8%. To sum up, the data mining algorithm can mine new German vocabulary according to the continuous update of time and enter it into the database of the system, so as to improve the recall rate of the translation system.

4.4. User Satisfaction. After using the system, five users were randomly selected to give satisfaction scores to the experimental group system and the control group system, with a full score of 10. In order to avoid experimental errors, the selected users were all sophomores majoring in German. The data are shown in Table 2, and the satisfaction score test results are shown in Figure 10.

The figure shows that the satisfaction score of the experimental group system is higher than that of the control group. The average satisfaction score of system 1 is 8.34 points, and the average satisfaction score of system 2 is 7.94 points. The average satisfaction score for system 3 is 8.2; the average satisfaction score for system 4 is 8.22; and the average satisfaction score for system 5 is 9. Compared with the traditional German machine intelligent translation system, the German machine intelligent translation system based on a data mining algorithm has a higher satisfaction score of 0.825 points. To sum up, the five users were more satisfied with the German intelligent translation system of the experimental group, and the application of data mining algorithms to the German machine intelligent translation system was more popular among users.
5. Conclusion

In this paper, the traditional German machine intelligent translation system is improved by using data mining technology, and the system database is classified and managed to improve the translation speed of the system. Data mining technology is used to collect new German vocabulary, improve the vocabulary content in the system data, and improve the system definition. Through various experiments, it is found that the application of data mining technology to the German intelligent translation system can improve the translation speed and accuracy of the program, increase the recall rate of the system, and improve user satisfaction so that more people can learn German more effectively.

Data Availability

The data that support the findings of this study are available from the author upon reasonable request.

Conflicts of Interest

The author declares that there are no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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