Developing The Design Of A Natural Language Processing - Based Online Translation Recognition System For Effective Implementation In Its Real World Application

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[1]*Received: 31 January 2023; Accepted: 02 August 2023; Published: 12 September 2023*

ABSTRACT

The purpose of this project is to address the significance of verbal communication in the context of fast globalisation by developing an English interpretation recognition system based on Natural Language Processing (NLP). The system is supposed to be able to translate spoken words into other linguistic expressions in real time by gathering and testing a huge number of spoken and translated English samples and by using sophisticated natural language processing algorithms. The outcomes of the experiments indicate that the system exhibits a high level of recognition accuracy and integrity. For instance, the system processes words with an accuracy of 68.21% and phrases with an accuracy of 59.51%. This research also examines how well the system performs in practical settings like business and education, which are crucial for raising the effectiveness and calibre of verbal communication. The study offers a prediction for the future course of technology in addition to demonstrating the system's efficacy.

INTRODUCTION

Since the Internet has grown so quickly and globalisation has accelerated, language communication between people has become even more crucial. English's standing as an international language is solidifying in the context of the multilingual age. Additionally, the need for voice translation and speech recognition technology has increased significantly due to the widespread use of smartphones and other smart devices. Using a huge amount of English oral and translation samples, experimental testing, data improvement, and successful NLP-based system architecture, we were able to create an English interpretation recognition system.

We provide a novel approach to English interpretation recognition using natural language processing (NLP) that can translate spoken English into expressions in other languages in real time. The system built around NLP technology maintains both high recognition integrity and accuracy, according to the experimental stage results. We also looked at how well NLP systems work in real-world settings like business and education, which is crucial for raising the effectiveness and calibre of language communication.

The context and relevance of the research are initially presented in this article. Modern approaches and technology in natural language processing are presented at the method stage. During the trial phase, a comprehensive examination of the test outcomes was carried out, encompassing an assessment of the precision and feasibility of the system identification. The research findings are summed up in the final conclusion, which also considers potential future research directions and technical advancements.

RECOGNITION SYSTEM FOR ENGLISH ORAL TRANSLATION

A. Oral Translation into English

The spoken English translation recognition technology is amazing, and spoken English plays a significant role in English. It translates spoken words into spoken phrases in other languages in real time by fusing machine

[1] *How to cite the article:* Rathi K. (2023); Developing The Design Of A Natural Language Processing - Based Online Translation Recognition System For Effective Implementation In Its Real World Application;*International Journal of Innovations in Applied Sciences and Engineering*; Vol 8, 41-47

translation and speech recognition technologies. There are several different domains in which this system can be used.

One of the key metrics for assessing oral skills is expression fluency. Nonetheless, it is feasible to comprehend local customs and traditions and engage in basic conversation with locals if an English translation recognition system is in place. Businesspeople also need to have this system. The ability to translate a speaker's language in real time in a multilingual business setting simplifies and facilitates understanding meeting material while enhancing communication effectiveness.

Although oral English is a rare system for language learners, it is a challenging aspect of learning a foreign language. gives you chances to practise speaking and aids in your understanding of the target language's pronunciation, intonation, and phrases. Language difficulties shouldn't be a concern when speaking with native speakers.

International collaboration and exchanges have gotten closer as a result of the faster pace of globalisation, and needs for English translation skills have increased across all sectors of society [11]. The aforementioned study makes it clear that creating an oral English translation recognition system is crucial to bridging the language gap and advancing understanding and communication between cultures. This promotes improved interlanguage communication and teamwork among speakers of many languages, strengthening the bonds of a global community.

B. Technical Implementation Specifics

1) A thorough description of the system architecture

Give a description of the front-end user interface, voice receiver, reprocessing module, core translation engine, post-processing module, and output module that make up the overall system architecture. Present the front-end user interface, which includes the text output and voice input interface designs, and describe how users interact with the system. Voice Receiver: Describe how the voice data input is captured and received by the system.

The acoustic model of the system's speech recognition module uses Convolutional Neural Networks (CNN) to first extract spatial features. Next, it aligns the CNN output speech labels with the real speech labels using the CTC (Connectionist Temporal Classification) model. Lastly, it models the extracted contextual information using Bidirectional Long Short-Term Memory (BiL.STM). Ultimately, the Modelling of the gathered contextual data is done using bidirectional Memory for Long Short-Term (BiL.STM).

One popular neural network model that has a significant advantage in spatial dimension is CNN. This research suggests a convolutional neural network-based voice recognition algorithm based on this. The convolutional neural network presented in this paper features a convolutional core size of 3*3. To improve the nonlinear representation of the model, deep learning is performed using two 3*3 convolutional kernels. To minimise the data dimension, the model employs a maximum pooling-based technique.

2) Data Preprocessing

a) Audio signal processing: Explains the processes involved in converting an acoustic signal into a digital signal, including echo cancellation and noise reduction: explains how the technology breaks up long speech signals into shorter ones to make processing easier.

3) The Interpretation Tool

a) Model selection: A thorough explanation of the chosen NLP model (such as the Transformer-based model), outlining its advantages and suitability for this project: An explanation of the training period, the source of the training data, and the model's optimisation to lower translation errors. While LSTMs may effectively use the information already available to create predictions about the output, standard recurrent neural networks are based exclusively on the current time and do not fully utilise contextual information. In order to create a text translation model based on Bi-LSTM and achieve the effective use of full text information, the model employs the theory of Bi-LSTM based on bidirectional long time memory network.

4) Post-Processing and Output

a) Semantic optimisation: Explains how to assure accurate and natural translation by semantically correcting and optimising the model's output. Output Formatting: Explains to the user how the system formats and presents the text that has been processed.

Based on the best possible English-Chinese translation model design, the idea of migrating pivot parameters—model parameters learnt from training other resource-rich or more experienced translation corpus information—is introduced as a way to further enhance the translation quality of the model. These model parameters are then applied to the English-Chinese translation model as initial values, further enhancing its performance.

C. Oral Translation Recognition System

Students are learning English language communication and skills in the context of global integration, which is fostering closer international cooperation and communication. It is significant in both life and the workplace [12]. An experiment was carried out to examine the effectiveness of the oral translation recognition system utilising 2000 random words, 1000 random phrases, and 500 random short sentences in order to test the system's effectiveness. The experiment examines the system's fundamental state by assessing its mistake rate, recognition accuracy, literal meaning that is right but not suited for the context, and performance in various language units and settings. In Figure 1, the experimental data is displayed.

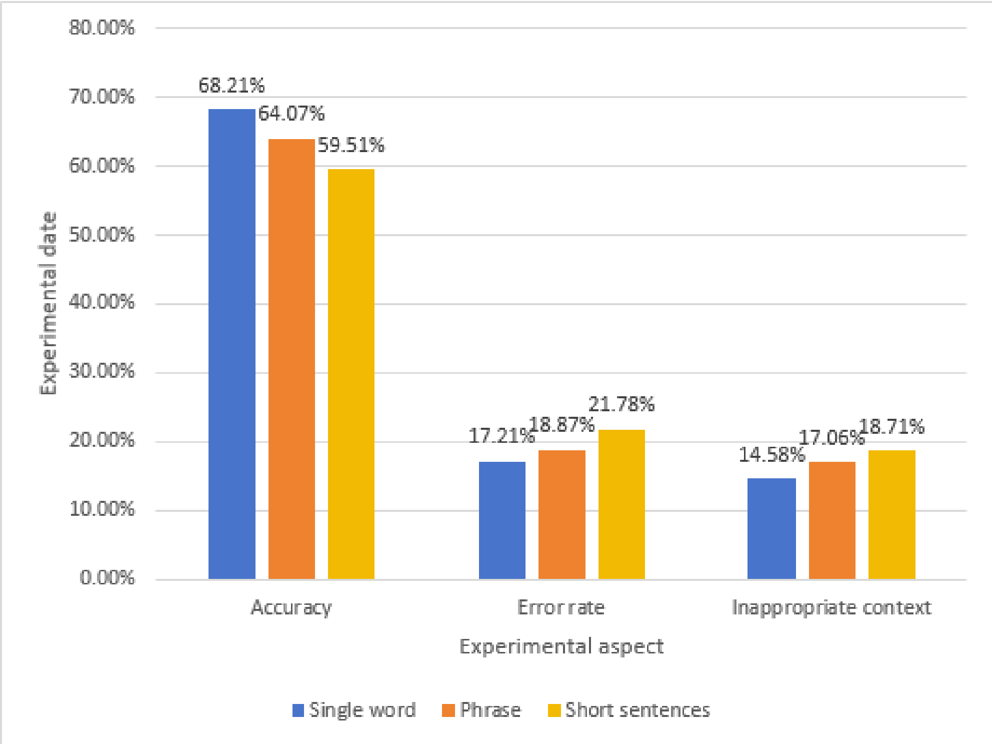

Fig. 1. Translation data of oral translation recognition system

It is imperative to thoroughly take into account a range of intervening issues, including politics, culture, technology, industry, and so on, when translating content into English [13]. Figure 1's data allows us to examine how well the oral translation recognition system performs while processing various language units. The system has a high accuracy rate of 68.21% when processing words. Nevertheless, the accuracy of the system declines while handling shorter sentences and phrases, which are more complicated language units. The accuracy rating of the method is 61.34% for phrases and 59.51% for random short sentences.

In addition to contextual errors, which range from 14.58% to 18.71%, the error rate in the system is 17.21% to 21.78%. In general, there are circumstances in which the system might not be able to translate accurately. These mistakes could be the result of voice recognition software not being accurate enough or machine translation models not being able to fully comprehend complex circumstances.

ENGLISH ORAL TRANSLATION RECOGNITION SYSTEM BASED ON NATURAL LANGUAGE PROCESSING

A. Systems for Processing Natural Language

Language recognition accuracy can be enhanced by taking into account text similarity in natural language processing from several angles [14]. The ability for computers to receive user input in the form of natural language is known as natural language processing. Algorithms can be defined as a sequence of behaviours that a user would experience when interpreting natural language through processing and computation. The goal of natural language processing is to process vast amounts of natural language data without the need for human intervention. There is some overlap with computational linguistics. It is a key area of artificial intelligence at the nexus between computer science and linguistics.

It is possible to create a variety of theories and techniques for successful natural language communication between humans and computers through research on natural language processing. Enabling computers to accurately comprehend human language and engage in natural conversation with people is the ultimate goal of natural language processing. Furthermore, domains like speech recognition, natural language processing, and computer vision have made significant advancements in deep learning [15]. Strong professionalism, a large vocabulary, and a variety of sentence forms resulting from various discourse modes are all features of the English language [16]. The effect can only be more accurately assessed through experiments. Using the same parameters as the experiment shown in Figure 1, the natural language processing system evaluates 2000 random words, 1000 random phrases, and 500 random short sentences. The experimental data is shown in Figure 2.

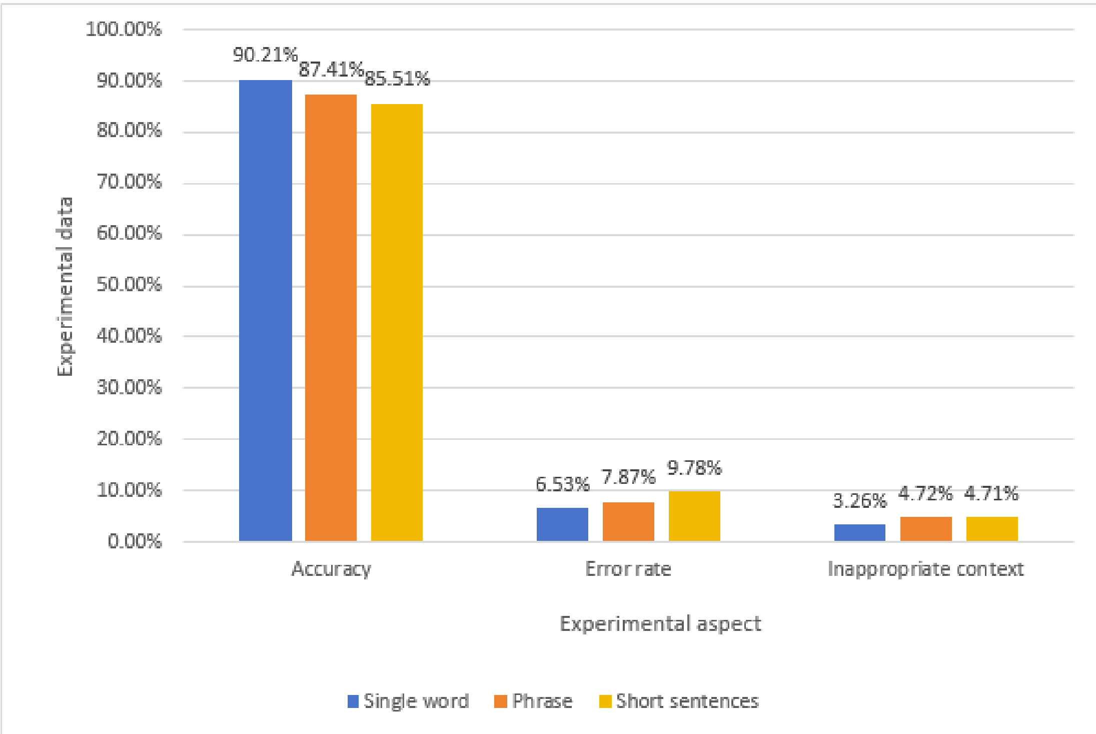

Fig. 2. Experimental data of natural language processing system

International communication benefits greatly from the use of English translation [17]. It is easy to determine from the statistics in Figure 2 that natural language processing systems have an accuracy range of 85.51% to 90.21%, an error rate of 6.53% to 9.87%, and a contextual inconsistency rate of 3.26% to 4.71%. Compared to oral translation recognition systems, all three values are superior. This indicates that systems for oral translation recognition that incorporate natural language processing into their translation process are more useful than those for oral translation recognition alone.

B. Translation Speed Test

The English language is widely spoken around the world. Gaining proficiency in English translation raises one's social competitiveness and opens doors for postsecondary education in other nations, which raises the bar for English translation abilities [18]. To handle a wider range of usage circumstances, English translation systems need to have both high accuracy and corresponding recognition speed. The 2000 random words and 1000 random phrases in the experiment are the same as in the prior one.

This experiment aims to evaluate the recognition speed of the system using 500 randomly selected short sentences. Group B is a natural language processing English oral translation recognition system, whereas Group A is a conventional oral translation recognition system. The system will continue to recognise the recognised object during the experimentation period. The duration of the word recognition, phrase recognition, and short sentence recognition portions of the experiment are separated. Table 1 presents the experimental data.

TABLE I. COMPARISON OF SYSTEM RECOGNITION SPEED

	Words (seconds)	Phrase (seconds)	Short sentences (seconds)
Group A	3~7	6~11	7~15
Group B	1~4	3~7	6~11

English is becoming a more widely utilised worldwide language in a variety of businesses in an effort to better enable international communication and respond to the trends of globalisation [19]. This indicates how crucial it is for English translation recognition to happen quickly. It is easy to conclude, based on the data analysis in Table 1, that Group B can handle a greater variety of oral translation recognition scenarios when it comes to word recognition speed, with an overall recognition speed advantage over Group A for three word types: words, phrases, and short sentences. The side also shows how market globalisation is accelerating. Global cultural interchange is progressively growing, and cross-cultural considerations are playing a bigger and bigger role in English translation.

TRANSLATION RECOGNITION FORMULA AND FINAL EXPERIMENT

A. Translation Recognition Related Formulas

The system recognition speed comparison in Table 1 requires the use of the calculation speed formula as shown in Equation (1):

$$S=Z/T \tag{1}$$

Z is the number of words recognised, T is the total time required to recognise all words, and S is the amount of time required to recognise a single word (phrase, brief sentence). The system can determine how long it takes to recognise a single word using equation (1).

$$T=FxN \tag{2}$$

In equation (2), the term's relevance over the entire corpus is measured by F, which represents the inverse document frequency, and T, which indicates the word's frequency of appearance in the document. The final result T shows how important a word is in a particular text, and it can also show how important a term is across the corpus.

B. Practical Use Experiments of Two Systems

An English professor from a certain university was chosen at random to read three postmodern works in the actual use experiment. The experiment came to an end after the professor completed reading the entire text at a pace of 50 words per minute. In this experiment, Group A and Group B's English oral translation recognition systems processed by natural language are compared in terms of recognition accuracy, recognition error rate, contextual error rate, and recognition completeness. In Figure 3, the experimental data are displayed.

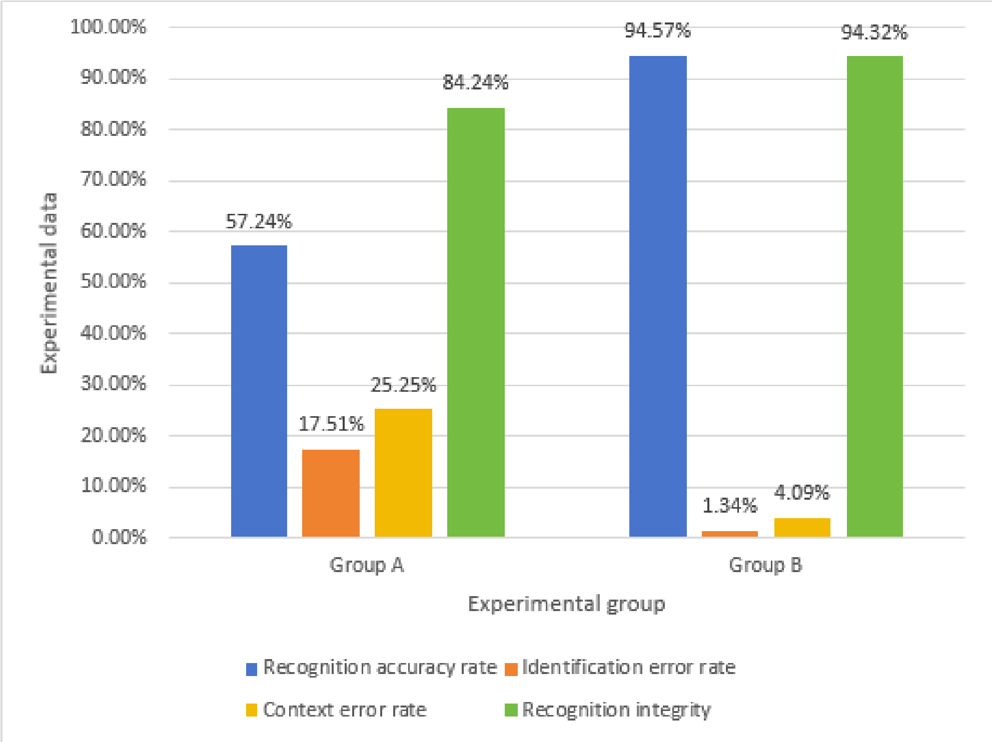

Fig. 3. Actual system usage experiment

It is easy to determine that Group B has a 94.57% identification accuracy and a 94.32% recognition completeness by analysing the experimental data in Figure 3. With a recognition mistake rate of 17.51% and a contextual error rate of 25.25%, Group A's recognition accuracy is only 57.24%. It is easy to discover that natural language processing English oral translation recognition systems have higher recognition completeness and accuracy than ordinary oral translation recognition systems, while their recognition error rate and contextual error rate are lower. because Group B's total experimental effect differs greatly from Group A's.

C. Results and Analysis

According to the study, the NLP-based English interpretation recognition system functions best at the word level and exhibits excellent accuracy while processing words, phrases, and short sentences. The technology provides advantages over the traditional paradigm in terms of accuracy and speed. However, the system is still limited in its ability to absorb complicated situations, mostly because voice recognition and machine translation models do not fully comprehend complex contexts. Future studies should focus on improving the algorithm's processing power for complex language units, broadening the range of useful application scenarios, and enhancing the system's usability and appeal.

CONCLUSIONS

This study presents the development of an English interpreter recognition system that can translate spoken English into expressions in other languages in real time using natural language processing techniques. The outcomes demonstrate that the system performs exceptionally well in word-level recognition and has high accuracy and completeness while processing simple and moderately complex linguistic units. However, when dealing with longer or contextually more complicated sentences, the accuracy of the system decreases, indicating some limitations.

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