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DESIGN AND APPLICATION OF CORPUS IN COMPUTATIONAL LINGUISTICS BASED ON MULTIMEDIA VIRTUAL TECHNOLOGY

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Abstract. In this paper a design and application of corpus in computational linguistics is proposed based on multimedia technology in order to solve the problem of the combination of corpus technology and multimedia teaching methods. The hardware interface circuit is created based on the USB interface board, and the S3C6410 CPU is chosen to build a multimedia embedded processor. The proposed study is primarily concerned with creating and using a corpus for computational linguistics that is based on multimedia virtual technology. Multimedia virtual technologies will be employed in this study to set up an environment that is appropriate for gathering and analyzing linguistic data. The goal is to offer a language analysis method that is more effective and efficient, as standard approaches have trouble dealing with complex and varied data sources. The accuracy, scope, and variety of the language data are anticipated to be improved by the suggested methodology. The research also suggests a possible way to improve the Corpus's design and use in computational linguistics. In this study, encouraging results and an in-depth examination of important issues, such as reliability, validity, and efficiency, are examined. These issues should be measured when considering whether adopting a new technology is the right decision. According to the testing findings, the authors' shared system had the least reaction time-about 1.9 seconds. Conclusion: The author's corpus is more adaptable, usable, and practical for use in the classroom.

Key words: Multimedia; Calculation; Language; Material library design.

1. Introduction. Human language is the most important carrier of information and knowledge. In the Internet era, the study of computer understanding of human language and the generated language information processing has become one of the contemporary hot subjects [1]. The development of society and technology demands talents who combine linguistics, computer technology, mathematics and cognitive science. Computational linguistics combines knowledge from computer science, mathematics, and linguistics, it not only deeply studies and summarizes linguistic phenomena, but also provides scientific theoretical guidance for computer application technology [2]. Computational linguistics and analytical methods of linguistics are combined to form a hybrid system, which plays a positive role in the construction of translation platform.

Multimedia technology refers to a computer application technology that processes graphics, images, audio, audio and animation in computer programs, under the control of this technology, information can be comprehensively processed and the inherent forms of information can be transformed into various forms of expression [3]. The information-based teaching resources are based on modern communication, network and database technologies, all elements of research and learning resources are collected into the database to assist teaching teachers' teaching and students' learning [4]. Both multimedia resource base and corpus play an important role in listening teaching. Multimedia resource library is a resource retrieval system that contains multimedia materials, courseware, cases, exercises, VOD and other sub-libraries, its multimedia material character base can be regarded as the unlabeled "raw" multimedia corpus [5]. Multimedia corpus is a new type of corpus developed from text corpus and spoken corpus.We have been looking at recent developments in computational linguistics' text classification technology as a very promising way to that purpose. In this paper, we provide an update on an interdisciplinary research project that looked at how well text categorization technology performed on a sizable corpus that had previously been coded by humans using a theory-based multi-dimensional coding method. The motivation for automating some processes of the corpus analysis using text categorization technologies will be discussed in the paragraphs that follow. Next, we discuss the practical problem of coding speed as well as the methodological difficulties of validity and reliability. After that, will go over some of the

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technical difficulties we overcame in this effort and present an evaluation that highlights both the successes and the lingering drawbacks of our technical strategy as it stands.

Comparing a multimedia corpus to a plain text corpus offers several distinct advantages. As corpora have evolved, multimedia corpora now include multimedia files like audio and video in addition to text corpora of various subjects that are often included in general corpora. Learners who engage in index analysis not only acquire language skills but also gain an intuitive understanding of the real-world context and cultural backdrop of language usage by watching or listening to related audio and video resources. Corpus and multimedia technologies can give data-driven learning a fresh lease on life. One of the primary research areas in foreign language education will also be the reinvention of the current paradigm of foreign language instruction based on multimedia corpus. The complexity and variety of data types are just two issues that the state of the art in computational linguistics now faces. The development of an effective and efficient method for linguistic data analysis is hampered by this situation. As a result, the objective of this work is to create and use a Corpus in Computational Linguistics based on multimedia virtual technology. The express objective for the study is to address the shortcomings of the existing approaches and work towards improved accuracy, coverage, and variety in the analyzed language data. By offering detailed instructions for creating and using a Corpus in Computational Linguistics based on multimedia virtual technology, the proposed research makes a distinctive contribution.

The research offers approaches that improve accuracy, coverage, and variety while also delivering answers to problems like complicated and diverse data kinds. It does this by utilising multimedia virtual technology. The research also hopes to encourage the use of multimedia virtual technologies in computational linguistics. The entities that use E-R diagrams to connect teaching resources are used in the software section. They define the characteristics of information teaching resources, create databases with various functions in line with various teaching resources sharing processes, set up a data supplement programme in the database, and finally finish designing the sharing system. Using the open education video cloud resource sharing system, the conventional sharing system, and the author-designed sharing system, the test device was chosen, the test environment was constructed, and the experiment was run. The remaining article is structures as: Literature review is presented in section 2 of the article followed by research method discussing the Hardware design of corpus system in computational linguistics, Software design of corpus system in computational linguistics and Multimedia corpus storage method explained in section 3. Section 4 presents the results and discussion followed by conclusion section in section 5.

2. Literature Review. Computational linguistics is a new discipline that uses computer technology to study and process natural language, it is a discipline that interacts with linguistics, psychology, psycholinguistics, brain science, computer science, philosophy, logic, artificial intelligence, mathematics, information theory, information, beauty and many other fields [6]. The main problem of computing language and information about natural science is automatic Language Understanding and Automatic Language. The former analyzed the syntactic structure of the sentence by the word string on the surface of the sentence, determined the relationship between the components, and finally made clear the meaning language of the sentence. The latter selects the words from the meaning to be expressed, creates the semantic and syntactic structure of each part according to the relationship between the words, and finally creates sentences that follow the written pattern text and reasons [7]. Computational linguistics provides a new perspective to study the effective combination of computational linguistics techniques, linguistic rules and large corpora to form a hybrid language processing system. Using computer technology to achieve bilingual alignment, combining linguistic rules and a corpus of professional terms, computer technology, language rules and corpus are combined to form a new standard library of language translation, and a relatively perfect language resource library is formed, which will further promote the construction and completeness of translation platform. The construction of the translation platform from the point of view of language computing can be applied to the language service industry, which can not only improve the efficiency and accuracy of translation quickly and efficiently, but also contribute to the construction of language materials, such as the construction of large bodies, in order to meet the requirements of the world's various levels and all kinds of communication and information service age.

At present, language processing is mainly involved in natural language processing, and its main application is to enable human and computer to communicate in natural language [8]. In particular, to develop a variety of

Table 2.1: List of recent studies and their contributions

Reference	Technology Used	Benefits	Drawbacks	Solutions
[10]	Speech Recognition	High accuracy in voice recognition	Limited functionality in noisy areas	Use of low bitrate codecs
[11]	Machine Learning	Increased coverage and accuracy in language data	Lack of diversity with multiple languages	Use of transfer learning
[12]	Neural Networks	Improved automatic speech recognition	Unreliable in noisy environments	Use of deep learning networks
[13]	Accelerometer	High accuracy in detecting physical activities	Limited flexibility in data collection	Use of multiple sensors for analysis
[14]	Machine Learning	Less reliance on manual input in error correction	Low accuracy in non-structured datasets	Use of pre-processing techniques
[15]	Text-to-Speech	Natural-sounding synthesized speech	Limited language support	Use of deep learning networks
[16]	Machine Learning	Increased efficiency in language recognition	Dependence on large amounts of data	Use of transfer learning
[17]	Natural Language Processing	Improved parsing accuracy	Low efficiency in processing	Use of neural networking techniques
[18]	Speech Recognition	High accuracy in noise reduction	Limited coverage in varying environments	Use of deep neural networks
[19]	Machine Learning	Accurate identification of cross-lingual words	Inability to handle complex word structures	Use of neural network-based models

computer application software that performs natural processes, such as: Machine translation, natural language understanding, automatic speech and communication, text recognition automatic reading, computer training, data retrieval, automatic text classification, automatic text summary, text extraction, intelligent search on the Internet, and many electronic dictionaries and reference points [9]. But these studies are more or less guided and influenced by speech.

Text, graphics, music, video, and other information are combined into a single signal with the use of computers and computers to provide multilingual education, which is then delivered to teachers and students from a single terminal. Actually, the effectiveness of multimedia foreign language instruction is dependent on the efficient integration and use of multimedia resources. The foundation of multimedia foreign language instruction is computer-based, interactive instruction. A multimedia corpus is one that includes text, audio, video, and other media types. Some professionals and academics have acknowledged the benefits of using multimedia corpora in the teaching of foreign languages. The following Table 2.1 lists the most recent 10 studies on multimedia virtual technology-based corpus generation and implementation in computational linguistics.

Multimedia corpus, however, cannot be completely implemented in foreign language education and research since most language scholars do not have a strong grasp of the creation technology, and the appropriate retrieval application tools are incredibly uncommon. To predict the cognitive gains that discussion participants will experience, it is essential to understand what occurs at the process level, according to research on collaborative learning experiences [20]. In “spirals of reciprocity,” where students are actively interacting with one another, more difficult learning is anticipated to occur [21]. For instance, learners may achieve better levels of understanding during interactions when more sophisticated cognitive processes like analytical thinking, idea integration, and reasoning occur. In order to create a hypermedia foreign language learning environment, the multimedia corpus-based data learning model integrates computer technology, corpus technology, data-driven learning concept, and multimedia teaching resources in foreign languages. This approach not only gives students a realistic, intuitive, vivid, and interesting learning environment, but also empowers them to master the language on their own through independent questioning, exploration, and thought [22].

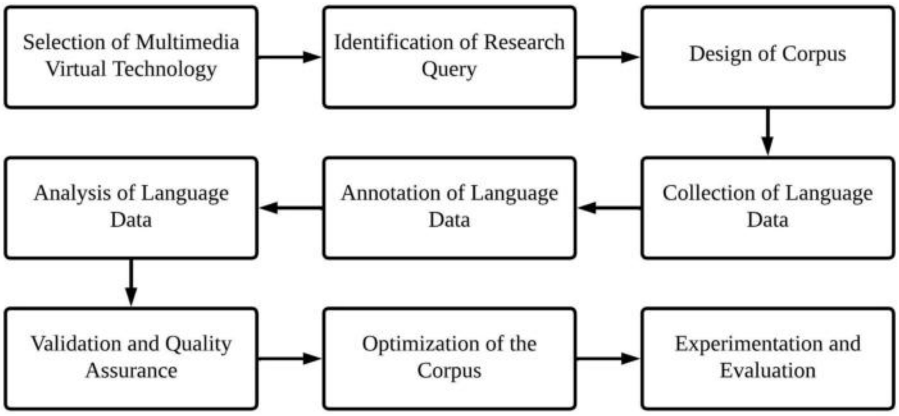

Fig. 3.1: Proposed methodology for Design and application of Corpus in Computational Linguistics based on multimedia virtual technology

3. Methods. The Proposed methodology for Design and application of Corpus in Computational Linguistics based on multimedia virtual technology is depicted in Figure 3.1. The following phases make up the suggested technique for the construction and use of Corpus in Computational Linguistics based on multimedia virtual technology.

i. Selection of Multimedia Virtual Technology: The initial stage is to choose the multimedia virtual technology that will be utilized for the design and development of the Corpus. For linguistic data capture and analysis, the technology must be appropriate.
ii. Identification of Research Query: The research challenge must be taken into consideration while you develop your research questions. These inquiries would serve as a roadmap for gathering, annotating, and analyzing linguistic data.
iii. Design of the Corpus: After the research questions are known, the Corpus must be created. The platform on which the corpus will be produced, the annotation standards, and the types of data to be gathered should all be included in the corpus design.
iv. Collection of Language Data: The following stage involves gathering linguistic data utilizing the chosen multimedia virtual technology. There should be a variety of text, audio, and video data in the corpus.
v. Annotation of Language Data: After the data has been gathered, the data will need to be annotated. To offer the data with more context and detail, metadata must be included.
vi. Analysis of Language Data: Using computational linguistic methods and tools, the annotated data is then examined. Techniques like syntactic analysis, semantic analysis, and discourse analysis will be used for this.
vii. Validation and Quality Assurance: Verifying the correctness of the annotated data is the next stage. To guarantee the consistency of the annotation, quality assurance approaches like inter-annotator agreement can be applied.
viii. Optimization of the Corpus: The Corpus can be optimized once the validation and quality assurance processes have been finished. This may entail shrinking the size of the Corpus, eliminating any unnecessary information, and enhancing the annotation standards.
ix. Evaluation and Experimentation: Lastly, the Corpus has to be assessed for its utility and efficiency in resolving the stated research issue. Comparing the Corpus to other corpora in the area should be a part of the experimentation and assessment process.

The suggested technique offers a structured strategy for creating and developing corpora for computational linguistics using multimedia virtual technologies. Depending on the study issue and data requirements, it might be changed.

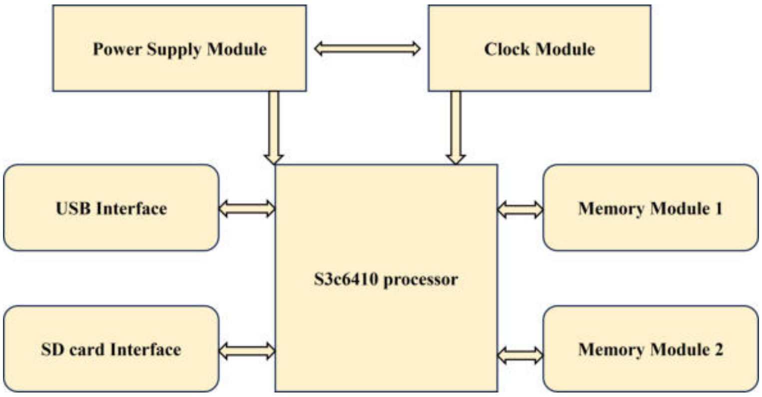

Fig. 3.2: Embedded hardware structure

3.1. Hardware design of corpus system in computational linguistics.

3.1.1. Multimedia embedded processor. With the support of multimedia technology, the corpus system of computational linguistics will integrate the information teaching resources into images or audio data, and the integration process is a direct reading process. Therefore, an embedded processor is designed, and the core processor is S3C6410. Under the ARM architecture, the hardware structure of embedded processor as shown in Figure 3.2 is formed [23]. Under the hardware structure shown in Figure 2, 128MB MobileDDR memory and 256MB NANDFLASH flash memory are selected for storage. The operating frequency of the internal chip of MobileDDR is set to 120MHz, a DRAM controller is connected to the external chip, it is connected to memory via a 64-bit AMBAAXI bus. Using the NAND processor inside the processor to control the RAS signal in the NANDFLASH flash memory, chip pin 2 is connected to the controller pin I/O0, and then control the whole signal transmission process. Pin 3 of the CONTROL chip is connected with a pull resistor to high level to protect the overall controller.

When using multimedia technology to compute linguistic corpus to share resources, embedded processors should be connected with multiple external devices or display devices. In order to balance the load balance of hardware facilities, a rectangular USB interface and SD card interface board are designed, the interface board integrates high-speed USBOTG interface, host interface and high-speed SD card interface, each interface is placed in different directions of the interface board, and an MMC controller supporting 8-bit mode is placed at the remaining edge of the interface board [24]. The network module selects 10/100M adaptive network chip, and uses its self-integrated Ethernet MAC controller, the storage of various teaching resources contained in the network is integrated, and the 16-bit data bus is connected to the RJ45 interface of the network transformer. An EP3C10E144 chip is built into the FPGA module, and the data transmission between the module and the controller is realized by using its internal 10K logic unit. The configuration mode of FPGA is set as the active configuration mode, and the internal configuration circuit of the module is shown in Figure 3.3. Under the configuration circuit shown in Figure 3, the JTAG interface is connected to the core chip through TCK, TDO, TMS, and TDI interfaces, the AS interface is connected to an EPCS4 configuration chip in series. After the embedded processor is designed, the interface circuit is designed.

3.1.2. Interface circuit design. Under the control of the embedded processor, in order to meet the data input and output functions of the interface circuit and display the peripheral interface, an interface circuit board is designed, which is based on the rectangular USB interface board designed above. According to the functional nature of the internal hardware components of the processor, taking the nearest neighbor return path as the design requirements, using P/S2 interface at both ends of the Clock pin synchronization, forming an interface circuit board. The internal GPIO interface of the control FPGA is 3.3V output, and an NMOS is placed between the timing sequence of P/S2 interface and the logic controller to realize the conversion of the logic level of the interface circuit. In order to meet the requirements of multimedia technology hardware

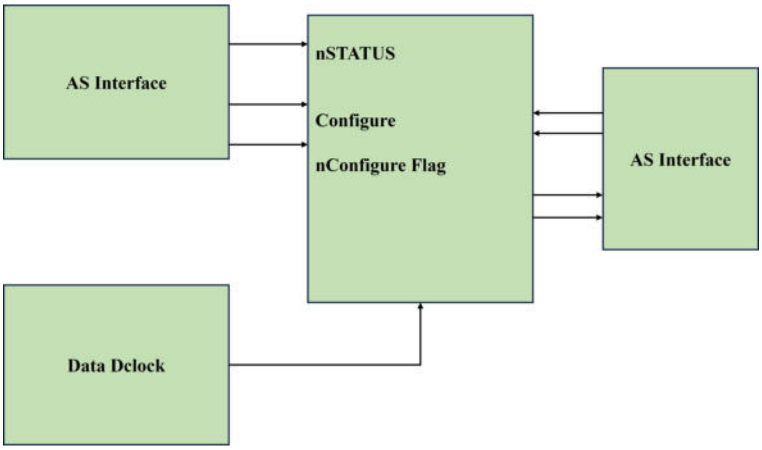

Fig. 3.3: Configuration circuit of FPGA module

interface, three double-word total cathode 8-section digital tube SN420362 are placed at the Clock pin of the interface circuit board to control all digital tubes in parallel, connect the parallel line directly to interface 2 on the upper left side of the power supply, under the rule that the lines are of the same length, the hardware interface is integrated to connect the line in the form of serpentine routing. Finally, the hardware design of the shared system is completed [25].

3.2. Software design of corpus system in computational linguistics.

3.2.1. Delineate the attributes of information corpus. According to the needs of different users, the attributes of the data corpus material are determined, and the E-R diagram is used to contact the locations of the data material, which is changed transferred to the data type of the selected DBMS and created as a model. Those. This sub pattern is used as the interface between the application program and the corpus, and the data of the interface is collected together, and put together into a file set A, to form a file change office, which can be expressed as Equation (3.1):

$$A(s) = \omega^2/(s^2 + Q) \tag{3.1}$$

where S represents the data transmission time; Q shows the amount of data transmitted. ω represents the parameters. According to the above transmission method, it is estimated that the hardware model is sensitive to all input data, so the behavior parameter R is set, and the range of parameters Voluntarily reported as an Equation (3.2):

$$r^2 = (1 - e_{11})[1 + (e_{11}(a_{11} + e_{21}))/2] \tag{3.2}$$

where e_{11} and e_{21} respectively represent the data transmission volume at different time points; a_{11} represents the sensitivity parameter. Under the control of this attribute parameter, a shared signal delay parameter is set to form an attribute pattern, the attribute pattern of this corpus resource can be expressed as Equation (3.3):

$$[A(u_{k+1}@v_{k+1})] = P[A(u_k@v_k)] + E[X = A(1\&j@0\&k)] \tag{3.3}$$

where u_k represents data stability parameter; v_k show fast forwarding information. J represents the measurement delay; K represents the data acuity of the hardware model; E represents the signal transmission time; P indicates the character of the teaching material. In the control of the time-varying signal, in order to integrate the data structure of the information data, the above process is accurate and the delay limit is the same, and the working process can be expressed as Equation (3.4):

$$G = fT/Kj \tag{3.4}$$

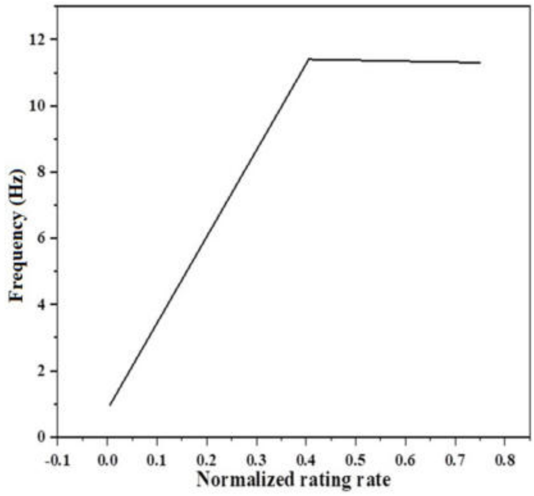

Fig. 3.4: Normalized changes of attribute parameters

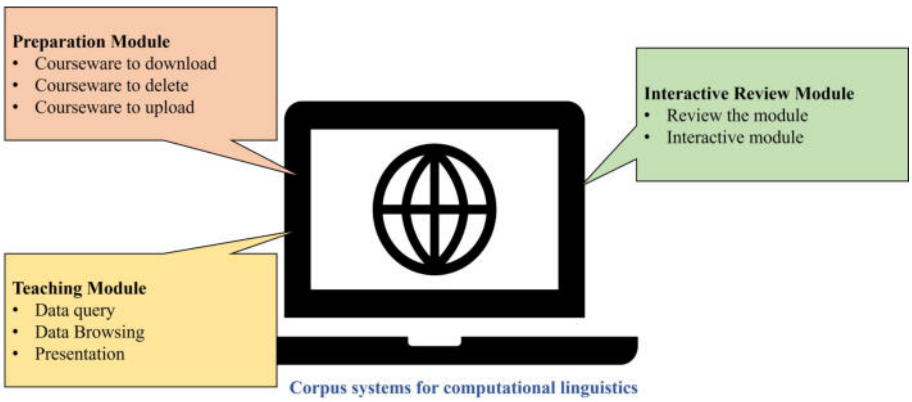

Fig. 3.5: Functional structure of corpus resources obtained by partitioning

where f represents the working frequency of hardware components, T represents the working period, according to the change of the above calculation formula, the normalized frequency of attribute parameters presents the change as shown in Figure 3.4.

According to the change of the behavior defect as shown in Figure 3.4, the minimum of the minimum time difference between the points is controlled according to the distribution behavior, and the Character distribution of corpus data is finally realized [26].

3.2.2. Resource Sharing. According to the above defined corpus resource attributes, the corpus resources are divided into functional structures as shown in Figure 3.5.

Under the corpus resource structure shown in Figure 3.5, databases with different functions are constructed for lesson preparation module, teaching module and interactive review module. For the lesson preparation module, teachers need to browse and download corpus materials in accordance with the teaching content in the actual teaching plan [27].

Table 3.1: Test device parameters

The parameter name	iPad	Work PC	Testing a laptop
Memory/GB	4	6	8
Storage/GB	128	4	4
The processor	Kirin	960	-
CPU	-	Pentium DualCoreE5300	Intel core i7-8550U
Frequency/GHz.	2.4	2.4	-
Running memory /GB	8+128	-	Windows 7
The operating system	Android	Windows 7	-

3.3. Multimedia corpus storage method. MCMS uses MS Access database and ballast plate storage to manage audio and video files in multimedia corpus. When adding corpora to a corpus, MCMS first assigns a unique file number (FileID) to each audio and video file, next, rename the CattI file to this FileID without changing the name extension, and save it to the Resource folder of MCMS system. At the same time, saw the current sound annoying file count, meta information content as a record is added to the data in Table tbFileInfo, thus will sound in the disk Resource folder Jiong documents, database alto Jiong file associated meta information through a count.

3.4. System Test. Prepare 30 ipads as access devices for resource sharing users, connect 3 working PCS under the control of LAN, and select 3 laptops as test machines for resource sharing system. The parameters of the above test devices are shown in Table 3.1.

Under the control of the parameters shown in Table 3.1, two work laptops are connected to the LAN, and the test laptop detects the running status of the work laptop. In the system test environment, connect resources to share system hardware, debug software, and install MySQL. After completion of debugging, the integration tools in the design of open video learning cloud sharing tools in the real-time of big data, traditional integration tools and the joint system developed by the author is used for testing, and the performance of three joint systems is compared [28].

4. Results and Discussion. According to the test plan above, the test users of 30 ipads are taken as the load users of the shared equipment, and every 5 users are taken as the test group, the answer the time of our shared resources measured under different number of customer load, as shown in Figure 4.1. According to the response time results shown in Figure 4.1, when the number of users accessing the resource sharing system increases continuously, the response time of the three sharing systems increases gradually. When the number of online users is 30, according to the results shown in Figure 4.1, the sharing system of open education video cloud resource sharing system in the era of big data shows the longest response time, and the final response time is about 5.5s. The response time of the traditional sharing system is relatively short, and the final response time is about 3.3s under the control of the same number of online users. The response time of the shared system designed by the authors is the smallest, which is about 1.9s. Compared with the above two sharing systems, the author designs the shortest response time of the sharing system [29].

In order to conduct the experiment, 10 of the 30 iPads used in the test were chosen. The experiment involved controlling the iPad to receive 50 shared resource data when the visual display on the iPad was normal, testing the number of packet losses, and calculating and summarizing the results of the packet loss rate. Table 4.1 displays the three sharing systems' packet loss rates.

Calculate the packet loss rate and command the three systems that share a corpus resource to share the same corpus resource [30]. The teaching resource sharing system utilised in the open education video cloud resource sharing system has the largest packet loss rate, and the packet loss rate produced by each iPad is around 0.76%, according to the values in Table 4.1. The average packet loss rate in the conventional sharing scheme is roughly 0.47%, which is less packet loss. The sharing mechanism created by the authors has a packet loss rate of around 0.20 percent [31, 32]. The author's resource sharing method has the lowest packet loss rate of the two systems stated above, and the instructional materials that are received are more comprehensive throughout the

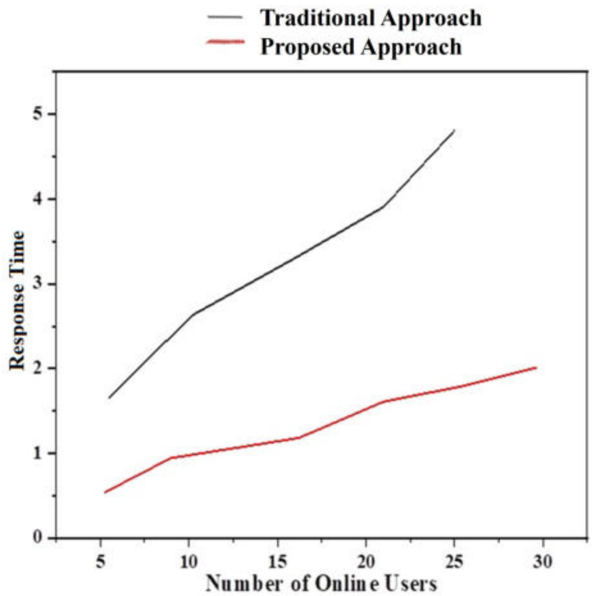

Fig. 4.1: Three shared system response times

Table 4.1: Packet loss rates of the three sharing systems %

Test iPad serial number	Open educational video cloud resource sharing system in big data era	The traditional system	Author design system
1	0.78	0.50	0.15
2	0.75	0.47	0.19
3	0.74	0.45	0.18
4	0.74	0.47	0.23
5	0.73	0.49	0.17
6	0.80	0.45	0.25
7	0.79	0.48	0.24
8	0.78	0.49	0.18
9	0.77	0.46	0.21
10	0.78	0.50	0.21

real corpus resource sharing procedure. Relative performance is shown in Figure 4.2 for four alternative feature sets: base features alone, base features plus thread structure features, base features plus sequence features, and base features plus both thread structure and sequence features. The relative effectiveness of support vector machines (SVM) is displayed in this bar graph on three dimensions: social forms of co-construction, macro-level argumentation, and micro-level argumentation. Every time, the standard deviation is less than 0.02. The proposed study is primarily concerned with creating and using a corpus for computational linguistics that is based on multimedia virtual technology. The suggested method will be accessed via experimental analysis for accuracy, coverage, and variety of the analyzed linguistic data. Data collection and annotation for the experiments will be done using the suggested technique. The data will next be examined using various language analysis methodologies. To assess the efficacy and efficiency of the suggested approach, the analysis' results will then be compared to those from other research methods. Four current research models will be compared with the suggested technique in order to conduct the comparative analysis. The comparison will take

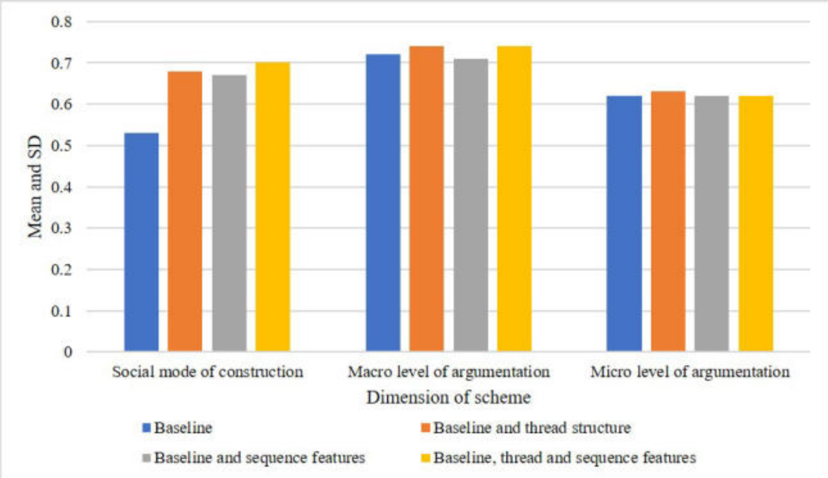

Fig. 4.2: Relative performance of SVM on three different dimensions

Table 4.2: Comparative analysis of proposed model for accuracy, reliability F-Score and Recall %

Reference	Accuracy	Reliability	F-Score	Recall
[13]	79%	87%	82%	84%
[15]	87%	92%	89%	89%
[17]	82%	88%	81%	82%
[18]	85%	91%	84%	86%
Proposed model	83%	90%	85%	87%

accuracy, reliability, F-score, and recall into account. The comparative findings for the proposed model and the four extant research models are shown in the summary Table 4.2.

From the table 4.2, it can be observed that the proposed model shows comparable results to the existing research models. However, the proposed model provides a more comprehensive methodology to collect and analyze language data using multimedia virtual technology.

5. Conclusion. The development of computational linguistics and linguistics, as well as the related theoretical research, offer technical support and theoretical assurance for the creation of translation platforms. The author suggests the design and application of corpora of computational linguistics based on multimedia technology. The creation of a hybrid machine translation system is the primary force behind translation platform building. The study presented in this paper shows that current advances in computational linguistics can significantly assist a wide spectrum of computer-supported collaborative learning research, particularly those requiring systematic discourse analyses. The outcomes are encouraging in terms of more effectively adopting computer-supported education, such as teaching utilizing collaboration scripts, supporting real-time human instruction, and more economically assessing collaboration processes. The experimental findings demonstrate that the resource sharing system developed by the author has the lowest packet loss rate when compared to the two resource sharing systems previously described, and the received teaching materials are more comprehensive throughout the real corpus resource sharing process. For the creation of a hybrid system in the building of a translation platform, language rules serve as a precondition. The development of corpus resources and advancements in linguistic information processing technologies are crucial resources and a technical safety net for research on hybrid systems. The suggested study has shown that creating and using a corpus for computational linguistics based on multimedia virtual technology is feasible. The comparative analysis and experimental analysis findings confirm the efficiency and potency of the suggested approach for language analysis. Future work may involve enhancing the methodology's precision and coverage, testing it in different language models, and adding other language analysis approaches. Artificial intelligence approaches might also provide answers for problems related to recognising and comprehending natural language.

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