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Retraction

Retracted: Speech Dialogue System-Based Environmental Resource Allocation and Online English Teaching and IoT Applications

Wireless Communications and Mobile Computing

This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope

(2) Discrepancies in the description of the research reported

(3) Discrepancies between the availability of data and the research described

(4) Inappropriate citations

(5) Incoherent, meaningless and/or irrelevant content included in the article

(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets 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 own 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.

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[1] K. Wang, "Speech Dialogue System-Based Environmental Resource Allocation and Online English Teaching and IoT Applications," *Wireless Communications and Mobile Computing*, vol. 2022, Article ID 8429433, 9 pages, 2022.

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Research Article

Speech Dialogue System-Based Environmental Resource Allocation and Online English Teaching and IoT Applications

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For the online teaching of English and the allocation of environmental resources, the conventional methods are difficult to adapt to the increased load in time when the business volume increases, and their practicability has obvious shortcomings. Aiming at this problem, this paper puts forward the environmental resource allocation and online English teaching based on the voice dialogue system. Based on the English teaching content, the vocabulary information table and dialogue information table which are input into the voice dialogue system are designed. In the user's usage, the dialogue sent by the user is matched with, and each group of matching results is taking as the target. Environmental resources are allocated for each group of matching results with the help of the dispatcher in the voice dialogue system, and the optimal allocations of single goal and multiple goals are realized. On this basis, the online teaching architecture is designed, and the above contents are deployed to the teaching architecture. It supports the multichannel interaction between users and the online English teaching platform and realizes independent online English learning. The experimental results show that the teaching method based on the voice dialogue system has stable environmental resource allocation, low blocking rate, and high teaching quality score, and the overall practicability has been significantly improved.

1. Introduction

English is the official language used by the most countries in the world. High level English skills not only have advantages in cultural exchange but also play a positive role in academic research [1]. With more and more frequent exchanges between countries in the world, all walks of life have higher and higher requirements for English skills. The judgment of English skills does not lie in mastering more or less theoretical knowledge but focuses more on oral communication. More people in society need talents with clear and good oral expression [2]. However, the effect of conventional oral English teaching methods is not ideal, and the situation of dumb English in English teaching is not rare. In order to improve oral English skills, experts and scholars from various countries have studied relevant teaching technologies and methods, and the voice dialogue system is one of them [3]. The phonetic dialogue system can promote the teaching effect of language courses. Scholars in South Korea, Japan, Iran, the United States, and other countries have found that the phonetic dialogue system plays a positive role in vocabulary pronunciation and knowledge construction in language teaching [4–6]. The combination of voice dialogue system and English teaching makes teaching methods more possible. For lower grade students, the voice dialogue system is very interesting, and students' interest in learning will be greatly improved. Students can communicate with the voice dialogue system at any time, not limited to 45 minutes in class. The voice dialogue system breaks the situation that learners are unwilling to speak. From the perspective of teachers, the number of English learners is large every year, and the voice dialogue system can make up for this deficiency and reduce the teaching pressure of English teachers [7–9]. Moreover, with the development and prosperity of Internet technology, online teaching is gradually popularized. The combination of voice dialogue system and online

English teaching can give full play to the role of voice dialogue system and improve the learning efficiency of English learning [10].

In the current research, the application of the voice dialogue system in teaching is mainly concentrated in Asian countries with English as a second language, which aims to improve students' accent in English learning. The voice dialogue system and online English teaching are not perfect, and this type of teaching method has not been widely popularized [11–13]. At this stage, more conventional teaching methods include teaching methods based on deep learning, integrating teaching resources by using deep learning related technologies, establishing the relationship between teaching resources and disciplines by using learning methods with the characteristics of fragmentation, miniaturization and multitasking, and obtaining accurate teaching through repeated extraction and iteration of teaching resources to realize personalized learning. However, in the face of the increasing business volume, the teaching methods in the network environment cannot adjust their own load in time, which is prone to inclined resource allocation and collapse of the teaching environment, and the practicability needs to be further improved [14]. In the teaching method based on WEB framework, multiuser real-time online teaching function, real-time online Q&A, and other functions are realized. There is no practical solution to the above problems of increased business volume and heavy load. The normal progress of teaching is often ensured by adjusting the number of online people, with low teaching efficiency and poor user experience [15]. There are the same problems in the online teaching method based on text analysis. Although it strengthens the understanding of English teaching content, it is more theoretical knowledge and has obvious shortcomings in practical communication [16]. Therefore, the environmental resource allocation and online English teaching based on the voice dialogue system are proposed. The voice dialogue system is used to simulate the English teaching dialogue. According to different English teaching tasks, the dialogue system is divided into task-based dialogue and open chat dialogue, aiming to complete the specific teaching tasks in specific situations through different dialogue teaching. While cultivating students' oral English, they can further understand the logic of English language.

The Internet of things (IoT) is a network that collects information in real time through a variety of sensing devices, radio frequency identification, positioning, scanning, and other technologies. It also realizes a ubiquitous connection between things and things as well as between things and people through various possible network access, and it manages the information that it has gathered in an efficient manner. At this point in time, Internet of Things technology is capable of successfully realizing the collection of data information, as well as storage, processing, interconnection, and application of that data [17, 18].

This study contributes in the Internet of Things technology to the information collection process at different ends of the online education system and designs a new interactive English online teaching system by using IoT technology.

As a result, the time it takes to access the contents of the online English teaching courses is significantly reduced, which helps alleviate the issue of delay.

When students talk with the voice communication system, they make full use of systematic and relevant responses to improve the naturalness of students' English communication, and the automation and intelligence of the voice dialogue system also reduce the teaching pressure of English teachers. To sum up, there are still great challenges in the research of online English teaching. Taking the voice dialogue system as an auxiliary, allocating teaching environment resources reasonably, and helping complete the teaching tasks of online English will help solve the problems existing in the above conventional online teaching methods. It will also further improve the functions of online English learning. At the same time, with the continuous development of voice dialogue system, it will show more excellent performance in English teaching.

2. Environmental Resource Allocation and Online English Teaching Design Based on Voice Dialogue System

2.1. Design of Student Aid Mode Based on Voice Dialogue System. In English teaching, the dialogue function needs to be supported by a large number of words, and the phonetic dialogue system is used as an auxiliary for learners' English learning to help learners correct English pronunciation and cultivate good pronunciation habits [19]. In the design of student aid mode, according to the English teaching content, the corresponding vocabulary information table and dialogue table are designed to realize dialogue with learners and speech recognition [20]. The details can be seen in Tables 1 and 2.

In the free dialogue, the speech information is generated from Table 1 and Table 2. The semantic matching information of candidate replies is obtained through each round of discourse and reply, mainly from words and fragments [21]. Firstly, the tool is used for pretraining on the data set of multiple rounds of dialogue to obtain the word vector representation. Then, for the discourse s and candidate response r of each given round of dialogue, each word in s and r is mapped into a word vector representation $[l_{s,1}, l_{s,2}, \cdots, l_{s,n_s}]$ and $[l_{r,1}, l_{r,2}, \cdots, l_{r,n_r}]$ through the pretrained word vector matrix. n_s and n_r is the number of words in s and r, respectively. l represents the word vector [22, 23].

After obtaining the semantic representation of context and reply at word level granularity, each round of discourse is matched with the reply in the context to obtain the matching matrix Y_1. The element in row i and column j of Y_1 is calculated as follows:

$$l_{1i,j} = l_{s,j}^T l_{r,j}. \tag{1}$$

Match matrix Y_1 and calculate the similarity between the words in each round of discourse in the context and each word in the candidate reply and model the matching degree of the context and reply at the word level granularity. For

TABLE 1: Vocabulary information.

Name	Type	Length	Primary or not
W_id	Int	9	Yes
Unit	Int	6	No
Property	Varchar	50	No
Content	Varchar	80	No
Interpretation	Varchar	80	No
Example	Varchar	255	No
Is_word	Int	2	No

TABLE 2: Voice dialogue table.

Name	Type	Length	Primary or not
S_ID	Int	9	Yes
Unit	Int	4	No
Sentence	Varchar	255	No
Sequence	Int	4	No
Role	Varchar	50	No

fragment level granularity matching, the sequential relationship between words in sentences is modeled. The hidden layer representation of each word contains the semantic information of text fragments from the beginning to the current position in the text [24–26]. Therefore, the GRU model is used to model the discourse and candidate reply of each round of dialogue, respectively. GRU is represented as fragment GRU, including context fragment GRU and candidate reply fragment GRU. The word vector representation of each word in s and r is transformed into hidden layer vector representation containing text fragment information $G_s = [g_{s,1}, g_{s,2}, \cdots, g_{s,n_s}]$ and $G_r = [g_{r,1}, g_{r,2}, \cdots, g_{r,n_r}]$. Taking G_s as an example, any $g_{s,i}$ in G_s is calculated. The calculation formula is

$$g_{s,i} = \tan\left(S_g\left(r_i \cdot g_{s,j-1}\right)\right). \tag{2}$$

After obtaining the semantic representation of the context and reply at the fragment level, the hidden layer representation of the context and reply fragment GRU is used to construct the matching matrix Y_2. The element in row i and column j of Y_2 is calculated as follows:

$$l_{2i,j} = g_{s,i} A g_{r,j}^T. \tag{3}$$

In the formula, A represents the parameters of bilinear transformation, and the matching degree of context and reply at fragment level granularity is calculated by bilinear transformation. The convolution operation is performed on Y_1 and Y_2, and the output result is represented by a low dimensional vector, that is, the semantic matching vector. Each semantic matching vector represents a group of voice conversations, allocates environmental resources for each group of voice conversations, designs the allocation scheme, and realizes one-to-one teaching assistance.

2.2. Design of Environmental Resource Allocation Scheme. In order to maximize the utilization of environmental resources, environmental resources are allocated for each group of matching results, and a reasonable allocation scheme is designed. Considering that the dispatcher in the voice dialogue system selects a group of matching results for resource transmission at the same time, the schematic diagram of fair scheduling of corresponding environmental resources is shown in Figure 1.

For the fair scheduling shown in Figure 1, if and only if for any scheduling algorithm:

$$\sum_{u \in U} \frac{v_u^{(c)} - v_u^{(z)}}{v_u^{(z)}} \le 0. \tag{4}$$

The formula U represents the set of matching results, and $v_u^{(c)}$ represents the average transmission bit rate of user u obtained by scheduling algorithm c. It can be seen from formula (4) that the average data transmission rate of each group of matching results can be optimized by using proportional fair scheduling [27, 28]. That is, after proportional fair scheduling, increasing the average data transmission rate of any group of matching results will reduce the average data transmission rate of other groups, and the sum of the average data transmission rate decreases of all other results will be greater than the increased average data transmission rate. This definition is equivalent to defining proportional fair scheduling by logarithm:

$$Z = \arg\ \max_c \sum_{u \in U} \log_l v_u^{(c)}. \tag{5}$$

At this time, proportional fair scheduling maximizes the logarithm sum of the average transmission rate of all users [29, 30]. When the voice dialogue system needs to select multiple groups of matching result transmission resources at the same time, fully consider the traffic overflow and adopt the equal allocation principle to schedule environmental resources, as shown in Figure 2.

Figure 2 shows the schematic diagram of environmental resource scheduling under the scheduling condition of multiple groups of matching results. In the system, targets with the number of N can be scheduled for parallel transmission at the same time, and one subchannel corresponds to a matching result. Therefore, there are not only single objective scheduling but also multiobjective scheduling in environmental resource scheduling. This puts forward higher requirements for the scheduling algorithm. It is necessary to develop multiobjective diversity in time and frequency at the same time to improve the data transmission rate of the system. The optimal solution of fair scheduling under the condition of multiobjective scheduling is

$$Z = \arg\ \max_c \prod_{u \in U} \left(1 + \frac{\sum_{u \in U} v_u^{(t)}}{(T-1)v_u^{(t)}}\right). \tag{6}$$

In the formula, t represents the time, and T represents the average window size. According to the above contents,
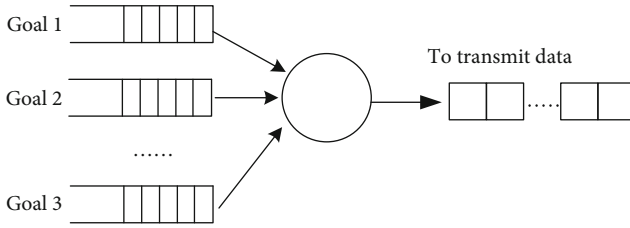
Figure 1: Schematic diagram of environmental resource scheduling of a single matching group.

the rational allocation of environmental resources can be realized under the condition of single goal and multiple goals. On this basis, an online English teaching framework can be established to realize online English teaching [17, 18].

2.3. Design Online Teaching Architecture. Compared with the current network applications with single channel (visual browsing or voice access) user interface, the future network applications will obviously have the characteristics of multichannel collaborative interaction. The access interfaces of multiple channels will be seamlessly connected together, so as to provide end users with strong mobility, rich user experience, and flexible access. In order to realize the multichannel interaction ability of online English teaching, the $X + V$ framework is used to design the online teaching architecture, as shown in Figure 3.

The architecture is based on W3C existing XHTML and VoiceXML specifications, injects a subset of VoiceXML tag library into XHTML, and can comprehensively use ready-made XHTML, XML Events, and VoiceXML technologies to develop a multimode platform, providing voice interaction ability for online English teaching.

When a user requests an $X + V$ page, the request is first sent to ASP.NET page. According to the user's request, call the background service, query the database to get the common words suitable for the user level, generate the $X + V$ page, and return it to the $X + V$ browser through HTTP protocol. The $X + V$ browser contains XHTML component, XML event component, and VoiceXML component. When the $X + V$ requested from the server arrives, the XHTML part of the page is directly translated by the XHTML component to generate an XHTML visual page. VoiceXML tags introduced by the VoiceXML namespace in a page are processed by the VoiceXML component. TTS speech synthesis module and AVR speech recognition module are called to generate and recognize speech and interact with users through external devices. There are two interaction modes between XHTML module and VoiceXML module. One is to interact through XML events, and the other is that VoiceXML fragments control DOM elements in the page by calling Javascript scripts. At the same time, by using ASP.NET dynamic page can easily expand the $X + V$ page, so as to expand other functions of online English teaching.

3. Analysis of Experimental Results

3.1. Experimental Preparation. After completing the content of environmental resource allocation and online English

teaching design based on the voice dialogue system, in order to verify the research results of environmental resource allocation and online English teaching, nearly 30,000 labeled voice data are manually marked for experimental research. Each piece of data has a corresponding label. The original text is represented by text, and the label is represented by label, for example, text: goodbye and label: goodbye. The data is divided into training set and test set according to the ratio of 9 : 1 of training data and test data. If the test set encounters decimal points, it will be rounded up. The experimental data includes 11 intentions in total, as shown in Table 3.

The length of word vector in each data in the table is 300, and the length of sentence is 20. Considering that the experiment is mainly comparative experiment, the same learning rate is set for each method used in the experiment, with a value of 0.01. The control group is the teaching method based on deep learning, the teaching method based on web framework, and the teaching method based on text analysis. Using the same experimental data, the experimental research is carried out from the two aspects of environmental resource allocation and online teaching and verifies the practicability of the designed online teaching method.

3.2. Experimental Results and Analysis of Resource Allocation Outage Rate under Different Traffic. For different stages of English teaching, there will be different traffic. Under the action of different traffic, an important parameter to measure the resource allocation performance of online English teaching environment is the resource allocation blocking rate. In the experiment, the resource allocation blocking rate is calculated through theoretical analysis and simulation experiments. The resource allocation frequency is set to 60, the access traffic is adjusted by changing the environmental resource allocation frequency, and the change of the environmental resource allocation blocking rate of each teaching method is observed when the total traffic is increasing. The experimental results are shown in Figure 4.

Figures 4 and 5 shows the experimental results of environmental resource allocation blocking rate of different teaching methods.

Method 1 shown in the figure represents the teaching method based on deep learning. Method 2 is the teaching method based on web framework. Method 3 is the teaching method based on text analysis, and method 4 is the proposed teaching method. By observing the experimental results of the environmental resource allocation blocking rate of each method shown in Figure 4, it can be clearly seen that the environmental resource allocation blocking rate increases significantly with the increase of business volume and frequency. Compared with the experimental results of each group, it can be seen in Figure 4 that the proposed teaching method faces the situation of increasing business volume. The blocking rate of environmental resource allocation is always at a relatively low level, and there is no significant change when the frequency is changed. Among the other three groups of experimental results, the blocking rate of environmental resource allocation increases significantly under the influence of traffic, especially when the frequency
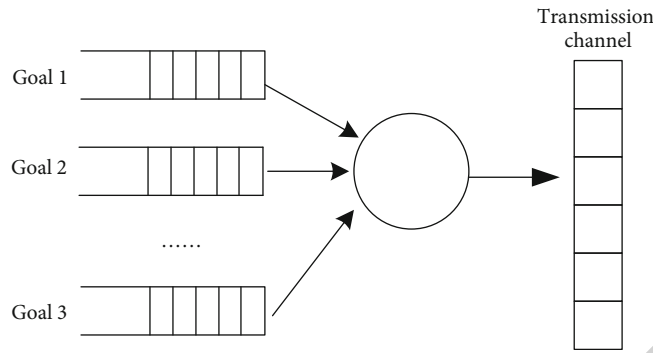
FIGURE 2: Environmental resource scheduling diagram of multiple matching results.
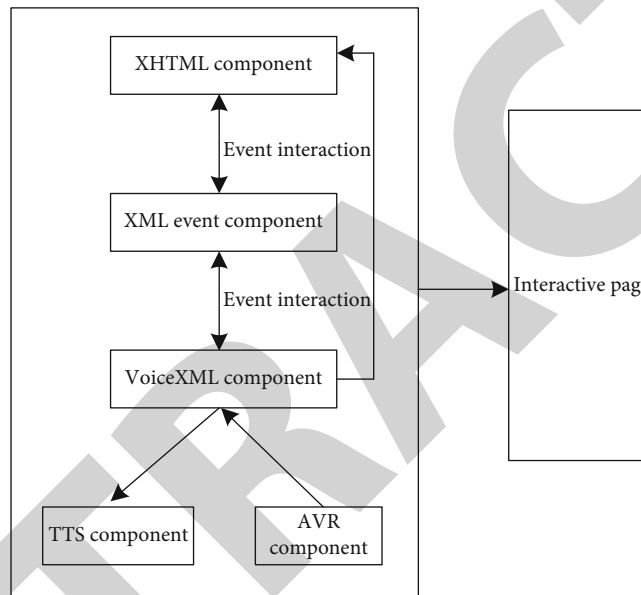

FIGURE 3: Online English teaching framework.

TABLE 3: Preparation of experimental data.

Type	Training set	Test set
Greetings	5376	597
Say goodbye to	7680	853
Thank	2062	229
Reply	7982	886
An apology	6463	718
Ask for instructions	1881	209
Invitation	4832	536
Doubt	6013	668

is relatively high. This is because the burst of overflow traffic leads to the increase of load. Conventional online teaching methods cannot adapt to this situation in time. The proposed teaching method based on the voice dialogue system uses the system as an auxiliary, which can adjust its own performance in time, so that the function of environmental resource allocation can be carried out stably and smoothly.

Figure 5 shows the experimental results of blocking rate of environmental resource allocation with frequency of 100.

3.3. Results and Analysis of Oral English Teaching Quality Evaluation Experiment. In the experiment, 20 boys and 20 girls were randomly selected as the test objects. In order to ensure the fairness and preciseness of the experiment, English teachers were specially invited to score the students' oral English. The test words are commonly used words. The words are divided into three categories, monosyllabic, disyllabic, and polysyllabic words. The number of words is 30, respectively. These three categories of words are tested. In the test process, the test words of each student are randomly selected. The quality of oral English teaching is measured by the difference between manual scoring and phonetic dialogue system scoring.

The scoring mechanism in the experiment is as follows. Since the speech dialogue system scores by obtaining the three features of speech, SMFCC, volume intensity, and pitch trajectory, the three feature parameters of standard speech and test speech are obtained, respectively, and the
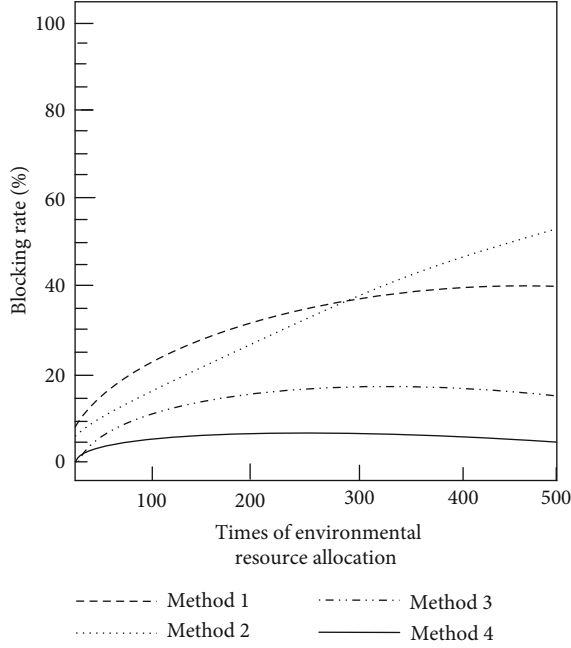
FIGURE 4: Experimental results of environmental resource allocation blocking rate at frequency 60.
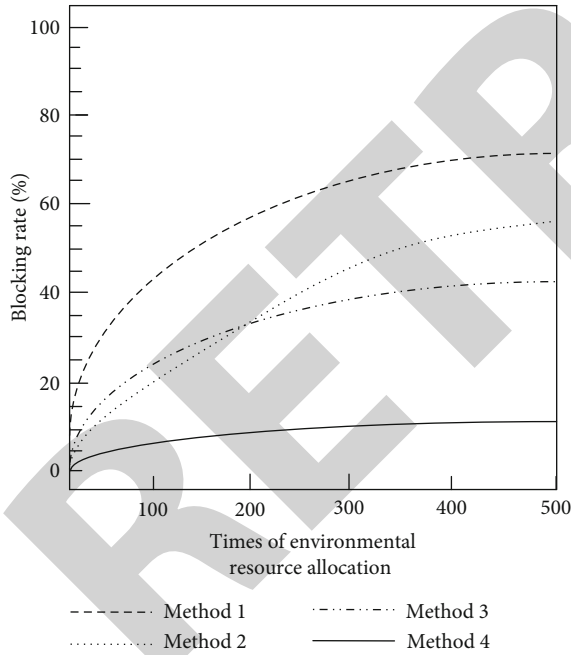

FIGURE 5: Experimental results of blocking rate of environmental resource allocation with frequency of 100.

SMFCC feature parameters are normalized by the Cepstral Mean Subtraction algorithm. The parameters of volume intensity and pitch trajectory are normalized in order to eliminate the interference of external factors (microphone, tone length difference, etc.) on the comparison results. For volume intensity, interpolation is used to solve the problem of different phoneme lengths, and linear scaling is used to

solve the problem of microphone differences. For the pitch trajectory, the interpolation method is still used to solve the phoneme length, while the linear translation method is used to solve the pitch difference.

Finally, the distance between the three feature data in the two speech is calculated, respectively. The greater the distance, the smaller the speech similarity, the smaller the distance and the higher the similarity. Through this distance, two thresholds can be set to obtain the similarity score. After repeated experiments, the final scoring formula is as follows:

$$E = \frac{1}{1 + a(\omega)^b} \times 100\%. \quad (7)$$

In this formula, a and b can be obtained by multiple experimental data tests. In order to obtain two parameters a and b, a voice with high pronunciation similarity (90%) compared with the standard voice is used as a test voice, and the distance between the two is about 2.5. A voice with low similarity (20%) compared with the standard voice is used, and the distance between the two is about 11; so, the value of a and b can be obtained. The threshold sum a and b of these two parameters can be calculated through multiple groups of data. ω is the calculated distance. E is the two speech similarity.

Since three characteristic parameters are used to obtain the final similarity score in the evaluation of oral English teaching quality, after speech preprocessing, the three characteristics of SMFCC, volume intensity, and pitch trajectory are calculated, respectively, and then the distance of the three characteristic parameters are calculated as ω_1, ω_2, and ω_3. The final score is obtained by the following formula:

$$E_{\text{oll}} = \frac{1}{1 + a(\omega_1)^b} + \frac{1}{1 + a(\omega_2)^b} + \frac{1}{1 + a(\omega_3)^b}. \quad (8)$$

The teaching quality evaluation value of each online teaching method is obtained through the above formula calculation. The specific experimental results are shown in Table 4.

By comparing and observing the data in Table 4, it can be seen from the distribution of the data in the table that the teaching quality evaluation scores of the teaching methods based on in-depth learning and teaching methods and web framework are relatively low, most of them are above the pass line, and a small number do not reach the pass level, while the teaching methods based on text analysis and the proposed online teaching methods have relatively high teaching quality evaluation scores. In particular, the proposed online teaching method has an overall evaluation score of more than 90 and maintains a relatively high score in the data test and analysis of each group, which shows that the application of the voice dialogue system effectively improves the oral teaching quality of online English teaching. Combined with the experimental results of environmental resource allocation blocking rate, it can be seen that the online teaching method based on the voice dialogue system has stable and reasonable environmental resource allocation,

TABLE 4: Experimental results of oral English teaching quality evaluation.

Method	Data set type	E_{oll} (%)
Teaching method based on deep learning	Greetings	43.1
	Say goodbye to	49.2
	Thank	61.8
	Reply	40.1
	An apology	69.3
	Ask for instructions	56.6
	Invitation	76.3
	Doubt	61.2
Teaching method based on web framework	Greetings	55.7
	Say goodbye to	78.5
	Thank	51.6
	Reply	72.8
	An apology	55.4
	Ask for instructions	63.7
	Invitation	65.7
	Doubt	47.3
Teaching method based on text analysis	Greetings	90.5
	Say goodbye to	84.2
	Thank	74.3
	Reply	96.4
	An apology	86.9
	Ask for instructions	91.6
	Invitation	70.9
	Doubt	73.3
Proposed online teaching method based on voice dialogue system	Greetings	92.2
	Say goodbye to	96.2
	Thank	97.9
	Reply	93.2
	An apology	93.7
	Ask for instructions	98.9
	Invitation	98.9
	Doubt	99.5

high oral teaching quality, higher practicability, and better overall level than the conventional online teaching method.

4. Conclusion

In view of the lack of effect of online English teaching, this paper studies the application of voice dialogue system in English Teaching in order to improve learners' oral learning effect. Based on the current teaching textbooks and assisted by the voice dialogue system, this paper designs and implements the environmental resource allocation and online English teaching based on the voice dialogue system. The main research contents include the design of student aid mode based on voice dialogue system and the design of online teaching framework. After the design is completed, through the experiment of the designed online English teaching method,

it is proved that the designed online English teaching method can realize the functions of oral practice, free dialogue, and basic accompanying learning function and enhance learning interest. However, the online teaching method designed in this paper has some shortcomings and needs to be further improved. The effect of speech recognition needs to be improved. The speech recognition engines of the speech dialogue system have differences in English speech recognition, and the recognition success probability is relatively low. On the one hand, it may be caused by the learners' own English ability; on the other hand, it may also be affected by the speech recognition engine. In the follow-up research, the use effect of more excellent speech recognition services in actual teaching can be tested and compared, and speech recognition service with good recognition effect can be selected to provide better help for online English teaching.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The author declares no conflicts of interest.

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