Measurement: Sensors 33 (2024) 101205

Contents lists available at ScienceDirect

Measurement: Sensors

journal homepage: www.sciencedirect.com/journal/measurement-sensors

Application of task processing system based on wireless sensor network in English writing intelligent assistance platform

Ma Li, Wang Ye *

Shijiazhuang Medical College, Shijiazhuang City, Hebei, 050000, China

ARTICLE INFO

Keywords:
Embedded task processing system
Intelligent corpus
Software development
Data mining

ABSTRACT

With the widespread use of 32-bit embedded task processing systems, embedded systems are used in various fields. Traditional software development is gradually being replaced by development methods based on embedded operating systems. The built-in processing system inherits the entire operating system and retains its core components, including thread synchronization and exclusive access to individual resources. However, embedded system resources are relatively limited, and operating requirements are more complex and flexible, which makes the development of embedded operating systems more complicated and difficult than general PC systems. The corpus as the basic intelligent corpus is the research capital used by scientists to study language, and it is also an important part of English writing teaching. In fact, after European linguists represented by Jeffrey Ritchie proposed the application of smart corpus to the teaching of English writing, smart corpus entered the field of view of scientists. This means that smart corpus will become an indispensable part of linguistics. This research method expands the research method of English writing, covering two main aspects: speech output and language error analysis. The application of this research method to the teaching system of English writing is mainly reflected in "language error analysis". This article discusses corpus-based English writing. In addition, in order to enrich the application influence of the English teaching management system, the system discussed in this article aims at the optimization of the teaching system and has designed more useful functions (such as English broadcasting, personal center users, system settings, etc.), so that students can learn more. It is easy to record their English learning status and enrich the content of English courses.

1. Introduction

Now, if the embedded task processing system is widely used, exploring the software development model of the embedded system will have great theoretical and practical value for the task development of the entire field [1]. This paper proposes a multi-task software development program, which absorbs the advantages of multi-task operating system and layered architecture, avoids the problems caused by oversized software systems, and introduces the component ideas of general software systems to integrate All functions of the software. Embedded software is gradually divided into a smaller and more versatile component library, which is complete and ensures the reusability of the software, and further enhances the development of embedded software systems [2]. At the same time, a software development name for embedded software development is proposed, which can hide business logic and improve the reusability, scalability, and follow-up of software maintenance. Based on this, we have performed an overall intelligent processing of the intelligent corpus [3]. As linguists continue to deepen their research on intelligent corpus linguistics, intelligent corpus linguistics methods are widely used in English writing teaching. In the study of English writing teaching, the corpus method is used to simulate the characteristics of learning, from qualitative subjective research to multi-scientific mixed, scientifically valuable, and the development of students' language achievements [4]. The research work expands the research methods of English writing, covering two main aspects: phonetic production and language error analysis. This research method is applied to writing teaching. The advantage of English feedback teaching is especially in the corpus-based feedback mode of English writing teaching [5].

An English teaching management system based on blended learning, guided by constructivism, multiple intelligence learning theory and contextual research theory, combined with research status, development status and application prospects, studied the optimization of English teaching system and used Android Studio tools, SSH development

* Corresponding author.
E-mail address: wangchangbin0805@163.com (W. Ye).

https://doi.org/10.1016/j.measen.2024.101205
Received 22 January 2024; Received in revised form 23 March 2024; Accepted 4 May 2024
Available online 6 May 2024

framework and The overall requirements for the design and implementation of SQLite database technology for language teaching and the applicability of the English Management Department in blended learning [6]. In English writing courses, feedback writing is an important teaching method, and feedback theory provides a strong theoretical basis for this teaching process. Feedback plays an important role in students learning English. Students can effectively identify the shortcomings of teaching feedback, overcome shortcomings, improve writing skills, and provide students with the most effective English teaching [7, 8].

2. Related work

Literature proposed a general multi-task integration and communication method based on the message mechanism [9]. The message mechanism is used to modify various complex task interaction methods in the existing operating system, thereby fully guaranteeing the degree of freedom between different tasks, and further ensuring the software's design requirements for "high integration and low connectivity", and will improve the sustainability and scalability of the software [10]. Literature proposes a unique management method based on system events to encapsulate hardware components, complete the separation of software and hardware, and at the same time ensure that the processing speed is reduced without causing conflicts, and the difficulty of developing internal systems is reduced [11]. The author of the literature explored the corpus-based written feedback teaching model from the perspective of teachers, and through the analysis of the results of teacher interviews, came to the following conclusions: First, rural high school students have poor English foundation and weak English writing ability. Very limited; Secondly, in experimental teaching based on corpus, the teaching effect of written feedback mode is better, and students have made significant progress. Third, this teaching method requires teachers to have high professional knowledge and computer knowledge, and it takes a lot of time to prepare for the course, so it is not easy to popularize in actual teaching operations. Literature designed and implemented multimedia game teaching function modules for the general classroom teaching methods and poor teaching environment, and adopted the Chinese-English contrast method for the management of multimedia teaching such as text, audio, and video [12,13]. Improve traditional classroom teaching methods and teaching content, further enhance students' learning motivation, and improve students' learning efficiency. Literature firstly describes the importance of English teaching management system meeting the requirements of blended learning, and discusses related topics and the research background of related topics at home and abroad [14]. Then use software engineering technology for detailed demand analysis and design, and finally use Android Studio tools and SQLite database to implement a fully functional and better-performing English teaching management system on Android mobile terminals [15].

3. Intelligent corpus based on embedded task processing system and design of optimization model for English writing teaching

3.1. Smart corpus

Neural repetitive networks (NNR) are able to recall previous nerves, that is, not only must the current nerve inserted, but also the previous neural pattern must be considered. The typical structure of RNN is shown in Fig. 1. As can be seen from the figure, for repeated neural networks, this neural network has 3 layers, namely the input layer Xt, the hidden layer A and the output layer h. In the upper three layers, the circular arrow line is used to show the state of the current hidden layer A.

The structure of the enhanced RNN is shown in Fig. 2. From the figure, we can clearly see the data transmission between hidden layer A.

The nature of the RNN chain indicates that this factor is related to

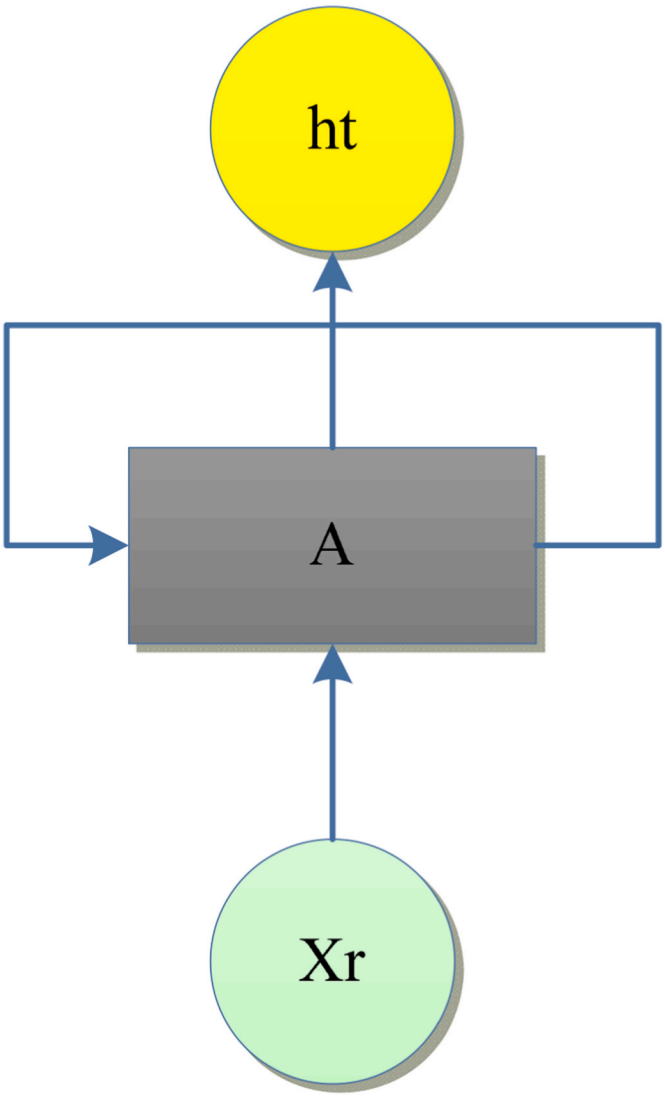

Fig. 1. Typical RNN structure diagram.

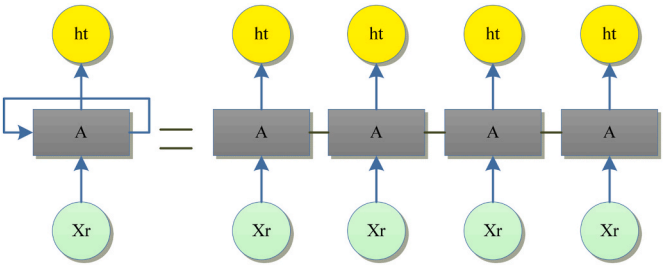

Fig. 2. Expanded RNN structure diagram.

sequencing and listing. (1) is the formula used to calculate the hidden layer of the RNN.

$$ht = \sigma\left(\mathrm{Wf}[h_{t-1}, x_t] + b_f\right) \tag{1}$$

The calculation of the hidden layer of the RNN is a complete connection and the basic unit of control information transmission. In order to enable the respondent to consider the information sorted in a specific time interval during the conversation, the historical record usually retains a collection of time-based words. However, RNN also has shortcomings. The working principle of RNN is similar to the process of

understanding objects in biological neural networks. It uses the direction evolution information of the sequence through the pre-existing direction loop in the hidden layer. In theory, RNN has storage capabilities, but in practical applications, RNN reveals the dependency problem that always exists. The problem here is that if a repetitive neural network is used to predict the result of the next word, the word may be related to the word entered above. However, because the gaps between previously inserted words are very large, RNN models usually focus on the most recently inserted words to minimize loss and limit the length of previous words. This is due to the fact that the length range of the dependent RNN does not include words that appear for a long time. This type of problem is called the gradient loss problem of repeated neural networks. Long short-term memory model.

Long Short Term Memory is called LSTM, which is a special type of repetitive neural network, which was born to solve the problem of long-term dependence on traditional repetitive neural network. The LSTM model was originally proposed by Hochreiter and Schmidhuber in 1997, but now Alex Graves has improved the commonly used LSTM model. Today LSTM models are very successful in many fields of science and technology. The network structure model designed by LSTM is based on the gradient learning algorithm, which solves the always existing problems. Both RNN and LSTM have the repeating chain structure of neural networks. In RNN, the structure of the repeating network module is very simple, while the repeating module in LSTM is more complicated. It usually includes a four-layer structure, each of which communicates in a more specific way.

The most critical part of LSTM is the state of the battery, just like a conveyor belt. The status of the unit runs on the conveyor belt, and the information carried by the unit status can be automatically transmitted through the conveyor belt. LSTM uses a fixed structure and relies on the forget gate structure to selectively influence the state of the unit. The so-called "gate" structure is an alternative way of leaving information. This structure functions like a door. If the sigmod output is 1, it means that the door is open and can pass. If the output is 0, it means that the door is closed and information is not allowed to pass through the door.

We use formulas (2) ~ (7) to describe the structure of a loop of LSTM:

Enter the gate:

$$i_t = \sigma(W_i * [h_{t-1}, x_t] + b_i) \tag{2}$$

Forgotten Door:

$$f_t = \sigma\left(W_f * [h_{t-1}, x_t] + b_f\right) \tag{3}$$

Candidate memory unit:

$$\widetilde{C}_t = \tanh(W_C * [h_{t-1}, x_t] + b_C) \tag{4}$$

Current time memory unit:

$$C_t = f_t * C_{t-1} + i_t * \widetilde{C}_t \tag{5}$$

Output gate:

$$o_t = \sigma(W_o * [h_{t-1}, x_t] + b_o) \tag{6}$$

Output:

$$h_t = o_t * \tanh\,(Ct) \tag{7}$$

The encoder-decoder model relies on the X input sequence to generate another Y-type output model. The structure of the encoder-decoder model is shown in Fig. 3. Encoding generally refers to the encoding of input data to form a semantic vector C with a fixed length through an encoder, and decoding means to decode the semantic vector C with a fixed length in the output sequence Y in the encoder. The encoder-decoder model has a variety of application scenarios, and representative applications include query response and machine translation systems. Here is an example of a question and answer system. The input sequence X represents the content of the initiated dialogue, and the response sequence represents the output sequence Y.

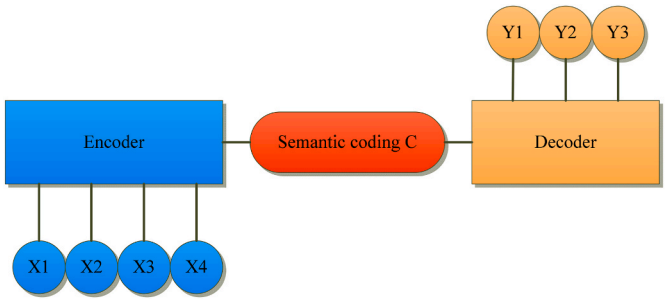

Fig. 3. Encoder-Decoder model.

This mode is easy to understand because the user enters a paragraph, and then creates another paragraph by encoding and decoding the Encoder-Decoder model. As for the entry paragraph and the exit paragraph, whether they are the same or not, they are composed of their respective word order:

$$X = \{X_1, X_2, X_3, \ldots X_n\} \tag{8}$$

$$Y = \{Y_1, Y_2, Y_3 \ldots Y_n\} \tag{9}$$

The intermediate semantic vector c is obtained from the input sequence X = {X1, X2, X3, … Xn} through the encoder. That is, all the information carried by the insertion sequence will be stored in the intermediate semantic vector.

$$C = F\{Y_1, Y_2, Y_3, \ldots Y_n\} \tag{10}$$

The decoder Y is used to predict the output sequence Yn at time n. The prerequisite here is to know the intermediate semantic vector C representing the context and the previously output 1, Y2, Y3 … Yn-1 sequence:

$$y_i = g(C, Y_1, Y_2, Y_3, \ldots Y_{n-1}) \tag{11}$$

If you want to generate the output sequence Yn, you must proceed step by step in order, just as you must pass one baton at a time. In practical applications, the training model used in the X coding sequence and Y decoding sequence is not specified, but the training model can be selected selectively. The lack of a suitable training model here means that it is the entire frame and the encoder and decoder in the same frame. The corresponding model can be selected according to actual needs. Common models of neural networks that can be freely provided to select encoders and decoders: CNN (Convolutional Neural Network), RNN (Recurrent Neural Network), GRU (Gated Neural Unit Neural Network), Bi-RNN (Bi-Running Recurrent Neural Network), LSTM (long-term short-term memory neural network), etc. These models can be assembled freely according to our own requirements. The formula for creating the RNN target sequence is shown in (12):

$$y_i = g(C, Y, S_t) \tag{12}$$

(12) In the formula, S represents the potential layer output by the RNN, C represents a fixed-length semantic vector encoded at the input, and g represents the possibility that each word in the generated dictionary belongs to Yn.

(2) Encoder-Decoder model of Attention mechanism.

Compared with the previous encoder/decoder model, the advantage of the attention model is that it is no longer necessary to encode all input data into a fixed-length vector C, but to encode a sequence of sequential vectors, and after each step, decode The process will select a subset of the vector sequence as the input value of the next decoder. Today, this model has made remarkable achievements in the field of translation. The calculation formula of the output sequence is as follows (13):

$$y_i = \mathrm{F}(C_i, Y_1, Y_2, Y_3, \ldots Y_{m-1}) \tag{13}$$

The semantic code C in the formula refers to the communication

space created by the accuracy of the X sequence in the coding position. Since the bidirectional RNN model is used for standard coding, it can be assumed that h is the i-th word arranged in the correct order of the standard coding. If the encoder uses the long memory neural network model and the short memory neural network model, the value of hj will represent the critical state of the potential time period X in the correct order of the encoding state. First, the method determines the value of the latent phase of the correction sequence at time X in the encoding state, and determines the sequence value of Yi at time X; (14) shows the structure of the suggested data.

$$C_i = \sum_{j=1}^{T_x} a_{ij} h_j \tag{14}$$

The aij of the formula calculated above is related to the probability of converting the j-th keyword into the i-th output word. The higher the value of aij, the more visible the i-th function is in the correct j-th function, and Tx represents the total number of elements X in the input sequence. If different models are used in the testing phase and the coding phase, they will also be different.

The CBOW text representation model is trained to find the maximum value of the objective function L, and the likelihood function formula of the objective function to optimize the logarithm is shown in (15):

$$L = \sum_{V \in P} \log p(V|\text{Content}\ (V)) \tag{15}$$

Projection layer: sum and accumulate the 2p word vectors in the input layer;

$$X_V = \text{SUM}\ \left(V_{t-p}, V_{t-p+1}, \ldots V_{t-1+p}, V_{t+p}\right) \tag{16}$$

Output layer: The task part of the CBOW text model is to use the number of occurrences of each word as the weight of the Hoffman principle.

Hierarchical Softmax (hierarchical softmax function) is an important technique for improving vector generation. The neural model no longer uses the Huffman tree, but uses the neural modeling method, using the Huffman tree to replace the normal neural network. The network can use the Huffman tree to achieve the purpose of improving the quality of the model in Hierarchical Softmax, which first reduces the inefficient samples. The construction summary of CBOW model is based on negative simulation, which is a combination of negative simulation method and softmax algorithm. NEG(V) represents a subset related to positive samples. The label LV(V) of word V is shown in (17):

$$L^{\nu}(V) = \begin{cases} 1, \widetilde{V} = V \\ 0, \widetilde{V} \neq V \end{cases} \tag{17}$$

The CBOW textual representation model based on an exemplary poor command line is not applied to the Huffman principle. During the training process, there is no need to enter the entire sample library, and only NEG will delete a large number of keyword samples to complete the sample training. The objective function is shown in (18):

$$g(V) = \prod u \in \{V\} \cup NEG(V) p(u|\text{Context}\ (V)) \tag{18}$$

Among them:

$$p(u|\text{Content}\ (V)) = \begin{cases} \sigma\left(x_V^T \theta^u\right), L^V(u) = 1 \\ 1 - \sigma\left(x_V^T \theta^u\right), L^V(u) = 0 \end{cases} \tag{19}$$

The basic concept of Skip-gram (Continuous Skip-gram Model) is very simple, similar to the correlation of the CBOW model. The former uses historical knowledge to predict current words, while the latter uses current words to predict history. That is, the standard deviation of the Pi arrangement items is predicted according to the input item V, and the method of determining the Pi arrangement order according to the current V item can be expressed as: P(pi/V).

The likelihood function of the training objective function is:

$$L = \sum v \in p \log p(\text{Content}\ (v)|v) \tag{20}$$

The calculation process of the objective function is as follows:

$$p(\ \text{Content}\ (v)|v) = \prod_{u \in \text{Context}\ (V)} p(u|v) \tag{21}$$

Input layer: This layer is for 2p word vectors V, using Vi. p, Vi-p+1, Vt-l + p, Vtp represents; projection layer: This layer is for 2p words input in the input layer The vector is accumulated and summed;

Output layer: The basic functional components of Skip-grap represent the use of the number of occurrences of each word in the corpus as the weight to form the Huffman tree.

Make basic corpus by putting the articles written by students in Microsoft Office 365. Since then, the "automatic collection" function in Microsoft Office 365: Word is used to mark the compilation of sample classes and execute commands on the auxiliary computer. Due to the students' limited English ability, they decided to use Chinese to control the rules. According to research needs, there will be complex or concise coding, which may be difficult or simple. Labeling and labeling methods should be adjusted according to the implementation of the model. For students in rural areas with weak English proficiency, they lack sufficient understanding of abbreviated English terms, and the use of the English Code of Conduct formulated by language researchers in research errors is a direct factor. Therefore, this research finally adopted Chinese codes suitable for the comprehension ability of rural junior high school students. Finally, use the "conversion" function in Microsaft Office 365: Ward to convert the document from the doc. format to the txt. format with the code "Unicode (UTF-8>", forming a corpus search tool-AntCanc 3.5.8 The recognized small corpus.

In order to conduct an accurate investigation, the author used AntConc 3.5.8 retrieval tool to retrieve the student corpus. AntC anc 3.5.8 is the most widely used corpus search software in the corpus industry. Even if there is no complete analysis function, it has the advantages of easy operation, fast movement and clear communication retrieval, which is very suitable for teaching. AntConc 3.5.8 can quickly and easily analyze content through word search, search history, word statistics and analysis tables.

3.2. Embedded task processing algorithm

Process: Process is the action of running a program with independent functions at a specific data collection point. This is a dynamic volume of ideas and activities. Not only the program code, but also the actions currently taking place, these actions are displayed by the value of the program counter and the contents of the register.

Thread: Thread is the main component of independence and self-organization of independent operation. It is smaller than the process and does not take up resources. In some cases, it can be understood as a lightweight process.

Task: An activity completed by software, either a process or a thread.

Process state switching: In cyclic operation, state operations are used to reflect the operational changes of different processes at different times. State is a commonly used function, usually has five functions: new state, end state, state, running state and state, the image conversion state is shown in Fig. 4.

In all structural plans, there is a concept of priority work. The so-called priority refers to the specific attributes added to the task according to the value of the task and the accuracy of the task. When the priority is high, important tasks need to be processed, and the CPU can be retrieved quickly at the set time interval. For experimental research, suppose that the priority of task t assigned to work T is p = i, and the larger the value, the higher the priority, the minimum priority is 1, and the maximum priority is k.

For the time scheduling strategy, due to mutually exclusive access to resources, non-priority tasks are hindered by high-priority tasks, which

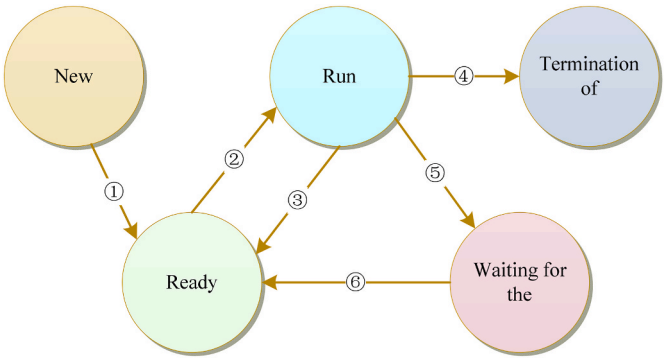

Fig. 4. Process state switching.

involves the scheduling of tasks in the system. In order to study the preemptive scheduling strategy, the following hypotheses are proposed.

1. There is no idle task in the system, that is, the CPU enters the idle state.
2. After high-priority tasks appear, high-priority tasks immediately acquire CPU resources.

For a given task set T = {ti=(ri, si, ni, wi)|1≤i ≤ k}, the effective utilization of the entire CPU is defined as:

$$U=\frac{\sum_{i=1}^{k}\mathbf{r}_i}{\sum_{i=1}^{k}r_i+\sum_{i=1}^{k}n_i*s_i+\sum_{i=1}^{k}w_i} \tag{22}$$

Assuming that there is no idle state in the CPU in the system, we can get:

$$U=\frac{\sum_{i=1}^{k}\mathbf{r}_i}{\sum_{i=1}^{k}r_i+\sum_{i=1}^{k}n_i*_{si}} \tag{23}$$

When ri → ni * si,

$$\sum_{i=1}^{k}r_i\rightarrow\sum_{i=1}^{k}n_i*_{si} \tag{24}$$

The effective utilization of CPU can be obtained:

$$U=\frac{\sum_{i=1}^{k}r_i}{2\sum_{i=1}^{k}r_i}=50\% \tag{25}$$

When ri ≫ ni * si,

$$\sum_{i=1}^{k}\mathbf{n}_i^*s_i\rightarrow0 \tag{26}$$

The effective utilization of CPU can be obtained:

$$U=\frac{\sum_{i=1}^{k}\mathbf{r}_i}{\sum_{i=1}^{k}r_i}=100\% \tag{27}$$

When ri ≪ ni * si,

$$\sum_{i=1}^{k}r_i\rightarrow0 \tag{28}$$

Therefore, the effective utilization of CPU resources is 0.

Therefore, it can be concluded that in the preemptive scheduling strategy, the effective use of the CPU is related to a limited number of tasks and the cost of mobile tasks. In order to improve the efficiency of CPU resources, the number of options and the number of task switching should be reduced.

For the setting of non-preemptive scheduling strategy, the executable operation is to use the RTC method. There are two main implementation methods: first-in first-out and non-priority based on FIFO. The FIFO-based scheduling strategy is expected to put all running tasks into the schedule from the end, and the scheduler will execute these tasks from the beginning of the line. This classification method is easy to implement, has strong advantages, and does not involve priority work. However, it is difficult to control the time due to the uncertainty of the work block and workflow. This article first studies the unselected prioritization method.

The preemptive scheduling strategy with threshold is mainly to solve the frequent on-site switching caused by frequent preemption between tasks in the traditional preemptive scheduling strategy, save scheduling costs, and improve the effective utilization of CPU resources. In the preemptive scheduling strategy with threshold, task t has two priorities, which are the basic priority and the scheduling priority. The basic priority refers to the task waiting to be scheduled to use this priority setting priority to schedule the task to select the CPU resource, that is, pi, and the scheduling priority refers to the priority in the running mode after receiving the CPU resource, that is, pr. In order to reduce the time required to switch jobs, that is, pr > pi, the priority of the task will be increased after running in the running system to ensure the best use of CPU resources.

4. Intelligent corpus based on embedded task processing system and practical application

4.1. System overall framework design

The use of an English-based learning management system uses an SSH system to construct different system modules and replaces our school's traditional classroom learning model through Internet technology. Consistent with the foregoing content in the above three chapters, and build a server in the campus data service center. It usually involves three aspects: service records, service name space and management records. Data services are usually included in English service resources, user system services and software-related services. The background management activities are specially designed to make it easier for users to keep the background on the desktop of the English teaching management system. The local center provides teachers with English teaching and related teaching services. Fig. 5 shows the principles of the English teaching management system.

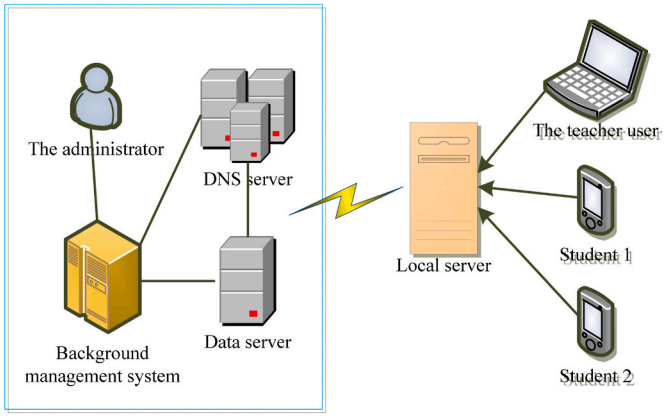

Fig. 5. System overall framework design.

The overall relationship structure of the English teaching management system is shown in Fig. 6.

4.2. Design of main functional modules of the system

The English teaching management system is suitable for blended learning that integrates different multimedia methods (such as images, text, audio, video, etc.), and uses the best learning environment to provide students with reading comprehension, English composition, English translation and online English courses in the school. And students can conduct self-assessment according to their own conditions, make learning plans, complete English learning activities systematically, and provide students with the ability to learn to make learning plans. Fig. 7 shows a summary of the main modules used in the English General Management System based on learning balance.

Login and registration are mainly for registering and managing users' personal information. In order to facilitate the registration of teachers and students, the system is designed to register through mobile phone numbers and emails. Most mobile phone registrants use mobile phone numbers. Enter the ID verification information, and then enter the user name and user password to fill in the personal information; the mailbox registrant first logs in with the mailbox account password, and then obtains the verification code by email to register the mailbox to the account, and the user enters the user name and user password again to fill in immediately Complete personal account;

In order to provide sufficient security for the user account, the user name is configured with a combination of letters, numbers and underscores; the user password is set to 6–20 case-sensitive letters and numbers; in addition, the system will also keep the phone number of the mobile phone registrant confidential And the email address of the registrant to improve personal safety. After successful registration, the user can enter the system login interface.

The English test is mainly to check the student's academic performance. Therefore, English video teaching and supporting tests are mainly used for English training. If students complete a stage video, they can take a small test. The exam module includes exams and test questions. When the student completes the test selection, the detection system will add the test and check the answer, and play the wrong questions with the key points in the video, so that the students can deepen their memory. When students complete the exam questions, they can click on another question to skip to the next exam question. The exam questions match the video. When the video progress is updated, the exam

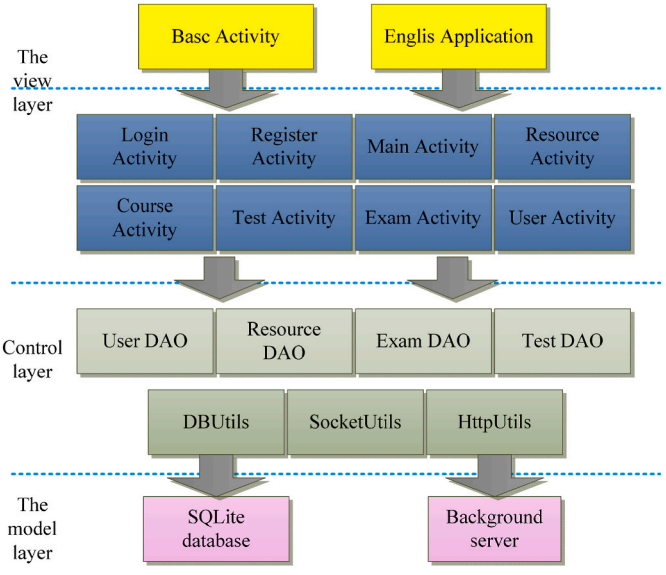

Fig. 6. Overall design of system class relations.

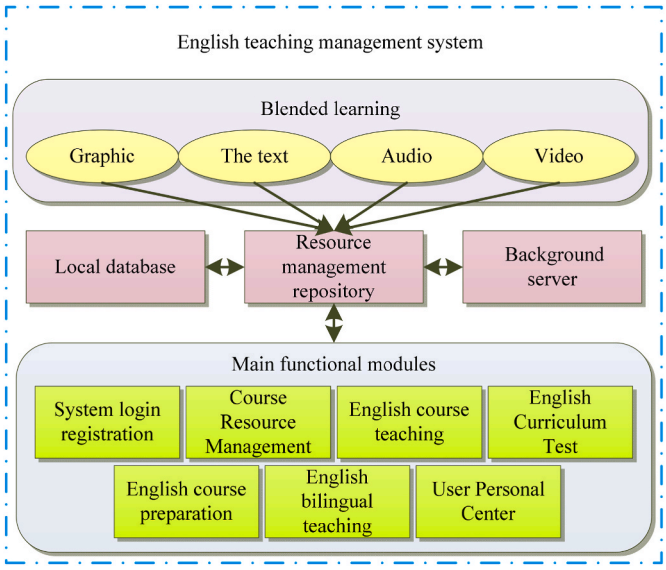

Fig. 7. The main functional modules of the mixed English teaching system.

questions and multiple-choice questions will also be updated at the same time.

The English course preparation model makes it easy for students to prepare and review English exams. For the English test, the standard English proficiency test scores mainly examine English vocabulary, listening English, speaking English, English grammar, reading comprehension, English grammar, etc. Therefore, in the subject of the exam, it is necessary to design the same checking mechanism to specifically check the activities of each module, and conduct these activities in an integrated manner in the "to-do list" so that students can combine to-do lists View and learn, so that students can easily complete the planned activities.

Secondly, all test preparation modules need to plan similar question banks, test question classification, test answers, detailed answers, etc., so that students can learn about the knowledge of the test content. Test questions are usually divided into categories such as education, science, life, health, and news. In addition, test scores and test answers should also be divided into multiple categories. After the students have completed the test questions, the system will display the test results to check whether the test content is correct, and create statistical information based on the test answers, so that the students can make a test plan based on their own equivalent situation.

4.3. System database design

As far as the subject of the main data is concerned, the main data table usually includes the organization personnel data table, the English course information table, the test class table, the class data table, the message table and other record tables.

(1) Organizational personnel data table: These fields usually include user ID, user account, user password, user mobile phone number, user mailbox, user type, registration time, user login time, etc. The table structure design is shown in Table 1:
(2) English course information table: It mainly includes fields such as course ID, course title, course type, course subcategory, course difficulty, course catalog storage link, course period number, course content description, course release author, course resource link and other fields. The structure design of the English course information table is shown in Table 2:
(3) Course exam information table: They usually have exam course ID, exam title, exam subject, exam course, exam time, exam

Table 1
User information user information table.

Field Name	Type of data	Length	Required fields	Description
Id(Kcy)	INTEGER	32	Yes	Number, indexed
use rnamc	TEXT	24	Yes	user account
password	TEXT	24	Yes	user password
telephone	INTEGER	24	no	User phone number
email	TEXT	48	no	User mailbox
type	INTEGER	4	Yes	user type
regtime	DATE	32	Yes	User registration time
logtimc	DATE	32	Yes	User login time

Table 2
English course information table.

Field Name	Type of data	Length	Required fields	Description
Id(Kcy)	INTEGER	32	Yes	Number, indexed
title	TEXT	32	Yes	Course title
catcgory	INTEGER	8	Yes	Course category
Subcategory	INTEGER	8	No	Course sub-categories
degree	INTEGER	4	No	Course difficulty
catalog	TEXT	256	No	Course catalog link
duration	INTEGER	4	No	Course period
content	TEXT	512	Yes	Course content description
author	TEXT	32	Yes	Course publishing author
url	TEXT	512	Yes	Links to Course Resources

answer, exam answer analysis, exam score and other fields. The structure design of the course examination information table is shown in Table 3:

(4) Course test information table: usually has fields such as course ID test, test title, test part, test content, test answer, test result, test time, etc. The course test information table is shown in Table 4:

(5) System message table: usually includes fields such as system message ID, system message title, system message content, system message category, system message creation time, system message sender, and system message status. The system information table is shown in Table 5:

4.4. System function test and performance test

The modeling process of testing whether the system can run correctly according to the required requirements, which proves the effectiveness of the physical system to a large extent. The test paper includes the main system communication module, English courseware module, English exam preparation module, English course exam forum module, and user interface module. The job modeling process usually includes two parts: test and exam. The system function test cases and test results of this article are shown in Table 6.

An example of using an English restriction strategy in a combined learning curve is to conduct basic research on the system's startup time, system data storage time, server response time, CPU and memory usage,

Table 3
Course exam information table.

Field Name	Type of data	Length	Required fields	Description
Id(Kcy)	INTEGER	32	Yes	Number, indexed
title	TEXT	32	Yes	Course Test Title
type	INTEGER	4	Yes	Course test category
content	TEXT	512	Yes	Course test content
answer	TEXT	8	Yes	Course test answers
analysis	TEXT	512	Yes	Test answer analysis
degree	INTEGER	4	no	Course test difficulty
time	DATE	32	no	Course test time

Table 4
Course test information table test information table.

Field Name	Type of data	Length	Required fields	Description
Id(Kcy)	INTEGER	32	Yes	Number, indexed
Title	TEXT	32	Yes	Course exam title
Content	TEXT	512	Yes	Course examination content
Type	INTEGER	4	No	Course exam type
Time	DATE	32	No	Course exam time
Answer	TEXT	8	Yes	Course exam answers
Analysis	TEXT	512	Yes	Exam answer analysis
Score	REAL	4	Yes	Course test score

Table 5
System news news information table.

Field Name	Type of data	Length	Required fields	Description
Id(Kcy)	INTEGER	32	Yes	Number, indexed
title	TEXT	32	Yes	Message title
content	TEXT	512	Yes	Message content
catcgory	INTEGER	8	No	Message category
time	DATE	32	Yes	Message creation time
people	TEXT	8	Yes	Message sender
status	INTEGER	4	Yes	Message status

etc., to ensure that the system meets the following requirements: specific user needs Allow users to obtain a more efficient system. Table 7 shows the test results of the test and experimental working model.

5. Conclusion

According to the characteristics of embedded systems, this article recommends a basic development concept of embedded systems and integrates software development methods. Use the concept of software engineering to improve program efficiency, make each module have a powerful "integration" function, shorten the communication "distance" between modules, further reduce the complexity of software development, and enhance the maintainability of the system.

Combining current case studies, the development and application of English management learning systems and English subjects, it proves that the English management system learning courses based on knowledge mixing must meet all these standards and students, such as English course management, and the use of Android Studio tools, SSH development Infrastructure and SQLite technology center to design and implement English management training for learning balance. The full text first gives a brief overview of the entire framework, and then further describes the scheduling structure classification, operation methods and basic management mechanisms. Finally, the programming method is executed by storing "defining" tasks and demonstrating the complete use of the system.

Ethics approval

Not applicable.

Credit author statement

Ma Li: Conceptualization; Data curation; Formal analysis; Writing - original draft; Wang Ye: Data curation; Formal analysis; Writing - review & editing.

Declaration of competing interest

The authors declare that there is no conflict of interests regarding the publication of this article.

Table 6
Main function test cases and test results.

Serial number	Functional module	Test case	Test Results
1	System start	Test case: Click on the icon of English course teaching system	Test result: successful
2	Toggle navigation bar	Test Case 1: Click-Home Test case 2: Gesture-training Test case 3: Gesture-mine	Case 1–3 successfully switched the navigation bar; Test result: successful
3	Test the menu bar	Test case 1: Gesture-click quality course Test case 2: Gesture-click on English radio Test case 3: Gesture-click bilingual video Test case 4: Gesture-click to radio podcast	Use cases 1–4 successfully jump to the corresponding menu module: Test result: successful
4	English Course Resource Management Module	Test Case 1: Materials for the teacher to complete the course Test case 2: Configure path source information Test case 3: Students view the original course Test Case 4: Students download course resources Test Case 5: Learning Course Resources	Use case 1–5 successfully implements related functions such as the course resource management module: Test result: successful
5	English course teaching module function	Test case 1: Play the English course teaching video Test case 2: Watch the English classroom teaching video Test case 3: Teaching and learning English courses	Use cases 1–3 successfully realize the function of English course teaching module: Test result: successful
6	English course preparation module function	Test Case 1: Create English Course Preparation Record Test case 2: Edit English course preparation questions Test case 3: Study preparation for English courses	Use cases 1–3 successfully realize the function of the English course preparation module: Test result: successful
7	Blended learning module function	Test case 1: Combination test for viewing text scripts Test case 2: Combination test for viewing images of test images Test case 3: Perform audio-text combined test Test case 4: Play mixed learning module video Test case 5: Online video and text mixed test Test case 6: Online video and text mixed learning Test case 7: Online audio and graphic mixed learning	Use case 1–7 successfully realized the English mixed learning module curriculum function: Test result: success
8	User personal center module function	Test case 1: Gesture-view personal learning records Test case 2: Gesture-view personal teaching records Test case 3: Gesture-view personal test records Test case 4: Gesture-view personal test preparation records"	Use case 1–6 successfully realized the relevant functions of the user's personal center module: Test result: successful

Table 7
Performance test cases and test results.

Serial number		Test case	Test Results
1	Test system response time	Use case 1: The recording script starts system 100 times, and the average startup time of the test system is less than 3s; Use case 2: The recording script adds, deletes, modifies and checks the system data 100 times, and the average response time of the test database is less than 3s; Use case 3: 100 users of the recording script module access the system at the same time, and the response time of the test system server is less than 3s; Note: The script recording tool is implemented by lodaranner	In line with expectations
2	Test memory and system CPU usage	Test method: Use the built-in DDMS tool (virtual debugging monitoring service) module to monitor the system memory and CPU: Test case: Operate each functional module of the smart community service system 100 times to check the running memory and CPU usage of the system:	In line with expectations

Data availability

Data will be made available on request.

Acknowledgments

There is no funding

References

[1] M.W. Aziz, N. Ullah, M. Rashid, A process model for service-oriented development of embedded software systems, IT Professional 23 (5) (2021) 44–49.
[2] V. Garousi, M. Felderer, C.M. Karapıcak, U. Yılmaz, Testing embedded software: a survey of the literature, Information and Software Technology 104 (2018) 14–45.
[3] L.B. Anderson, L.K. Paul, W.S. Brown, Emotional intelligence in agenesis of the corpus callosum, Archives of Clinical Neuropsychology 32 (3) (2017) 267–279.
[4] M. Hinton, Corpus linguistics methods in the study of (meta) argumentation, Argumentation 35 (3) (2021) 435–455.
[5] K.D. Vattoy, K. Smith, Students' perceptions of teachers' feedback practice in teaching English as a foreign language, Teaching and Teacher Education 85 (2019) 260–268.
[6] T.S.Y. Masadeh, A.I.M. Elfeky, Efficacy of open-source learning management systems in developing the teaching skills of English language student teachers, American Journal of Educational Research 4 (4) (2016) 329–337.
[7] K. Fadli, L.A. Irawan, H. Haerazi, English teachers' feedback on students' writing work in the new normal era: teachers' feedback; writing skills, Journal of Language and Literature Studies 1 (2) (2021) 83–92.
[8] A. Astrid, L. Marzulina, D. Erlina, K. Harto, A. Habibi, A. Mukminin, Teaching writing to efl student teachers: teachers' intervention and no teachers' intervention

through peer feedback writing techniques, Universal Journal of Educational Research 7 (9) (2019) 1901–1908.
[9] F. Wang, D. Jiang, Z. Wang, Z. Lv, S. Mumtaz, Fuzzy-CNN based multi-task routing for integrated satellite-terrestrial networks, IEEE Transactions on Vehicular Technology 71 (2) (2021) 1913–1926.
[10] Z. Meng, Z. Wu, C. Muvianto, J. Gray, A data-oriented M2M messaging mechanism for industrial IoT applications, IEEE Internet of Things Journal 4 (1) (2016) 236–246.
[11] A. Senthil Kumar, K.S. Ramaswami, WASN: WiMax based ad hoc and sensor network event monitoring—a unique management architecture, National Academy Science Letters 38 (2015) 343–347.
[12] Q. Pan, A interactive teaching mode based on educational games–Case study of acupuncture course, International Journal of Emerging Technologies in Learning (IJET) 14 (17) (2019) 167–181.
[13] A.Y. Kapi, N. Osman, R.Z. Ramli, J.M. Taib, Multimedia education tools for effective teaching and learning, Journal of Telecommunication, Electronic and Computer Engineering (JTEC) 9 (2–8) (2017) 143–146.
[14] E. Dogoriti, J. Pange, S. Anderson G, The use of social networking and learning management systems in English language teaching in higher education, Campus-Wide information systems 31 (4) (2014) 254–263.
[15] B.A. Alshorman, A.K. Bawaneh, Attitudes of faculty members and students towards the use of the learning management system in teaching and learning, Turkish Online Journal of Educational Technology-TOJET 17 (3) (2018) 1–15.