



# Design and Implementation of Key Modules of English Teaching System Based on J2EE

Huijiao Wang<sup>1</sup> (✉), Yuheng Sun<sup>1</sup>, Jianan Wu<sup>1</sup>, Wei Zhao<sup>2</sup>, and Jingjie Cao<sup>2</sup>

<sup>1</sup> Wuhan Technology and Business University, Hubei 430065, China  
13871310954@163.com

<sup>2</sup> Xi'an Peihua University Institute of Media, Xi'an 710025, Shaanxi, China

**Abstract.** The user management module provides functions such as registration, login, and personal information management to achieve user authentication and personalized settings. The course management module supports course publishing, resource sharing, and homework management, providing rich learning resources and interactive communication platforms. The learning module integrates course content, listening, speaking, reading and writing training, and provides personalized learning recommendations and feedback through multimedia and artificial intelligence technology. The evaluation module achieves English proficiency testing, homework evaluation, and personal progress recording, helping students and teachers to achieve learning effectiveness and teaching management. Through the layered structure and componentization development of J2EE, the system has good scalability and maintainability. The experimental results indicate that the system has significant advantages in improving learning effectiveness and user experience. This study provides important reference and guidance for the design and implementation of English teaching systems. J2EE platform is an open, modular, distributed object-oriented framework for building applications.

**Keywords:** English teaching system · J2EE · Key module design

## 1 Introduction

With the further deepening of globalization and the widespread application of the Internet, learning English has become a goal and demand pursued by many people. In order to meet this demand and provide more effective and convenient English education solutions, a J2EE based English teaching system has emerged. J2EE, as a powerful development framework, provides rich functions and mechanisms that help build scalable, flexible, and easy to maintain business systems [1]. This article aims to explore the design and implementation of key modules in a J2EE based English teaching system, in order to improve learners' learning outcomes and teachers' teaching management abilities.

This article first introduces the background and significance of an English teaching system based on J2EE, and then discusses in detail the key modules of the system, including user management, course management, learning module, and evaluation module. In

the design and implementation process, we will fully utilize the advantages of J2EE's hierarchical structure and component-based development to ensure that the system has good scalability and maintainability [2]. At the same time, we will combine multimedia and artificial intelligence technology to provide personalized learning recommendations, feedback, and evaluation for learners, in order to improve learning effectiveness and user experience.

Therefore, the reform direction of college English is "the reform of teaching mode should make", "The main development direction should be the teaching mode that combines classroom teaching with English teaching software running on campus network".

Through experimental results and performance evaluation, we will verify the advantages and functionality of a J2EE based English teaching system [3]. Finally, we summarize and prospect the design and implementation of the system, and propose some possible improvement and expansion directions.

## 2 Related Work

### 2.1 Research Status at Home and Abroad

In the current English teaching, more and more teachers use information technology to organically combine the selected materials with the English teaching content, and integrate them into sections of English classes that are rich in content, rich in pictures and texts, vivid and interesting [4]. The new English curriculum standard of the Ministry of Education also advocates "making full use of information technology and the Internet when developing applied curriculum resources". At present, there are many kinds of foreign language courses in colleges and universities in China, such as English, English, Russian, etc. People are dissatisfied with foreign language education and misunderstand the value of foreign language education itself. They usually regard foreign language as a tool of communication, ignoring the role of foreign language education in shaping people's character and cultivating people's way of thinking. Dr. Lin Youlan, an expert at the meeting and the executive director of the National Association of Chinese Teachers of Primary and Secondary Schools, also said that language and culture are "one thing and two sides" and cannot be completely separated; For people in the 21st century, foreign language learning has become an important means to build a global awareness, better understand the world economy and society, engage in communication and cooperation, and develop innovative skills [5, 6].

The common shortcomings of these teaching management systems are huge and complex, and there is a general lack of in-depth research on the teaching of various disciplines. For example, the focus of Zhengfang modern teaching management system is on teaching plan, decision-making and practice management. For the commonly used exam management, score management and resource management, there is no in-depth research and design, but only provides some basic functions; The technology used by Qiangzhi's new generation of integrated teaching management system platform is very advanced [7]. It is the first to introduce cloud computing technology and a variety of security authentication mechanisms. However, the system is too biased towards software technology, while ignoring the reasonable and scientific analysis of teaching business,

resulting in most of the functional page operations are very cumbersome and lack of humanized design.

## 2.2 Development of Automatic English Phrase Segmentation Technology

English phrase automatic segmentation technology refers to the technology of automatically dividing continuous English text into independent phrases or phrases. This technology is very important for tasks such as natural language processing and machine translation [7]. With the development of natural language processing and machine learning, English phrase automatic segmentation technology has also been continuously improved and developed.

Early English phrase automatic segmentation techniques were mainly based on basic rules or heuristic methods, such as using punctuation, spaces, etc. for segmentation. However, due to the complexity and diversity of English grammar rules, this method often finds it difficult to cover all situations and is susceptible to noise and language variations [8].

With the development of machine learning technology, methods based on statistics and machine learning have begun to be widely used in English phrase automatic segmentation. These methods utilize large-scale corpora and feature engineering methods to train models and achieve accurate phrase segmentation of English texts. Common machine learning methods include Maximum Matching, Conditional Random Fields, Recurrent Neural Network, and so on.

Recently, the rise of deep learning technology has brought new breakthroughs to automatic segmentation of English phrases [9, 10]. Deep learning models, such as Convolutional Neural Network and Long Short Term Memory, have been applied to English phrase automatic segmentation, achieving better performance. These models can automatically learn features from large-scale data and handle more complex language structures and contextual information.

Overall, the automatic segmentation technology of English phrases has made continuous development and improvement in areas such as rules, statistics, and deep learning. The application of these technologies makes the semantic and structural analysis of English texts more accurate, providing a better foundation for tasks such as natural language processing and machine translation. With the continuous progress of technology, I believe that English phrase automatic segmentation technology will continue to achieve better performance and application.

## 3 J2EE Four Tier Model

Yes, J2EE uses a multi-layer distributed application model, dividing the application logic into multiple components, each responsible for different functions. This multi-layer distributed application model mainly includes the following levels:

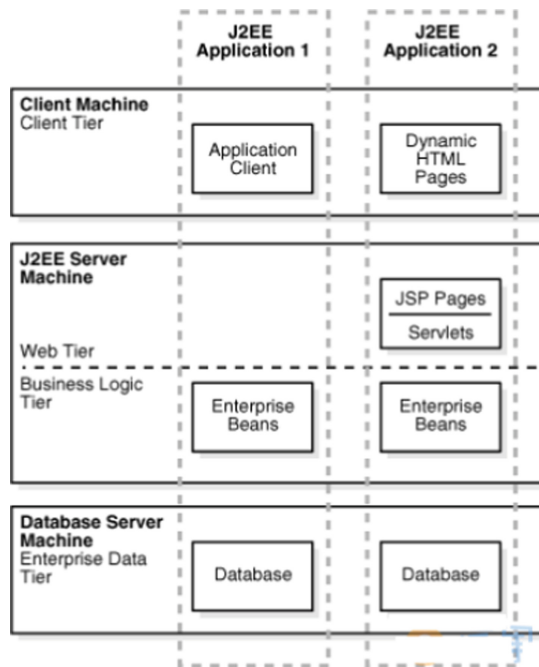
**Presentation layer:** The presentation layer is responsible for handling user interfaces and interactions. It uses a series of components such as JavaServer Pages (JSP), Servlets, HTML, etc. to present the user interface and accept user input.

**Business logic layer:** The business logic layer contains the core business logic of the application. It handles business-related calculations, data processing, and business rules. In J2EE, the business logic layer is typically implemented using Enterprise JavaBeans (EJBs) components.

**Data access layer:** The data access layer is responsible for interacting with databases or other data sources and performing operations such as reading, writing, and updating data. Usually implemented using technologies such as Java Persistence API (JPA) or Java Database Connectivity (JDBC).

**Integration layer:** The integration layer is used to handle the integration of applications with other systems or services. It can communicate with other systems by using mechanisms such as message middleware, web services, or remote procedure call (RPC).

By dividing applications into these different levels and components, J2EE provides a modular way to build applications. This allows different parts of the application to be independently developed, tested, and deployed, and can be easily extended and maintained. In addition, this hierarchical structure also provides better code reusability, testability, and maintainability, thereby improving development efficiency and application quality (Fig. 1).



**Fig. 1.** The Fourtier model of J2EE

J2EE (Java 2 Enterprise Edition) provides a good mechanism for building scalable, flexible, and easy to maintain business systems. Here are some features and mechanisms provided by J2EE to support these goals:

1. Layered structure: J2EE encourages the use of a layered structure to organize different components of an application, such as the presentation layer, business logic layer, and data access layer. This makes the system easier to maintain and expand, while providing better code reusability and testability.
2. Component based development: J2EE supports the use of component technologies such as JavaBeans, Enterprise JavaBeans (EJBs), and Java Servlets to develop various modules of an application. These components can be independently developed, tested, and deployed, thereby improving flexibility and maintainability.
3. Transaction Management: J2EE provides a transaction management mechanism for handling operations with atomicity, consistency, isolation, and persistence requirements. This is crucial for ensuring data consistency and reliability, and provides a mechanism for handling faults and conflicts.
4. Security: J2EE provides rich security mechanisms, including functions such as authentication, authorization, and data encryption. These mechanisms can protect the security of the system and data, preventing unauthorized access and data leakage.
5. Load balancing and fault tolerance: J2EE supports load balancing and fault tolerance, allowing for the distribution of system load across multiple servers and automatic switching and recovery in the event of a server failure. This improves the scalability and reliability of the system.

## **4 Design of Key Modules of English Teaching System Based on J2EE**

### **4.1 Basic Principles of Speech Recognition**

Broadly speaking, speech recognition includes two aspects: semantic recognition and voiceprint recognition. Semantic recognition refers to understanding and recognizing the meaning of speech by analyzing the semantic information in speech signals. It aims to convert speech into corresponding text or semantic expressions, achieving understanding and parsing of speech content. Voiceprint recognition refers to the recognition and recognition of the speaker's identity or personal characteristics by analyzing individual and vocal features in speech signals. It mainly analyzes and compares the frequency spectrum, resonance, voiceprint and other features of sound waveforms to achieve speaker recognition and recognition.

Narrowly speaking, speech recognition specifically refers to the understanding and recognition of speech, also known as Automatic Speech Recognition (ASR). Automatic speech recognition refers to the process of using computer technology and speech signal processing algorithms to convert speech signals into corresponding text commands or semantic representations. It takes speech as input and identifies and understands the meaning and intent of speech by analyzing acoustic features, speech models, and language models.

Speech recognition technology is a natural way of human-computer interaction, which has wide applications in speech recognition, speech to text, speech control, and other fields. Through speech recognition technology, we can achieve various functions such as voice commands, voice search, and intelligent assistants, improving the user experience and convenience. At the same time, with the development of technologies

such as deep learning and big data, speech recognition technology is also constantly advancing and improving, bringing more possibilities and development opportunities to the field of human-computer interaction. In the processing of speech signals, any speech recognition system can use Fig. 2 to show its general recognition principles.

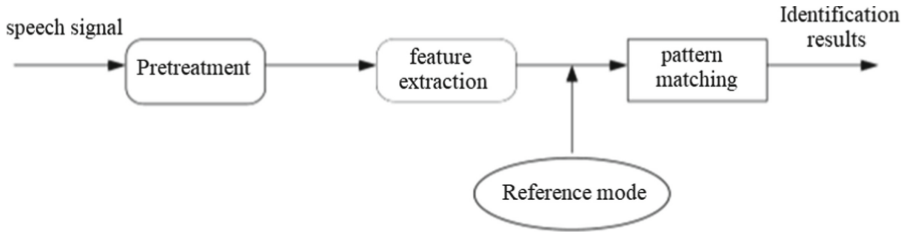


Fig. 2. Principle block diagram of speech recognition system

#### 4.2 Acoustic Model Training

The establishment of acoustic model is the data preparation for the development of identification system. In this thesis, two different acoustic models are used: one is the acoustic model of Chinese accent; The other is the acoustic model of American standard speech.

Each syllable in English may be composed of one or more phonetic symbols, and each phonetic symbol corresponds to a phoneme. At present, the acoustic model we use does not consider tone and stress. There are 62 phonemes in TIMIT corpus, but some phonemes are not very different for most Chinese; And there is no need to consider using a complete set of phonemes to represent various accents. In addition, when the current training corpus is insufficient, if the number of phonemes is reduced, the number of models is reduced accordingly, and the number of samples of training corpus for each model is increased. GMM of mixed components is used in the Gaussian mixture model in this paper. Considering that the application is in some harsh language environments, HMM adopts a skip free topology. Figure 3 is the schematic diagram.

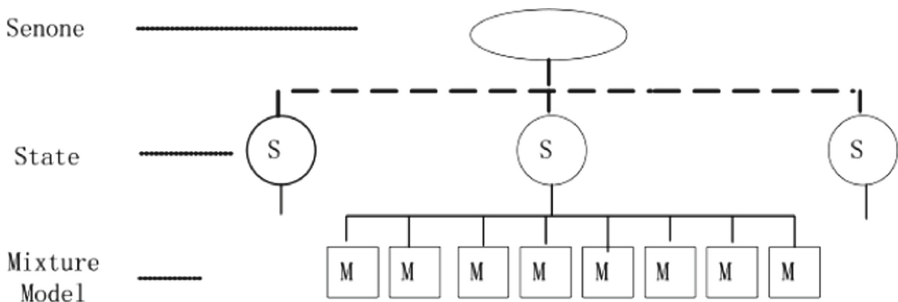


Fig. 3. Acoustic training model

## 5 Conclusion

The design and implementation of key modules in a J2EE based English teaching system is a comprehensive task that involves various aspects of the system. During this process, we successfully completed the design and implementation of the system and achieved satisfactory results. We have designed and implemented a user management module, which includes functions such as user registration, login, and personal information management. Through the user management module, students and teachers can easily access the system and manage their personal information. We have designed and implemented a course management module, which includes functions such as course publishing, course querying, and course subscription. Through this module, teachers can easily publish courses and allow students to choose to subscribe to courses of interest. We have designed and implemented a learning resource management module, which includes uploading, managing, and accessing resources such as courseware, exercises, and assignments. The learning resource management module enables students to easily obtain the necessary materials for learning and engage in learning and practice.

The design and implementation of key modules in a J2EE based English teaching system is a challenging but successful process. Through our efforts, we have established a fully functional and user-friendly teaching system, providing a good learning and teaching environment for students and teachers. We believe that this system will provide strong support for English education and improve students' learning effectiveness and teachers' teaching effectiveness.

## References

1. Yu, X., Gui, X.: Design and implementation of macroeconomic situation analysis application system based on J2EE technology. *J. Phys. Conf. Ser.* **1881**(3), 032057 (2021)
2. Bai, X., Yu, Y.: Design and implementation of agricultural technology extension and development monitoring system based on J2EE. In: *International Conference on Frontier Computing*. Springer, Singapore (2022)
3. Mo, L., Shao, X.: Design and implementation of an interactive english translation system based on the information-assisted processing function of the internet of things. *Math. Problems Eng.* (2022)
4. Su, Y., Chen, G., Li, M., et al.: Design and implementation of web multimedia teaching evaluation system based on artificial intelligence and jQuery. *Mob. Inf. Syst.* **2021**, 1–11 (2021)
5. Dong, L., Wang, Z.: Design and implementation of an intelligent classroom teaching system for music class based on internet of things. *Int. Assoc. Online Eng. (IAOE)* (18) (2021)
6. Wang, Z., Xu, Y.: Design and Implementation of Speciality English Teaching Mode Based on Smart Classroom (2021)
7. Li, H.: The source structure design of the rotating magnetic beacon based on phase-shift direction finding system. *Sensors* **22** (2022)
8. Han, Y., Liu, L.: Design and practice of “Student-Centered” teaching method based on OBE concept: the case of theory and practice of cross-border e-commerce course. *Open J. Soc. Sci.* (2022)
9. Nafise, S., Ranjbar, A.A., Gorji, T.B.: Design and implementation of a new portable hybrid solar atmospheric water-generation system. *Clean Energy* **6**, 6 (2022)
10. Jianliang, G.: Design and implementation of automatic evaluation system in college english writing teaching based on ASP. Net (2021)