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Research Article

An Empirical Study on Virtual English Teaching System Based on the Microservice Architecture with Wireless Internet Sensor Network

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We design in this paper a virtual English teaching system based on a wireless sensor network using the features of microservice architecture such as low coupling, lightweight, and high autonomy. This paper explains the characteristics of microservice architecture, uses the wireless sensor network as a carrier, uses the technology provided by Spring Cloud ecology to practice microservices, and makes a specific design and implementation of microservice architecture. The system allows teachers and students to upload and download English course resources, adopts the knowledge map to classify and manage course resources, realizes the diversified search and sorting function of course resources, greatly facilitates users to query and manage course resources, and improves the utilization rate. The internal functional modules of the platform are reasonably divided with the microservice design principle and are developed and deployed independently. For the security of the system, the authentication mechanism of the device and the authentication and authentication strategy of the application interface are designed, respectively. Finally, functional and nonfunctional tests were conducted on the system through the built test environment. The test results show that the virtual English teaching system designed and implemented in this paper has good feasibility and scalability. Through the research of this paper, it brings great help to the wireless sensor network virtual English teaching system and also improves the learning efficiency of students.

1. Introduction

With the development of Internet technology, the theory of microservices is becoming more and more mature, and the related technologies around microservice architecture are gradually improved. The development cost of microservices is greatly reduced, and many traditional monolithic application architectures have started to transform to microservice architecture [1]. The reason for this is that the increasing number of users and types of access has increased the difficulty and cost of system development, and further development under the previous architecture is much more difficult than splitting into the microservice architecture. Most of the systems have been out of this status quo, the old system cannot adapt to the new technology, and the development is also slow [2, 3]. Some others still use the overall architecture, but there is a constant demand for increased functionality, there are also problems brought about by the increase in users, the system begins to become chaotic, the subsequent development of the software is slow, the system is full of loopholes, various problems are constantly exposed, and the accumulation is difficult to return. Traditional English teaching faces infinite impacts and challenges while welcoming the new environment and opportunities of the computer network environment: how to guide the efficient integration of the two resources, that is, to give full play to the advantages of the information age. The computer network adapts to the needs of modern education development and truly integrates into the curriculum as an organic part. It has become an important issue to promote the transformation of English teaching from traditional to modern and also constitutes the focus of the current research on the reform of virtual English teaching.

The wireless sensor network virtual English teaching system has largely improved the teaching mode and enriched the teaching methods. Wireless sensor network virtual English teaching system makes full use of the characteristics of network resource sharing, solving the impact of time and space on traditional experiments, while greatly reducing teaching costs and improving teaching efficiency. Particularly for some more dangerous experiments, the role of wireless sensor network virtual English teaching system is particularly prominent due to the fact that the limited energy of wireless sensor network nodes, limited computing power, the variability of the geographical environment, and the mobility of nodes resulting in limited communication between nodes and other problems make it more difficult to carry out experiments in the teaching process. To build a virtual English teaching system for wireless sensor networks to help students master the experimental content better and faster and use their precious time for critical learning content, the wireless sensor network virtual English teaching system involves several directions of computer technology, which is developed by simulation and computer network and combined with database [4]. There are abundant virtual software resources on the network to provide good conditions for the construction of the wireless sensor network virtual English teaching system. Students can run the wireless sensor network virtual English teaching system by configuring the parameters on the PC, which is good for cultivating students' learning interests. Therefore, it is of good practical significance to research and develop a wireless sensor network virtual English teaching system with good generality and good simulation performance [5, 6].

The main work of this paper designs and implements a wireless sensor network virtual English teaching system. By analyzing the current problems of backward teaching methods, insufficient vivid teaching contents, confusing teaching resource management, poor teaching quality, and weak teacher-student interaction in the process of English teaching, we design and develop a wireless sensor network virtual English teaching system that meets the actual English teaching, and the system effectively improves the teaching efficiency and teaching quality of English courses. The system effectively improves the efficiency and quality of English teaching [7]. The first section discusses the background and significance of this research paper in detail and discusses the main work and section arrangement. Section 2 introduces the related work of this research and analyzes the current status of the research. Section 3 investigates the requirements and network model of the virtual English teaching system based on microservice architecture for wireless sensor network, which lays the foundation for the system design and development, and also provides a detailed design of the virtual English teaching system for wireless sensor network. Section 4 focuses on the relevant analysis of this paper's research, and the value of this paper's research is demonstrated through experimental analysis. Section 5 concludes and summarizes the main work done in this paper and explains the future system improvement based on the current work status.

2. Related Work

With the rapid development of the Internet industry and intensified competition, how to quickly complete online product iterations and enrich product functions has become the key to increasing active users of Internet products, and a development method called microservices has been favored by major Internet companies at this time and has become the standard architecture for Internet product development. Graham argues that virtual English teaching by wireless sensor network is a combination of the current learners' personalized learning needs [8]. Mo et al. proposed a wireless sensor network virtual English teaching with microservice architecture, and the system first analyzes and matches learners' personalities using Myers-Briggs Type Indicator (MBTI) [9]. Melis et al. used the Bruce learning model to provide matching learning contents for different learners, and the teaching model is experimentally verified to improve students' learning efficiency. Management and service are the main problems that solve future classroom teaching [7]. Winkowska et al. proposed a virtual English teaching system combining an online teaching management system and teaching resource platform to optimize the existing teaching methods and improve the efficiency of school teaching resource management [10].

Since microservice architecture is broadly defined as the use of a set of small services to design service-oriented software, there is a certain application complexity between independently deployed computing units in the microservice architecture, and such complexity can lead to security vulnerabilities [11]. Liu et al. proposed the microservices-based data service framework, which overcomes the problems of large volume and complex protocols of traditional data service platforms and at the same time greatly improves the maintainability and scalability of software to achieve the purpose of decoupling and decentralization [12]. Chen et al. proposed a data-driven learning concept based on microservice architecture learning and the English learning approach and related teaching models driven by this concept can be seen as development and extension of the previous resource-based learning models [13]. By studying the interactive teaching mode of English listening and speaking classes, Bao et al. argued for the positive role of multimedia teaching in improving college students' English listening and speaking skills and applied information technology to reading teaching to explore a new model for transforming English reading teaching in colleges and universities [14].

Through combining and analyzing the research of virtual English teaching mode in the computer network environment at home and abroad and the wireless sensor network of microservice architecture, we can find that the research where researchers put more energy mainly focuses on the theory of virtual English teaching in the computer network environment. In terms of exploration, optimization of teaching modes for different course types, and exploration of teaching strategies, there is a very little research on system performance. There have been a lot of excellent research results, but there are still some problems under the prosperous scene, such as individual studies only rigidly apply the theories of English teaching in the traditional environment to study the teaching practice in the new environment [15]. The author believes that these problems should be avoided in future research; otherwise, the reliability and validity of the new round of research will be seriously affected [16]. Firstly, according to the problems of confusing English teaching resource management and complicated types of teaching courses, a comprehensive wireless sensor network virtual English teaching system is designed and implemented so that teachers and students can manage English course resources through this module, such as uploading, deleting, editing, and other operations, and students can view and download English course resources through this module and other functions, and secondly, the module also classifies and manages the course resources in the way of knowledge map, realizes the diversified search and sorting function of course resources, greatly facilitates users to query and manage the course resources, and improves the efficiency of English course resource management. The wireless sensor network virtual English teaching system based on microservice architecture facilitates students to record their English learning and enrich the English teaching course content to improve the practicality of the system.

3. Research on Virtual English Teaching System Based on Microservice Architecture for Wireless Sensor Network

3.1. Research on the Needs of Virtual English Teaching. Virtual English is a framework and procedure constructed under the guidance of a specific teaching concept that can reflect the law of teaching development and has constructive characteristics such as clear purpose, stable structure, and strong practicality. The decolonization of virtual English is the healthy development goal of modern virtual English, which is gradually explored and formed in the teaching practice of ecological classrooms, and its construction can in turn promote the ecological development of classroom teaching. The ecological model is guided by the theory of educational ecology and the concept of "student-centered" education, designs various forms of teaching activities such as multidimensional interaction according to students' ability levels and knowledge needs, and promotes students' natural, harmonious, and free growth and development under good artificial conditions by balancing the ecological position of several teaching components [17]. This virtual English application in the classroom is a very important tool for teaching and learning. The application of virtual English in classroom teaching is not only to realize the reasonable arrangement of a single virtual English but also to study the complementary adaptation and coexistence between multiple virtual English, to select the suitable virtual English for different student groups, different teaching contents, and different teaching environments to realize the complementary advantages of teaching resources.

To make the system have better module reusability and technical advancement, the microservice architecture-based wireless sensor network virtual English teaching system mainly adopts the microservice framework for layered design, dividing each functional module into three layers of business logic layer, model layer, and view layer for design, and each layer is responsible for different system functions. The Spring framework is mainly responsible for the design of the business logic layer, including the system login and registration business logic, English course resources sorting/querying/searching logic, English course test logic, English test preparation logic, and authentication logic [18, 19]. These logic module interfaces can provide a unified standardized logic function for the view and model layers; the Hibernate model layer is mainly responsible for system background data management, such as data addition, deletion, data table creation, deletion, and database backup. The background data of the hybrid English teaching management system mainly include basic student information, English course resources, English test resources, and English teaching resources and provide data services for the upper layer through a unified data interface. The view layer in the Struts framework is mainly responsible for system interface customization and display, such as the main interface of the system, user personal center interface, English course resource management interface, English course test interface, English teaching interface, and other modules. The architecture of each layer of the virtual English teaching system based on the microservice framework is shown in Figure 1.

The system performance requirement analysis mainly analyzes the system hardware and software environment, system quality, system external interfaces, and so on. Specifically, the system performance requirement analysis mainly includes system correctness, stability, security, portability, system response speed, server response speed, memory usage, and CPU utilization rate. The microservice architecture-based wireless sensor network virtual English teaching system is based on microservice architecture, using microservice architecture to implement each module of the system. Through the Internet network using multimedia technology for online English teaching, the system requires a good performance index. In this paper, we mainly analyze the system reliability, hardware and software environment, and performance indicators. Among them, the system reliability requirements are analyzed as shown in Table 1.

Feasibility analysis mainly refers to the feasibility analysis from system development technology, system resources required, and system market prospect before the system is designed and developed to ensure that the system can be carried out smoothly in the design and development process

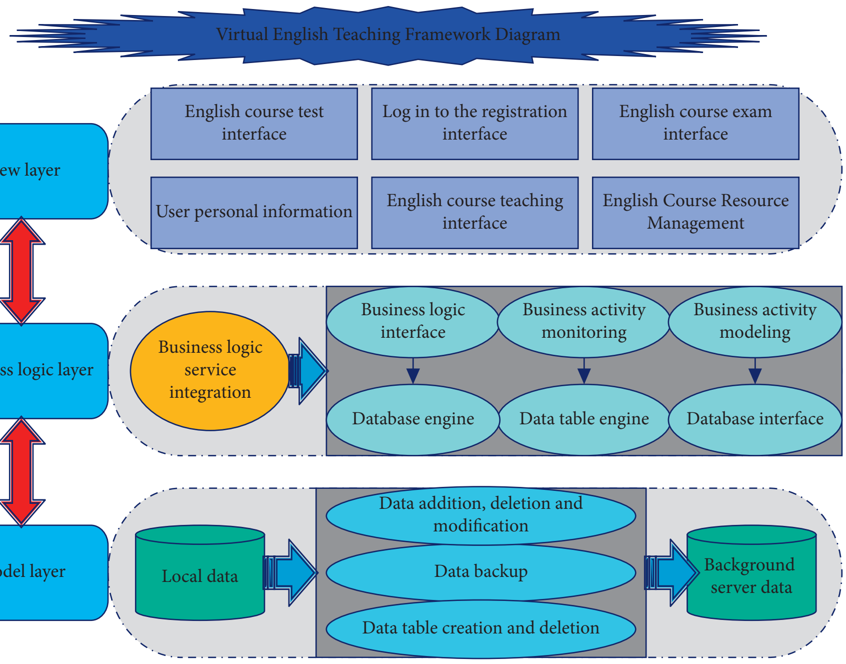

Figure 1: Virtual English teaching system architecture diagram.

Table 1: System reliability requirements.

Reliability requirements	Reliability detailed requirements	Reliability index
Correctness	The cumulative error rate of each functional module of the system	Less than 0.5%
Stability	The cumulative error rate of continuous system operation	Less than 0.5%
Restorative	The system shuts down and restarts abnormally, and the function can operate normally	Higher than 99.5%
Safety	System data security, zero loss	Higher than 99.9%

[19]. The feasibility analysis of the wireless sensor network virtual English teaching system based on microservice architecture is mainly from three aspects: technical feasibility, resource feasibility, and economic feasibility.

3.2. Microservice Architecture Wireless Sensor Network Model Construction. In wireless sensor networks, the irregularity of network environment and data collection requires the controller to have strong adaptive capability [20]. In this paper, we propose to combine fuzzy control with traditional PID controller and introduce it into wireless sensor network to realize its parameter self-tuning, calculate the instantaneous queue length and real-time packet loss rate of message queue, and realize adaptive congestion control.

To ensure that the instantaneous queue length of the message queue within the node has absolute safety and reliability, the setting of the message discard probability will be chosen to find the maximum value of the message discard probability. Using $f(x)$ as the objective function of the cuckoo search, the maximum value of the message discard probability $f(x)$ is calculated by continuous update iterations using the jump path and step size of the $g(m, n)$ flight update search when the PID parameters change. The path update expression of cuckoo search is shown in equation (1), where $f(x, n)$ denotes the position of the message discard probability at this k-th update at this n-th iteration, α denotes the step size factor, which obeys normal distribution, and $g(m, n)$ denotes Levy flight.

$$f(x,n) = \{f(x,n-1) + \beta\}\forall g(m,n). \tag{1}$$

A random wander is performed by Levy flight to obtain the location of the next updated nest, and the expression is as in the following equation:

$$g(m,n) = \frac{\mu\xi(\mu)\cos(\mu\tau/2)}{\tau} * \frac{1}{\sum_{i=1}^{n}\mu^{m-1}}, \quad m \subseteq [1, +\propto]. \tag{2}$$

The parameters such as initial population size and a maximum number of iterations M are initialized. In the simulated scenario, 200 random network nodes are set, so the initial population size $N = 200$ and the maximum number of iterations $M = 200$ are set, and the probability of discovery is as in the following equation:

$$f(n) = \frac{\sum_{i=1}^{n} f(i,t)}{t} * 100\%. \tag{3}$$

The objective function is set to the message discard probability $f(x)$, at which point, the expression for the message discard probability within a node is updated to equation (4). In this algorithm, the maximum number of iterations computed is H, where there are no nested loops, so the computational complexity spent in each iteration to compute the optimal solution does not exceed $O(H)$. The maximum population size is G. Therefore, the space complexity of the cuckoo search algorithm is $O(G)$.

$$f(x) = H(f(0)) + \exists H(f(1)) + \frac{1}{\sum_i^n (G(i) - \exists G(i-1))}. \tag{4}$$

The integrated model of the virtual English teaching system reflects a complete and sound pattern in the system view. Not only are the four step-by-step design elements of teaching objectives, learning starting points, process methods, and outcome evaluation interconnected to ensure the functioning of the whole teaching system, but also each of the four elements has a unique structure within itself to achieve specific teaching functions. The wireless sensor network model establishes a set of vocabulary acquisition level objectives reflecting the principles of English subject pedagogy and a corresponding evaluation system combining subjective and objective criteria. The two parties are responsible for different types of teaching tasks in different contexts, and finally, the theoretical requirements of individualized teaching are fully implemented through a synchronized and integrated teaching process and teaching method strategy.

Given the search direction (x, t), the step size can be calculated by being. In the backtracking line search, the step size is taken as $s = f(x, \beta)$, and the update rule for t is shown in equation (5), which uses the step size as a rough measure of the proximity to the central path. Generally, $\beta = 2$ and $s = 0.05$.

$$H(t) = \max\left\{ \max\{\beta \min(3m/\tau, t), t\}, \sum_{i=1}^{n} f(i) * \min(s_i, s_{i-1}) \right\}. \tag{5}$$

In local routing-based topology, the multihop mode is used to save energy and achieve efficient routing. Sensor nodes collect information from the surrounding environment to form a data-centric forwarding route. Building a cluster can also be divided into four phases, including the election phase of the cluster head node, the broadcast phase of the cluster head node, the establishment phase of the cluster, and the generation phase of the scheduling mechanism within the cluster. The cluster scheduling mechanism means that the cluster head assigns time slots to the cluster members that allow them to send data using the Time Division Multiple Access (TDMA) method. Here, the cluster head can choose to consolidate the intracluster messages before forwarding them out. This is followed by the data stabilization phase, where messages are sent according to the currently established clusters. After some time, the stabilization phase ends and a new cluster establishment cycle is entered.

$$G(t) = \frac{f(t)}{1 - f(t) * |\tau| \sin(1/f(t))|}. \tag{6}$$

3.3. Virtual English Teaching System Design. To develop a system using microservice architecture, it is necessary to establish the infrastructure, and at the same time, it is necessary to be able to divide the services according to the requirements, so that each service module can be developed and run independently [21–23]. Therefore, this virtual lab platform uses a combination of microservices and layered architecture. With the API gateway as the boundary, the front end and back end of the system are separated. RESTful requests are used to interact the web pages with the back-end services. To simplify the call logic, the back-end service provides an API gateway as the call interface for the web front end to access the back end. As an important part of the microservices architecture, the API gateway aggregates the invocation logic of multiple microservices, reducing the number of client requests and optimizing the client experience. In the microservice architecture, each different back-end service may have a user-maintained business, so there will be a lot of redundant login verification and signature verification in microservices. We can separate these functions in microservices into a separate OAuth2 authentication authorization server and then call the OAuth2 server through the API gateway to filter user requests and ensure the security of the service is guaranteed (see Figure 2).

The wireless sensor network virtual English teaching system based on microservice architecture mainly mixes a variety of multimedia methods, such as pictures, text, audio, video, and other contents, using the advantages of network teaching. School students can learn English courses online and provide comprehensive guidance to students on English words, English grammar, English speaking, reading comprehension, English composition, English translation, and other contents. The system also provides English course mock exams and English test questions to allow students to customize their learning plans according to their conditions and complete English learning tasks in a targeted manner, providing students with learning efficiency. The main functional modules of the wireless sensor network virtual English teaching system based on microservice architecture are shown in Figure 2.

In the system, the logical structure of the database is generally independent of the specific functions and is generally more abstract. The design of the system database logical structure can generally adopt three different design methods: the top-down design method firstly designs the overall data structure and then gradually enriches and refines the data structure from top to bottom; the bottom-up design method firstly designs the specific data structure and then gradually merges and unifies the data types from bottom to top; the expansion-by-expansion design method firstly designs the core The bottom-up design approach

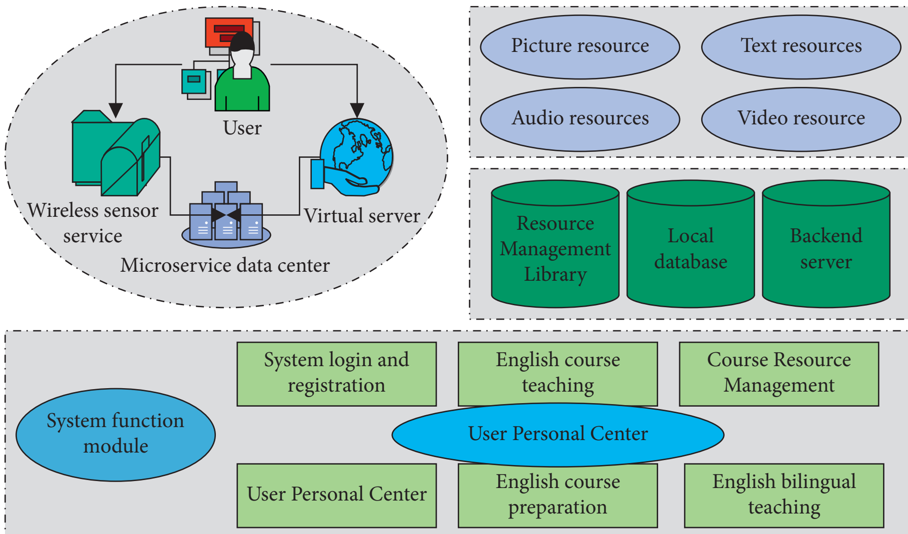

Figure 2: Main functional modules of virtual English teaching system.

starts with the design of the core data structure and continues to expand outward until the design of all data structures is completed. According to the actual data management requirements and data structure characteristics of the English teaching interactive management system designed and developed in this project, a combination of top-down and bottom-up database logical structure design methods was adopted in the design process.

4. Analysis of Results

4.1. Network Model Analysis. This section compares the average throughput of three congestion control algorithms when the number of nodes increases. Throughput is a direct indicator of network performance. By increasing the number of nodes, the amount of data passed by messages is indirectly increased to observe the variation of throughput in more complex scenarios. Throughput is limited by the computing power of the hardware device itself, so the magnitude of its magnitude does not vary too significantly. The throughput comparison curves of the three are shown in Figure 3. As can be seen from Figure 3, when the number of nodes increases, the number of messages for data transmission will increase, the time for data transmission between nodes will shorten, and the throughput will increase accordingly. The throughputs of all three congestion control algorithms show different degrees of increase when the number of nodes increases. The CFPID algorithm has the highest throughput when the number of nodes is small. As the number of nodes grows, the growth in throughput of IBLUE and PID is gradually surpassed by CFPID, reflecting the superiority of CFPID in terms of later stability and adaptive adjustment in complex situations (see Figure 3).

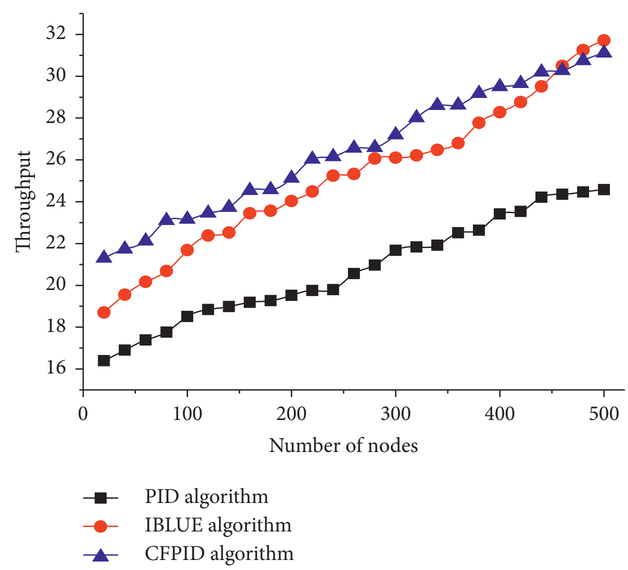

Figure 3: Throughput variation comparison curve.

We compare the real-time packet loss rate of nodes under the regulation of three congestion control algorithms. When the distribution density of nodes rises, the overall total amount of data in the network increases and the number of packets to be transmitted in the message queue within a node will increase, resulting in an elongated transient queue length. When the queue length exceeds the desired value, it will intensify the network congestion, then the packet drop operation is required to control the queue length by dropping a certain number of packets through the message drop probability, and the packet drop rate will change with the change of the instantaneous queue length to control the queue length around the desired value. But the packet loss rate keeps changing, which will make the queue length of the message queue keep changing, which leads to the instability of the network, and the fluctuation of the network will also indirectly affect the overall network working status. Therefore, the convergence speed and stability of the instantaneous packet loss rate will determine the performance of the network. In the experiments of this section, the initial number of nodes is set to 100, and the variation curve of the

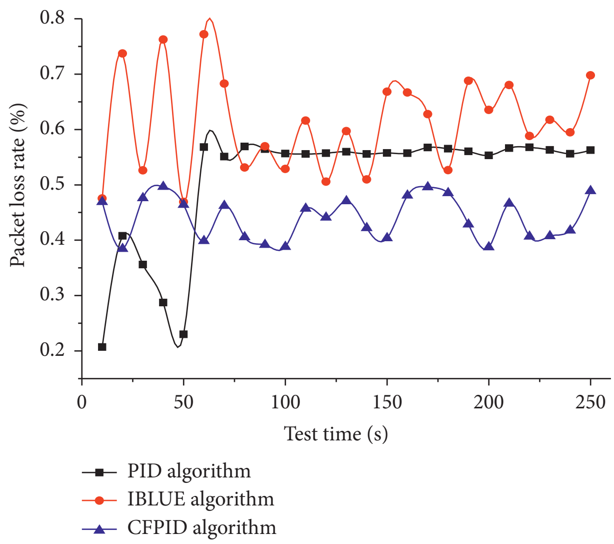

Figure 4: Real-time packet loss rate variation curve.

real-time packet loss rate of network nodes is shown in Figure 4.

As can be seen in Figure 4, when the distribution of network nodes is denser, the elevated data volume and the shortened transmission time lead to a growing message queue of nodes. When the message queue is stretched significantly, the CFPID congestion control algorithm can detect the danger more accurately and quickly, initially use the maximum packet loss rate to limit the further growth of the queue length, and pull the instantaneous queue length with the trend of congestion back to the controllable range quickly to suppress the aggravation of congestion. After a small amount of oscillation, the equilibrium point will be found as quickly as possible and stabilized in a region with less variation, and then only small adjustments are needed to keep the instantaneous queue length in a relatively stable and healthy state (see Figure 4).

4.2. System Performance Analysis. Figure 5 shows the message delivery rate values obtained for LBR1, LBR2, AODV, and RASeR. lBR1 (Figure 5(a)) shows the best performance, followed by LBR2, which is negatively affected by the high migration rate. aODV (Figure 5(c)) presents a low delivery rate in general and is poorly scalable. On the other hand, RASeR provides a decent messaging rate of up to 32 nodes, obtaining nearly 60%. In this protocol, we observe problems related to messaging duplication, leading to network congestion. Intuitively, the global TDMA imposes an upper limit on the number of messages sent per cycle. Therefore, if the number of received messages is continuously higher than this upper limit, it will eventually lead to a buffer overflow. This situation can be represented by the total number of messages per protocol used to route multihop traffic to the receiver, a parameter that has a significant impact on energy consumption. Although LBR1, LBR2, and RASeR share routing criteria based on hop count, RASeR is very inefficient in terms of the number of messages it generates (see Figure 5).

To ensure that the system can respond to users' requests on time when the system is put into use with concurrent access by multiple users, the Load Runner test tool was used to simulate concurrent access to the system by a large number of users and to test the response time of the system. According to the actual application of the system, concurrent access of 300 and 500 people was simulated by Load Runner, and the performance of the system was verified to meet the expected design requirements through testing. The system performance test shows that when 300 and 500 people access the system at the same time, the access time of the system can be guaranteed within 5 seconds, which fully meets the expected design requirements of the system, indicating that the system can handle concurrent access by multiple users and meet the expected design goals. The specific results of the system performance test, such as stress test and system response time, are shown in Figure 6.

There are still problems in the design and implementation of the system, the system uses the microservice architecture for English system implementation, the system operation efficiency is not high enough, and the level of intelligence still needs to be improved, so for today's intelligent Internet era, intelligent Internet has become the mainstream of the development of today's era. It is necessary to develop an English teaching management system based on artificial intelligence and machine learning, to better meet the needs of today's era. Secondly, the English resources of the system are not rich enough, and the English courseware materials are not ideal enough to cover all the English teaching tutorials, so it is necessary to further improve the English resources at a later stage to improve the practicality of the English teaching management system. It does not have grouping, group member identification, and group voice function, which cannot fully meet the teaching needs of teachers and students in the process of teaching English courses.

4.3. System Application Analysis. The purpose of this construction method is to enhance the observability and comparability of changes in vocabulary acquisition levels by maintaining the equivalence between the two tests; the test itself remains unchanged in other aspects; that is, the type of questions is in the form of English-Chinese translation, the number of items is 82, and the score is 100. The full score was 100, and the test duration was 30 minutes. The posttest data were statistically compiled and showed that the average score of the experimental group was 57.9 and the average score of the control group was 54.3. To further evaluate the actual effectiveness of the experimental and control groups on their corresponding teaching treatments, the study selected the paired-sample t-test as the inferential statistical method and used SPSS20 as the statistical test tool to first match the pre- and posttest scores of individual subjects from the experimental and control groups and then perform a hypothesis test on the overall data. The results of the

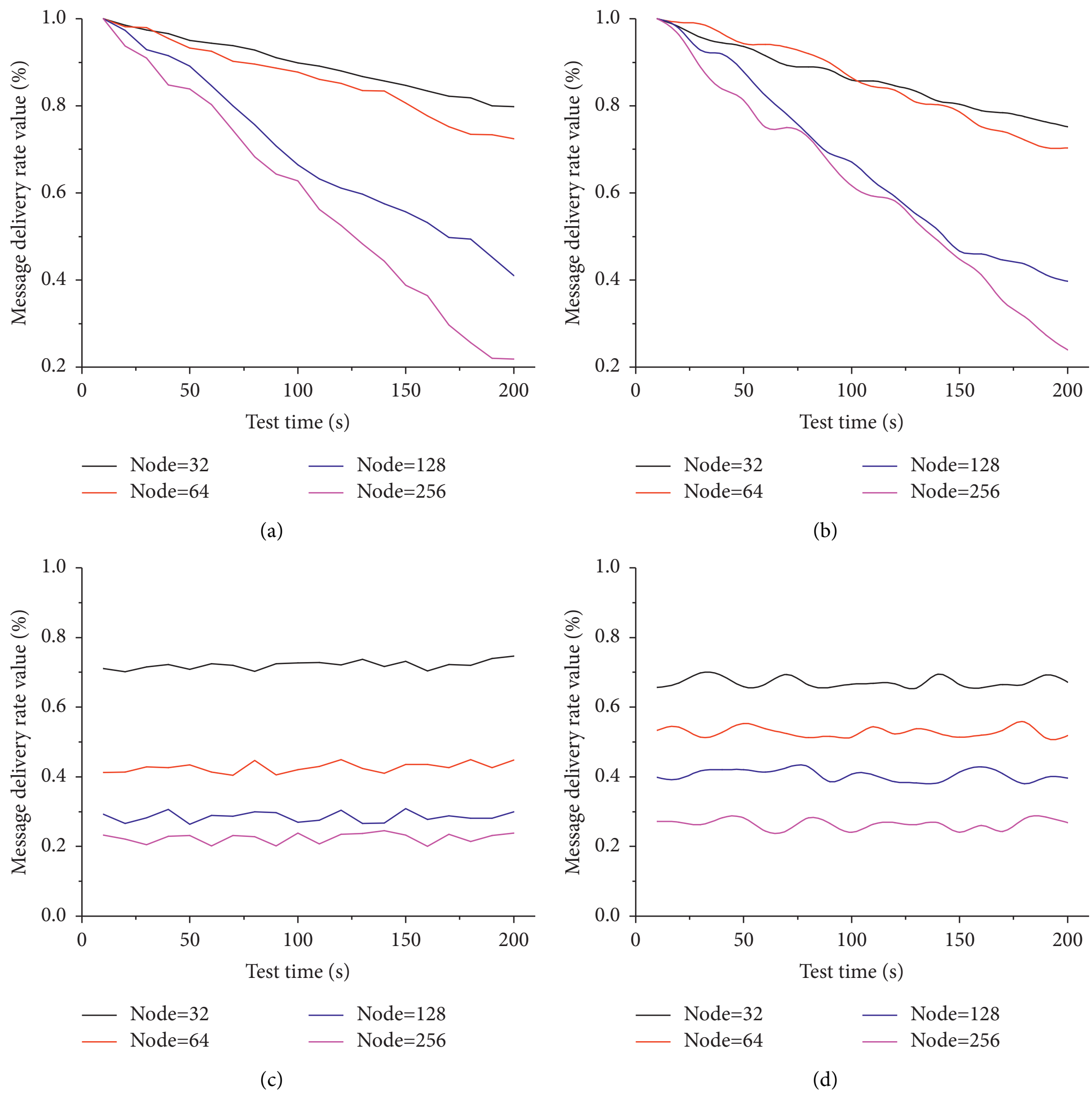

Figure 5: Number rate values for messaging. Message delivery rate value of (a) LBR1, (b) LBR2, (c) ADOV, and (d) RASeR.

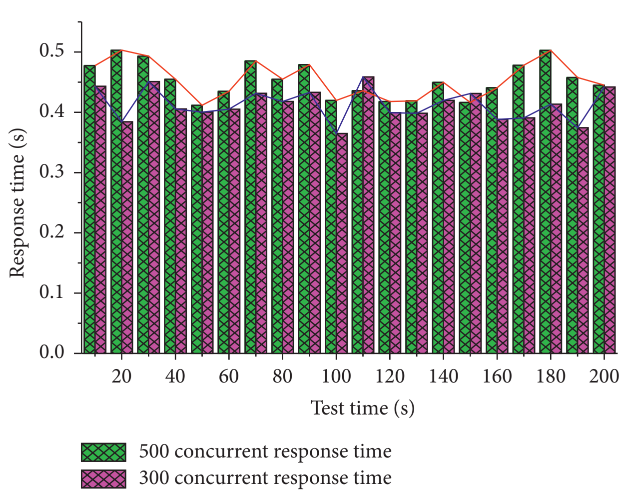

Figure 6: System processing capacity stress results.

hypothesis test on the variability of the means are shown in Figure 7.

The design goal of the virtual English teaching system is to help users teach and learn English more effectively, encapsulate the complex device access and data transmission process at the bottom of the IoT, and reduce the learning curve and usage difficulty of users. Therefore, the usability of the system is tested in three aspects, including ease of use, user experience, and development efficiency. 100 users with different age characteristics and professional knowledge backgrounds are selected for trial according to the basic operational objectives, their usage results and operational experience are scored (each index is scored out of five), the trial results are recorded and analyzed, and the statistical results are shown in Figure 8. Through the analysis of the survey results, users of different age groups and professional backgrounds can easily use the functions provided by the system, which can effectively improve the learning efficiency

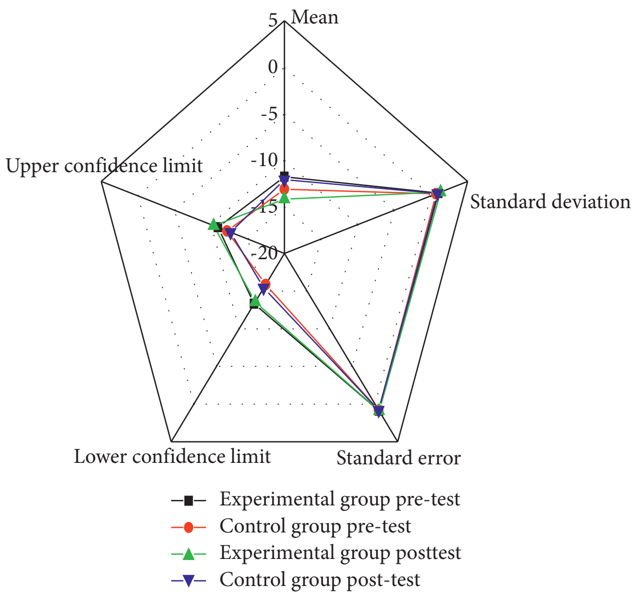

Figure 7: The *t*-test results of paired groups of experimental and control groups at their respective levels.

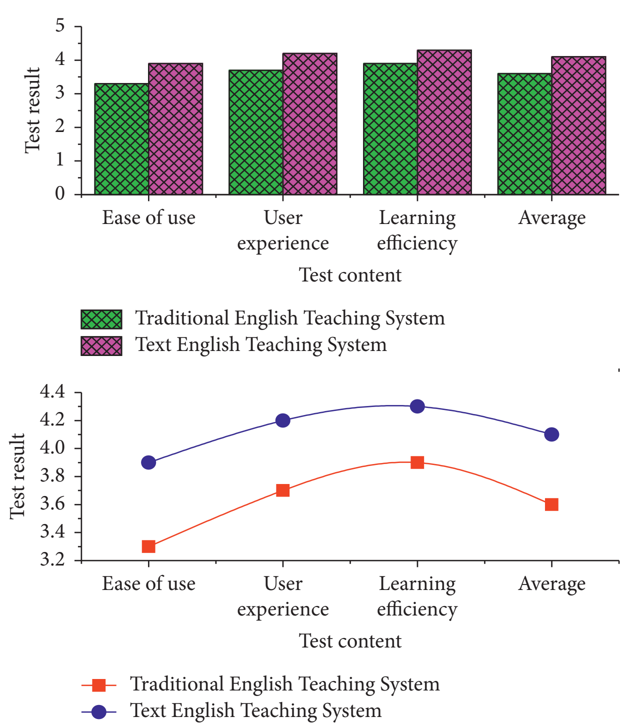

Figure 8: Availability survey results.

and reduce the learning curve of users compared with traditional teaching methods, and combined with the simple and easy-to-use functional interface, users can quickly realize the management of the device side (see Figure 8).

Through the random distribution of multiple movable network nodes, the wireless sensor network performs real-time data monitoring, adjustment, and control of the area to be measured, realizes people's data collection and control of super-large-scale scenarios, and makes a great contribution to the development of the Internet of Things. However, advanced wireless network technology has brought many value-added services and has also caused a series of data transmission reliability problems. To ensure the reliability of data transmission and avoid excessive network energy consumption and network congestion from affecting data forwarding, scientific data forwarding routing and congestion control mechanisms have become the top priority for wireless sensor networks to achieve highly reliable data transmission. Implement and test the English teaching management system, focusing on the system login and registration module, the system main interface module, the English course resource management module, the English course teaching management module, the English course testing module, the English course preparation module, the user personal center module, and so on. The realization and analysis are carried out, and the core realization codes and effect diagrams of each functional module are given. The important modules of the system are systematically tested and the test results are analyzed, which meet the needs of virtual English course teaching.

5. Conclusion

This paper initially analyzes the application prospect of the wireless sensor network, discusses the importance of this technology and the difficulty of learning this technique, introduces for this difficulty the background of the research of virtual English teaching system of the wireless sensor network, combines it with the concept of microservices, and discusses the design and implementation of a virtual English teaching system of wireless sensor network based on microservice architecture. This paper introduces the technology related to this wireless sensor network virtual English teaching system, the system requirements. In response to these requirements, the microservice architecture is used to divide it into corresponding modules and the key parts of the modules are analyzed and designed. This paper designs and implements a virtual English teaching system based on microservice architecture for wireless sensor networks, which is a more detailed design and preliminary implementation of the virtual English teaching system for wireless sensor networks, filling the gap in the research of virtual English teaching system. At the same time, the implementation of the English management system can provide quality learning support services for the majority of students, greatly stimulating students' enthusiasm for learning and improving the quality of English Teaching quality. With the arrival of the era of big data and the era of intelligence, software development has a breakthrough and development point; therefore, the future English teaching management system also needs to follow the trend of the times, using today's advanced data mining technology, machine learning knowledge, and artificial intelligence technology to do further transformation and upgrading of the system, which is one of the key concerns of the later system transformation and upgrading. Through the introduction of new technologies, the operating speed and experience ability of the system can be better improved.

Data Availability

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

Conflicts of Interest

No conflicts of interest exist concerning this study.

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