Research Article

Application of Voice Database in Enterprise Human Resources Optimization Based on Improved Algorithm

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With the continuous development of IP network technology, VoIP technology has become more mature. However, due to the characteristics of the packet network itself, the voice quality of VoIP service is caused by delay and packet loss. This paper analyzes the application of the speech quality system in the optimization of human resources in enterprises. With the emergence and development of database systems, data sharing has been significantly improved, data integrity has been guaranteed, data security has been improved, and the development difficulty of embedded applications has been greatly reduced. Through system simulation, it can be seen that with the increase of the packet loss rate, the voice quality is obviously degraded, and the decline rate becomes slower with the increase of jitter. After designing and implementing a company’s human resource allocation, achieving the most efficient allocation of resources requires continuous testing, evaluation, and improvement. Therefore, after completing the company’s human resource allocation, it is necessary to establish a set of testing and evaluation mechanisms.

1. Introduction

In recent years, Internet technology and multimedia technology have developed rapidly, it has become a trend to provide multimedia services through the Internet, and it is also a hot research topic today [1]. With the rapid development of communication technology, VoIP has become a typical Internet multimedia service. Because VoIP is a data exchange process in the form of packets, VoIP phones provide more than just voice services through VoIP services. Voice, as the most important and basic technology in the process of human communication, has made a huge leap in the human communication experience. Therefore, voice communication is one of the most important technologies in the communication system [3]. In the development of voice communication technology, the development of voice quality assessment technology provides an important basis for assessment [4]. The call quality directly affects the user’s overall reputation for the service provided by the operator. With the development of science and technology and the progress of society, embedded systems are application-centric and computer-based, and embedded systems are achieving more and more extensive and detailed applications. Now, it has been widely used in analog systems, medical instruments, computer equipment, communication equipment, aerospace, and many other fields [5]. There are data management issues in many embedded system applications. When the amount of data that the system must process is not large, data management is still relatively simple. However, when the amount of data in the system increases to a certain scale, the conventional system will use the file system to organize and manage the data [6]. In addition, the development of many companies in many countries and regions in the world has almost one thing in common; that is, human resources are the point of dependence and support of society for economic and technological development [7]. In today’s society, human resources have become the main resource for scientific and technological progress and business development. In order to adapt to the fierce international competition today and in the future, China will revitalized enterprises with Chinese characteristics and establish first-class human resources at
home and abroad [8]. The company team has become the primary factor. For this reason, it is necessary to make a fundamental change in human resources. The focus of human resource development has shifted to improving the quality and efficiency of human resources. How to focus on human resources strategy, retaining and attracting talents, and how to do a good job in the development and management of human resources have become the top priority of their work after China’s entry into WTO [9].

2. Related Work

The subjective speech quality evaluation method is to evaluate the level of speech quality through the human subjective perception of speech [10]. ITUP.800 and P.830 define the subjective evaluation method of average opinion score, and the test method used is the absolute classification score test. It gives an average opinion score. The literature introduces that an accurate voice quality evaluation model is to find the relationship between various factors that affect voice quality and MOS scores [11]. The regression algorithm is an efficient algorithm based on statistical methods. It uses a mathematical-statistical method to study what we are concerned about [12]. We have uncertain dependencies and constraints between variables. The purpose is to use the obtained mathematical expressions to analyze unknown variables through known variables and display the law of change. The literature proposes and introduces some commonly used VoIP voice quality assessment methods and focuses on the two most commonly used methods, namely PESQ and E-Model [13]. The advantages and disadvantages of these two methods are theoretically analyzed to further verify the simulation data. In order to overcome the shortcomings of these two algorithms, Professor Sun proposed a hybrid E model/PESQ algorithm [14]. Data integrity is guaranteed, data security is improved, and the difficulty of developing embedded applications is greatly reduced. In theory, using it alone can make up for the first two shortcomings. In this article, we optimized the algorithm, added network jitter to the input parameters, improved the delay calculation, and proposed an improved hybrid E model/PESQ algorithm [15]. The literature puts forward that the purpose of optimizing the human resource allocation structure is to use certain methods to measure the reasonable structure, personnel deployment, and recruitment of the entire enterprise and various departments according to the company’s current work structure and strategic goals, guided by the idea of sustainable development [16]. Work provides a strong human resource guarantee for being able to reach the level of enterprise management in medium-developed countries and realize the goal of modernizing enterprise management systems. Based on an organizational structure that can quickly respond to market changes, determining a reasonable structure of employee skills, number, age, cultural quality, and gender is a key issue for optimizing the allocation of human resources. With the intensification of the international competition environment of modern enterprises, the human resource problems faced by Chinese enterprises have become more and more prominent. The competition for human resources is also becoming increasingly fierce [17]. Enterprises undertake the dual tasks of enterprise and society, and performance is of greater significance to enterprises [18]. Due to the socialization of companies under China’s planned economy, in order to ensure the number of jobs in society, companies usually assign more jobs than reasonable standards. When faced with nonenterprise in the same industry, this will lead to a decline in company performance and insufficient product prices. Therefore, a reasonable minimum number of employees in a company are of greater significance to the company [19].

3. Voice Quality System and Embedded Database

3.1. Voice Quality System. Testers must assess the overall quality of the audio without training. It can be seen from Table 1 that the tester finally gives the listening score according to Table 1 and finally uses the average score of all testers as the final average score.

The advantages of the MOS subevaluation method are obvious, and the results are closest to people’s subjective feelings. Our ultimate goal is to understand how people think about voice quality. Therefore, this method can be considered as the most accurate. Figure 1 shows a schematic diagram of PESQ.

The premise of the E-model is to assume that voice quality impairment factors are always added physically. In short, if you can flexibly add network disruption factors, such as noise, echo, delay, encoder performance, and jitter, you can estimate the integrated network. Figure 2 shows the structure of the E model in G.107.

All influencing factors of F-model are attributed to the parameter $R$, which includes the effects of delay, packet loss, echo, and other factors.

The calculation formula of transmission performance $R$ is shown in the following formula:

$$ R = R_0 - 10 \cdot (S + D - I - E) + f + A, $$

where $R_0$ is the basic signal-to-noise ratio, which represents the damage caused by noise, such as background noise in a call environment or circuit noise generated by a circuit.

The expression of $R_0$ is shown in the following formula:

$$ R_0 = 15 - 1.5 (S + N_o), $$

$$ N_o = 10 \log \left[ 10^{S/L_o/10} + 10^{N_o/L_o/10} + 10^{N_o/10} + 10^{N + 10^3/10} \right], $$

$$ N_o = P_s - S - D_s - 100 + 0.004 (P_s - OLR - D_s - 14)^2, $$

where $OLR = S + R + LRL$, as shown in the following formula:

$$ N_o = RLR - 121 + Pre + 0.008 (Pre - 35)^2. $$

Among them, the preexpression is as shown in the following formula:
\[ \text{Pre} = \text{Pr} + 10 \log \left[ \frac{1}{10} \left( \frac{10}{1 + 10} \right) \right] \]  

(6)

\[ Nfo = Nf or + RLR. \]  

(7)

\[ Nf or \] represents the noise at the receiving end, as shown in the following formula:

\[ Nf or = -64 \text{dBm}. \]  

(8)

Iolr indicates that the voice quality is degraded because the loudness level OLR is too low, as shown in the following formula:

\[ Iolr = 20 \left\{ 1 + \left( \frac{Xolr}{8} \right)^{1/8} \right\}^{1/8} - \frac{Xolr}{8} \]  

(9)

\[ Is = Iolr + 1st + Iq. \]  

Figure 1: PESQ algorithm flow chart.

Figure 2: E-Model structure diagram.
Among them, the expression of STMRo is as shown in the following formula:

$$\text{STMRo} = -10 \log \left[ 10^{-\left(\text{STMR}/10\right)} + e^{-2(T/4)}10^{-\left(\text{TELR}/10\right)} \right].$$

(11)

$Iq$ is the impairment caused by the distortion produced by the speech during quantization, as shown in the following formulas:

$$Iq = 151 \log \left[ 1 + 10^Y + 10^Z \right].$$

(12)

Among them,

$$Y = \frac{R_o - 100}{15} + \frac{46}{8.4} \cdot \frac{G}{9},$$

(13)

$$Z = \frac{46}{30} \cdot \frac{G}{40},$$

(14)

$$G = 1.07 + 0.258Q + 0.0602Q^2,$$

(15)

$$Q = 37 - 15 \log (q \ du).$$

(16)

The benefit coefficient $A$ is shown in Table 2.

After considering that in the actual VoIP system, the main factors that affect the VoIP voice quality are the network quality and the encoder, therefore, for $R_o$, $Ls$, and the gain coefficient $A$, we can use the default values, which not only simplifies the calculation process but also saves a lot of input. The working of the parameters, such as the default parameters, is provided in Table 3.

Figure 3 shows the relationship between the transmission performance level $R$ and the average opinion score MOS score.

In order to make the experiment process more convenient, we set the maximum value of the client jitter buffer to 100MS and, on this basis, simulate the data shown in Table 4. In order to eliminate the contingency of the data and make it universal, we set the maximum value of the client jitter buffer to 100MS. This combination of data simulates 50 voice calls.

Individual simulation data are shown in Table 5.

Draw the relationship between packet loss, jitter, and voice quality through simulated data, as shown in Figures 4 and 5.

In Figure 4, as the jitter increases, the voice quality decreases significantly, and the rate of decrease slows down as the packet loss rate increases.

In Figure 5, as the packet loss rate increases, the voice quality decreases significantly, and the rate of decrease slows down as the jitter increases.

The sample data used in the regression model come from the simulation in this article, and these data are obtained through simulation in a specific environment.

Coding: AMR-WB jitter buffer maximum: 100 ms.

When the above-mentioned environment changes, the parameters of the regression model will also change accordingly as shown in the simulation data in Figure 6.

3.2. Embedded Database. The step of searching for a keyword of 79 is shown in Figure 7. The node sequence to be searched in the search process is $A \rightarrow C \rightarrow F \rightarrow I$, and the search is successful.

Next, we analyze and compare the storage usage of T-trees, unbalanced B-trees, and unbalanced T-trees to describe the nominal data load (denoted by $w$) or the maximum number of data items that can be accommodated. In order to facilitate performance analysis and comparison, unbalanced B-tree and unbalanced T-tree nodes can completely occupy the entire storage block, and their size is set to $K$.

Each node in the T-tree has three link pointers to the root node and parent node of the left and right subtrees, and two fields, namely the balance factor and the number of data elements, so the rated data load can be determined in the following way:

$$W_t = \frac{(K - 3 \cdot L - 2 \cdot I)}{E}$$

$$= \frac{(K - 14 \cdot I)}{E}.$$  \hspace{1cm} (17)

Each node of the unbalanced B-tree has only one link pointer, which points to the root node of the rightmost terminal tree, plus a field for indicating the number of data elements, so the rated data load can be calculated by the following formula:

$$W_{ub} = \frac{(K - L - I)}{E}$$

$$= \frac{(K - 5 \cdot I)}{E}.$$  \hspace{1cm} (18)

Each node of the unbalanced T-tree has two link pointers, which point to the root nodes of the left and right subtrees, respectively, plus a field for indicating the number of data elements, so the rated data load can be calculated by the following formula:

$$W_{ut} = \frac{(K - 2 \cdot L - I)}{E}$$

$$= \frac{(K - 9 \cdot I)}{E}.$$  \hspace{1cm} (19)

Therefore, in terms of nominal data load, unbalanced tree storage usage is not as good as unbalanced B-tree storage usage, but worse than T-tree storage usage.

Now, suppose that $N_h$, represents the minimum number of nodes contained in a T-tree with a height of $h$. Obviously, $N_h = 0, N_1 = 1, N_2 = 2$. From the definition of $T$ tree, we can see, as shown in the following formula:

$$N_h = N_{h-1} + N_{h-2} + 1.$$  \hspace{1cm} (20)

The solved formula is as follows:

$$N_h = \frac{\theta^{h+2}}{\sqrt{5} - 1} (\theta = (\sqrt{5} + 1/2)).$$  \hspace{1cm} (21)
In contrast, the maximum height of the n-node T-tree is $\log_\theta (\sqrt{5} (n + 1)) - 2$. Therefore, the time complexity of searching in the T-tree is $O(\log n)$.

Table 2: Part A value specified by G.107.

| Communication system example                                      | The value of A (maximum value) |
|-------------------------------------------------------------------|--------------------------------|
| Traditional communication environment                             | 0                             |
| Cellular mobile system inside a building                         | 5                             |
| Vehicles driving inside the area                                 | 10                            |
| Remote areas, such as connecting via multiple relay satellites    | 20                            |

Table 3: Default value and range of $E$ model parameters.

| Parameter                                      | Abbreviation | Unit | Defaults | Allowable range | Note          |
|------------------------------------------------|--------------|------|----------|-----------------|---------------|
| Loudness level                                 | SLR          | dB   | +8       | 0...+18         | (Note 1)      |
| Receive loudness level                         | RLR          | dB   | +2       | −5...+14        | (Note 1)      |
| Side tone masking level                         | STMR         | dB   | 15       | 10...20         | (Note 2)      |
| Side tone level                                 | LSTR         | dB   | 18       | 12...23         | (Note 2)      |
| D value of the phone on the sending side        | Ds           | —    | 3        | −3...+3         | (Note 2)      |
| D value of the receiving side phone             | Dr           | —    | 3        | −3...+3         | (Note 2)      |
| Speaker echo intensity level                    | TELR         | dB   | 65       | 5...56          |               |
| Weighted echo channel loss                      | WEPL         | dB   | 110      | 5...110         |               |
| The average word delay of the echo channel      | T            | ms   | 0        | 0...500         |               |
| 4-wire loop round trip delay                    | Tr           | ms   | 0        | 0...1000        |               |
| Absolute delay in echoless connection          | Ta           | ms   | 0        | 0...500         |               |
| Number of quantization distortion units         | Qdu          | —    | 1        | 1...14          |               |
| Equipment damage factor                         | Ie           | —    | 0        | 0...40          |               |
| Packet loss intensity factor                    | Bpl          | —    | 1        | 1...40          | (Note 3)      |
| Random packet loss probability                  | Bpl          | %    | 0        | 0...20          | (Note 3)      |
| Burst ratio                                     | Burs:R       | —    | 1        | 1...2           | (Note 3)      |
| Circuit noise referenced to 0dB point           | Ne           | dBm0p| −70      | −80...−40       | (Note 3)      |
| Receive side noise floor                        | Nfor         | dBmp | −64      | —               | (Note 3)      |
| Indoor noise on the transmitting side           | Ps           | dB(A)| 35       | 35...85         |               |
| Indoor noise on the receiving side              | P            | dB(A)| 35       | 35...85         |               |
| Benefit factor                                  | A            | —    | 0        | 0...20          |               |

Note 1: the total value of 0dB points between the transmitter and the receiver. Note 2: fixed relationship: LSTR = STMR + D. Note 3: currently under study.

The nodes of the unbalanced B-tree form a singly linked list. When searching for boundary nodes, it is necessary to compare the minimum key value and the maximum key value of each node. Therefore, when the search is successful, the unbalanced B-tree will find the average search length $ASL_{ub}$ of the boundary node as follows:

$$ASL_{ub} = \frac{1}{n} \sum_{i=1}^{n} P(i) \times 2n,$$ (22)

where $P(i)$ ($i = 1, 2, \ldots, n$) is the probability of finding the $i$-th node.

According to the previous assumption, the probability of finding each node is $1/n$, which is $P(i) = 1/n$. Therefore, the average search length of an unbalanced B-tree is

$$ASL_{ub} = \frac{2}{n} (1 + 2 + \cdots + n)$$ (23)

$$= \frac{n + 1}{2}.$$

That is to say, when the search is successful, the time complexity of the search operation of the unbalanced B-tree is $O(n)$.

In the case of a successful search, an unbalanced T-tree with $n(n \geq 1)$ nodes, and one node in the left subtree, the average search length $ASL_{node}$ for finding the bounding node is as follows:
\[ P(n, i) = \frac{1}{n} \left[ 2 + i \times (P(i) + 1) + (n - i - 1) \times (P(n - i - 1) + 2) \right], \quad n \geq 1, \]

where \( P(i) \) is the average search length of an unbalanced tree containing one node, then \( P(i) + 1 \) is the average of the number of comparisons used to find each node in the left subtree, and \( P(n - i - 1) + 2 \) is to find each node in the right subtree, so the equation \( i \) in 25 can be averaged from 0 to \( n \) to get the following formula:

\[ P(n) = \frac{1}{n} \sum_{i=1}^{n-1} \left[ 2 + i \times (P(i) + 1) + (n - i - 1) \times (P(n - i - 1) + 2) \right] \]

\[ 2 + \frac{2}{n} \sum_{i=1}^{n-1} iP(i), \quad n \geq 2. \]

Obviously, \( P(0) = 0, P(1) = 2 \).
The solved formula is as follows:

\[ P(n) = 2n + \frac{n+1}{n} 1m + C, \text{ Where } C \text{ is a constant}. \]

It can be seen that under random conditions, the average search length of an unbalanced T-tree is the same order of magnitude as LOGN; that is, the time complexity of the search operation is OLOGN.

4. Enterprise Human Resources Optimization Processing and Realization

4.1. Research on Optimization of Enterprise Human Resource Allocation Structure. The human resource structure is the composition and common positioning of all employees in
Figure 6: Packet loss rate, jitter, and Ier.

Figure 7: Steps to find the data element with the key of 79 in the unbalanced T-tree.
the operation of a company, and it can fundamentally reflect the actual situation of the company’s human resource allocation. The company should optimize all aspects of the organization’s internal departments and even the company’s internal human resource structure, such as the personalized trend of team human resources. In any organization, there is the work organized by the manager and the managed, which often involves many different aspects, and each aspect requires different personnel and abilities to achieve it. Organization is the basic feature of society, so it must have a structure, that is, “organizational structure”. As a specific organization, there are also problems with the organizational structure of the enterprise. There is a high degree of correlation between “organizational structure” and “corporate human resources allocation” because the optimal allocation of human resources is statically reflected in the staffing of the organizational structure; that is, a certain unit in the organizational structure corresponds to the people of this unit. Therefore, when the management organization and system are sound, the management effect is not necessarily the best. If the benefits of the management system cannot offset its costs, there is no need to establish such a management organization and formulation system. This requires reasonable and flexible arrangements for the organizational structure, focusing on the adjustment and innovation of the core business of the enterprise, and continuously optimizing and adjusting the structure of human resources.

A reasonable academic structure requires that the proportion of people with different academic qualifications in the organization is reasonable, and talents should not be wasted or lack of talents. Through in-depth investigation and research on some state-owned enterprises in China, it is found that the problem with enterprises with higher general education level is that the educational structure of various departments is unreasonable and the educational structure of all age groups is unreasonable. The educational structure of all age groups is unreasonable. Some measures to solve the problem of academic structure imbalance can be solved by the exchange or deployment of personnel in different departments, or a good education and training system can be established, with emphasis on the training of middle-aged and grass-roots employees. It has not yet been determined whether people with higher education are more beneficial to the development of Chinese companies. The key is to predict the demand and supply of human resources based on the different strategic goals and tasks of Chinese companies. It is not only a quantitative forecast but also a short-term, mid-term, and long-term academic qualification. It is not only a quantitative prediction but also a short-term, medium-term, and long-term academic qualifications, skills, and age structure, as well as human resource allocation plan. While performing these basic tasks, it is necessary to adapt to the educational structure of each department.

4.2. Research on the Realization of Optimal Allocation of Enterprise Human Resources. Production efficiency is the main factor for the company to maintain a reasonable gross profit margin, and ensuring reasonable jobs for the company is an important factor in improving the company's production efficiency. The minimum number of employees for a unit position refers to the minimum number of employees for appropriate positions adopted by the company to ensure job efficiency. In this problem, too many numbers will cause fluctuations between labor and internal consumption, and the waste of company resources will result in insufficient corporate resources. The number of people who complete the scheduled activities will affect the completion of the company’s performance. Therefore, the principle of the lowest employment rate is the principle of the highest efficiency of the enterprise. First of all, it is necessary to conduct a reasonable analysis of the position. According to organizational performance, we calculate the upstream and downstream working methods of production positions and departments, comprehensively analyze the production workload that upstream and downstream positions can undertake, and then calculate the average workload of workers. The best way to get the number of workers required to complete 10% of the extra workload and the number of workers that can reach the average daily workload is to conduct actual production line tests and make continuous adjustments based on the data obtained in the production line. Throughout the process, we must avoid non-data-driven workload calculations, and everything is data-driven, which is a product of practice to determine the company’s position. In this cycle, everything revolves around the product. To produce products, it is necessary to purchase raw materials. After the raw materials are purchased, they must be produced, and many links are involved in the production, which creates multiple positions in the production.

Human resource strategic planning belongs to the overall strategic category of an enterprise and is the support and basic role of organizational strategy. Human resource planning should consider the company’s current discovery status and future development potential and make plans accordingly. Define and verbally describe the number of positions and human resources needed now and in the future. On the basis of maximizing corporate performance, attention should be paid to the improvement of quality and quantity. We must pay attention to the analysis of existing human resources and make plans. The training of corporate human resources is a very important part. At present, Chinese companies have done a lot of work in human resource training, but the effect is not good. Human resource training is very poorly targeted. It does not provide training for company needs nor does it design appropriate company training for successful operation and management experience. At present, the training of enterprises only pays attention to the form and ignores the effect. There is no certain evaluation and acceptance of the training effect, and an evaluation mechanism has been formed. As a result, the vacancy rate of company employee training is relatively high, employees are less motivated to participate in training, and their learning and growth are poor, so they cannot use the knowledge they have learned. Finally, the turnover rate of employees is relatively high.
After designing and implementing the company’s resource allocation, to achieve the most effective resource allocation, continuous testing, evaluation, and improvement are required. Therefore, after completing the company’s resource allocation, it is necessary to establish a set of resource allocation detection and evaluation mechanisms to continuously discover and optimize the company’s current resource allocation problems, and it is necessary to establish a regular inspection and control system. Adjust management and coordination to ensure that the staffing can meet the company’s strategic and development needs in a timely manner. The company’s human resource allocation is closely integrated with the company’s current business strategy, dynamically optimizing the human resource structure, promoting the company’s sustainable development and innovation, as well as various intermediate businesses, start-ups, industries, and commerce. After testing the HR configuration, the current HR configuration needs to be adjusted and improved according to the test situation. Adjust the human resources allocation according to the existing management foundation and situation of the Chinese company, report to the company’s senior management, strengthen communication with middle management and corresponding management, solve current problems, and understand and ensure employee safety. It is on the same step. This can effectively promote improved human resource allocation.

5. Conclusion

With the continuous development of IP network technology, VoIP technology has become more mature. However, due to the characteristics of the packet network itself, the voice quality of VoIP services is caused by delay and packet loss. The voice quality is not as good as the traditional PSTN telephone network, which limits the development of VoIP technology. With the emergence and development of embedded database systems, data sharing in the embedded environment has been significantly improved, data integrity has been guaranteed, data security has been improved, and the difficulty of developing embedded applications has been greatly reduced. By introducing and analyzing the basic principles of optimizing the human resource allocation structure of Chinese companies, we pointed out the dynamic optimization of hard structure age, educational background, profession, professional knowledge and soft structure knowledge, and ability and quality. The key to the internal talents of Chinese companies lies in the analysis of talents, which is an important issue related to the optimal allocation. The success of the optimization and coordination strategy for educational background, age, professional knowledge, and ability structure directly affects the realization of the strategic goals of state-owned enterprises. The basic principle of optimizing the allocation of human resources in state-owned enterprises is to ensure the effective operation of the organization and sufficient workload and to achieve true rationalization and high efficiency. It is necessary to optimize the specific content with the best configuration to achieve the best integration state of all the resources of the organization. Safeguard measures provide employees with talents, create development opportunities, allow employees to surpass themselves, develop their potential, and ultimately realize the company’s human resource structure. It is to establish a fair, just, and open employment mechanism to achieve optimization.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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