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Research Article

Brainwave Acquisition Terminal Based on IoT Smart Sensor for English Listening Test

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In our teaching, teachers cannot understand students' learning situation deeply, they can only judge students' mastery of English through usual homework situation and test scores, but this is not an accurate way of judging. In addition, the combination of the Internet of Things and sensors and their application in the teaching field has made preliminary progress, and the phenomenon of Internet of Things smart sensors being used in teaching is becoming more and more common. For this reason, this article proposes that the brainwaves of the students' learning process can be sent to a remote server for persistent transmission through the Internet of Things. It also collects brainwave data to match the learning structure in the student management system and finally establishes a machine learning model for analyzing the student's learning process to analyze the student's learning situation. This article discusses and constructs a brain wave collection terminal based on the intelligent sensor of the Internet of Things for English listening test. Experiments have shown that the brainwave collection terminal in this article has achieved an accurate grasp of how students learn in the English listening test. Its accuracy is as high as 89.34 ols pay more and more attention to the education of their children. However, the understanding of the students' learning situation only stays on the surface, and it is impossible to have a deep understanding of the students' specific learning situation. In addition, the development of science and technology has become more and more mature. The Internet of Things and smart sensors are gradually being used in the teaching field. Although they provide convenience for daily teaching activities, their research and development in this area is not very mature, and there are still many problems. In addition, products used in the field of brainwave sensors for teaching have appeared. However, the data cannot be obtained and the computer wave model cannot be established or modified. Therefore, the technology for applying brain wave sensors to teaching is not mature. Therefore, this article needs to study the brainwave collection terminal of English listening test, and provide technical support for more accurate grasp of students' learning situation.

1. Significance

The brainwave acquisition terminal for the English listening test studied in this article can solve the problem of immature technology in the current teaching field and provide a set of practical brainwave data acquisition devices for the market. Second, the brainwave acquisition device studied in this article can assist schools in completing daily teaching activities and can also provide the collection of student learning data for scientific research institutions or teaching institutions. In addition, the device can better model the learning data of students and provide better scientific and technical support for accurately grasping the learning situation of students, and this article still has a great breakthrough in the setting of brain wave collection terminal, which provides a good reference value for the subsequent replacement of brain wave devices.

2. Related Work

With the rapid development of science and technology, mankind has made major breakthroughs in intelligent technology, especially in language learning. Researchers spend a lot of time to intelligentize the process of language learning and improve the efficiency of human language learning. Among them, Ockey and French has done a series of studies on the need to assess multilingual listening skills in a global context, which is becoming more and more common. His research is aimed to determine the degree of influence of accent intensity and familiarity on listening comprehension, and developed an accent intensity scale in this regard [1]. Green focuses his research on different types of listening behaviors, including a series of sound files that reflect different types of discourse, themes, target audiences, and purposes. He first describes the test population, instructions, and sound files, and then gives the task. What follows is a discussion of each task, according to the type of listening behavior that the test developer wants to measure, according to the applicability of the reflection-sound file [2]. Lee et al. has studied the machine to understand the content of spoken language and developed a machine that can understand the content of spoken language. He passed the TOEFL listening test, showing that the model uses the hierarchical structure of natural language and the ability to select attention mechanisms, which is better than the original method and other neural network-based models [3]. Lee and Young described two prototype studies before a new English listening test can be used in practical applications. One of the prototype studies collected evidence to support domain description inference, that is, whether the test task appropriately sampled the examinee's general English listening comprehension ability [4]. Wang studied the holding of listening test-training courses in Beijing Science District. The course is held in the "AES Engineer Training Camp" of Aisin Jufu, and is aimed at domestic and foreign sound and sound engineers. His research purpose is to cultivate the subjective and objective listening of young sound engineers to achieve the most accurate [5]. In order to prove the difference in semantics, Dal Palu et al. rolled office chairs to make sounds and asked 90 participants to take a hearing test, and described the moving sounds of two high-quality and low-quality office chairs. He then presented the recorded stimulus information to the listeners through headphones, and found that the difference in chair sound was related to calm and rough surfaces, happy and annoying moods [6]. These studies have made good elaboration on human hearing, but they have not stated in the study that sound entering the brain may still be transmitted to the world outside the brain in another form. How to record the form of sound after entering the brain is rarely mentioned in the research of English listening. Most of these studies focus on the study of humans receiving sound, no one has studied the changes and manifestations of sound after it enters the brain.

3. Innovation

This article has the following innovations in the study of brainwave acquisition devices for English listening tests: (1) the research device in this article is based on the production process of English listening audio and the students' English listening test. It will be more in line with the actual learning situation of students, and at the same time, it will be able to more accurately grasp the impact of changes in English audio on brain waves. (2) It combines the Internet of Things and sensors to form an Internet of Things smart sensor, which can remotely obtain and integrate the information and data of the Internet of Things storage server. (3) On the basis of the original English listening test brain wave collection terminal, it combines the science and technology of the intelligent sensor of the Internet of Things. This makes it possible to model the collected student learning data and better provide technical support for daily teaching activities. (4) In the process of English listening, brain waves are not only stimulated by external audio but also affected by inevitable physiological signals. Therefore, this article uses IoT smart sensors to reduce the brain waves generated by the influence of the signal, so that the student's learning data is more accurate.

4. Design Method of Brainwave Acquisition Terminal for English Listening Test

4.1. Audio Signal Collection and Output. In daily life, the songs we hear, as well as the current audio television and audio movies, require some recording equipment and sound output equipment in the production process. These include high-sensitivity condenser microphones, audio and tone modulators, and control equipment. It is shown in Figure 1.

As shown in Figure 1, there are various devices in the audio recording process, and the technologies and principles involved are also different. For example, the principles of audio sensors and speakers are also different. In addition, when we do the English listening test, the most basic material is the listening audio, and then the paper or electronic manuscript test questions. But how is the English listening audio produced, and how is it played and output synchronously in different classrooms? Figure 2 shows the floor plan of the simultaneous English listening test in different classrooms.

In Figure 2, to play synchronized English listening in different teaching buildings requires network transmission. In this process, the network plays a key role, so the network is indispensable in the English listening test. Of course, we need to trace back to the collection of English listening audio. If it needs to make English listening audio, it needs to collect audio signals. The collection of audio signals requires the use of some recording equipment, as well as a sound source. This sound requires someone to read a piece of English to our recording equipment, but cannot use other equipment to play the voice for recording, because in this way, the source of the sound cannot be obtained. The audio obtained then needs to be analyzed and modulated on the recorded spectrum before it can be output. The analysis of the frequency spectrum requires the application of related principles, and the principles are as follows:

$$\begin{aligned} E_{(f)} &= \sum_{Z-1}^{N} t(s) g_N^{(s-1)(f-1),} \\ t(z) &= (2/N) \sum_{k=1}^{N} E_{(f)} g_N^{(s-1)(f-1),} \\ g_{(N)} &= f^{(\pi Z)/N}. \end{aligned} \tag{1}$$

In processing the frequency spectrum, we use the FFT function in the audio signal-processing tool. In formula (1),

Figure 1: Audio capture device diagram.

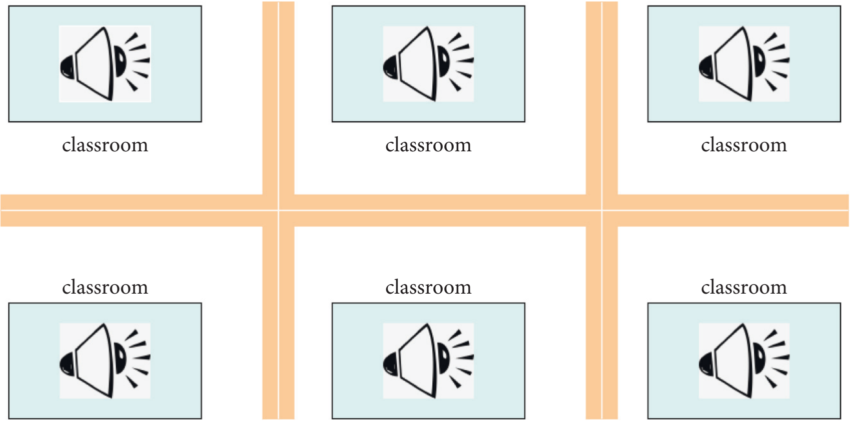

Figure 2: Plan of simultaneous English listening test in different classrooms.

E is the serial number, S is the audio duration, t is the highest value of the audio amplitude, g is the lowest value of the audio amplitude, f is the average of all audio amplitudes, and z is the amplitude of the audio duration. After analyzing the frequency spectrum, we need to modulate and demodulate the audio model, and the final piece of audio is considered complete. The principle of modulation and demodulation is as follows:

$$g(s) = E(t) * ins\left(g_N * f\right),$$

$$E = \frac{1}{2}\left\{E_{\left(g+g_N\right)} + E_{f\left(g+g_N\right)}\right\}, \qquad (2)$$

$$E_0(f) = g(f) * ins\left(g_N * t\right).$$

The audio modulation process needs to add Gaussian white noise for demodulation. The Gaussian in the so-called "White Gaussian Noise" means that the probability distribution is a normal function, while the white noise means that its second-order moments are uncorrelated. The first moment is a constant, which refers to the correlation of successive signals in time. Gaussian white noise is an ideal model for analyzing channel additive noise. So the above formula E_0 represents the sequence of Gaussian white noise. Finally, after filtering the modulated and demodulated audio signals, they can be put into the audio player for playback, which is the process of our audio output [7]. In fact, the collection and production of audio signals is relatively cumbersome, but the development of technology nowadays has provided a more convenient device for audio production, that is, a recorder. Although there are many principles involved in the recorder, it is possible to automate the processing of the collected audio signals during the audio production process. The output method only needs to transmit the finished audio to the designated device through the network for output [8]. The entire audio production process is shown in Figure 3.

The production process of English audio is basically the same. In English listening, sound is transmitted to the brain through our ears to generate brain waves, and when the sound passes through the ear, our eardrum is equivalent to a sensor. When receiving audio signals, the central nervous system will feed back to the brain, and the brain will produce brain waves in response. This research is to design a terminal to collect these brain waves.

4.2. The Perception of English Listening Audio by IoT Smart Sensors

4.2.1. IoT Smart Sensors. Since the development of sensors, there are more and more types of them [9], and with the development of communication technology, sensors can sense some information from a long distance. For example,

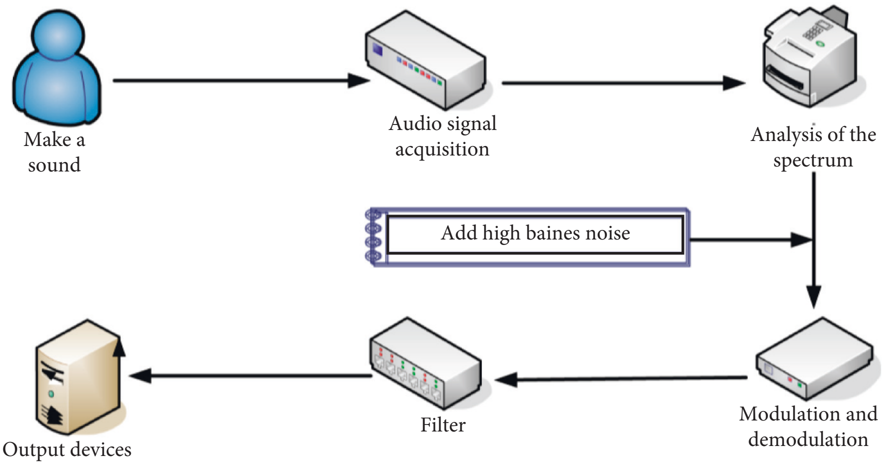

Figure 3: Flow chart of the audio production process.

the use of electrical appliances in our smart home can be remotely controlled through the Internet of Things [10]. The Internet of Things unites people, machines, and things. It combines it with the sensor, making the sensor more intelligent. The Internet of Things smart sensor is more similar to the Internet of Things architecture [11], and affected by the principle of the Internet of Things, the Internet of Things smart sensor can also be seen as a combination of collecting signals and controlling and processing signals [12]. For example, if the Internet of Things is used in our audio sensors, it can be more clearly transferred to the mind, and the sensor is blessed by the Internet of Things, the signal is more stable, and the tone will be clearer. The combination diagram of the Internet of Things and audio sensors is shown in Figure 4.

As shown in the figure, the Internet of Things connects sensors with sensors through network signals. Moreover, among the audio collected by each sensor, it will be transmitted to a general sensor service device through the network signal, and then passed into the human ear through the sound output device to enter the brain. In addition, IoT smart sensors can reduce noise according to the noise in different audio, and make the audio we want to hear clearer. The principle of noise reduction is as follows:

When the volume and loudness of this section of noise is h and the duration of the accompanying section of audio is X, there will be changes in the audio frequency during this process. Therefore, it is necessary to control the audio frequency M, and the time X_0 when the noise starts to appear and the time when the noise ends are X_3. Then we first need to reduce the volume of the noise, then:

$$h = \frac{M}{E} * \left|X_0 - X_3\right| * ins(x). \tag{3}$$

Then the internal modulator of the sensor reduces the tone of the noisy audio, and the principle is to add Gaussian white noise for demodulation as mentioned above. There are many types of ground principles involved in IoT smart sensors. But in this article, the combination of smart audio sensors and the Internet of Things is mentioned, so the principle is to collect various audios. The principle involved and the principle of the Internet of Things have been added to the previous audio sensors. Of course, in order to prevent the confusion of language types, we can set the language type that it needs to record to English. The setting principle is as follows:

$$E = \sqrt[X]{M} * \cap_t S * g. \tag{4}$$

In the above formula, E represents the number of language conversions, and X is the duration of the metaphorical audio mentioned above, and M is the frequency of English audio, S is the duration of English audio, t is the highest value of English audio amplitude, and g is the lowest value of English audio change amplitude. In the process of intelligent language conversion, the perception layer inside the smart sensor will completely preserve the English audio, and can use the Internet of Things to transmit it to a device dedicated to broadcasting.

4.2.2. Perception of English Listening Audio. Perception of English speech audio is closely related to listening level [13]. Just as we have taken a lot of English tests, basically, every English test cannot be separated from the English listening test. The ability to perceive English speech includes learners' perception and recognition of English segments, supersegments, and changes in continuous speech [14]. Therefore, when English speech is introduced into our ears, each person's different perception abilities will have different effects on the brain, and also have different effects on brain waves. Because whether people can hear English voice clearly, their brain waves are generated and the brain waves can be converted into English through sensors. In other words, when we are doing English listening, the brain waves generated can also be restored through the collection terminal. When our brain is full of alpha waves, the brain's attention is highly concentrated, and the perception of listening to English audio is also clearer. At this time, the human body has the least energy consumption, the right brain is powerful, the memory of English audio is the best, and the perception ability is the strongest. However, when the brain is full of beta waves, the brain is in a state of high

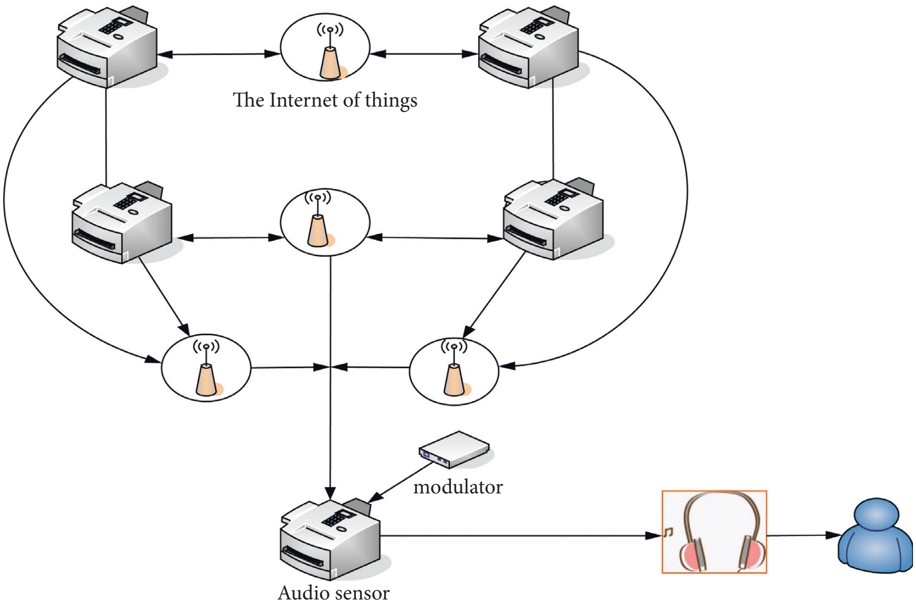

Figure 4: The combination of the Internet of Things and audio sensors.

tension and consumes the greatest energy to the human body. It is in a state of avoiding English listening all the time, that is, the brain will become sleepy in English and its ability to perceive English listening audio is weakened; when English listening audio stops, the human body will be in a relaxed state, the brain is full of gamma waves, the brain is in a resting state, and the ability to perceive English listening audio disappears [15].

Therefore, the ability to perceive English listening audio has an impact on the brain waves inside the brain. When the English listening audio enters the brain, the sound of the English listening audio will change the brain waves of the human brain. This brain wave can be collected and analyzed with the help of a terminal to restore the original English listening, and because of our different learning abilities, our familiarity with English will be different, and our perception of English listening audio is different [16].

4.2.3. The Perception of English Listening Audio by IoT Smart Sensors. When we have hearing audio, we need to get the text of the hearing audio, then we can use some sensor equipment, such as our mobile phone. Downloading a Baidu translation software or other translation software in your mobile phone, and then turn on the voice translation function of this software. When it aligns with the English audio playback source, it can be seen that the perceived English listening audio in the mobile phone is converted into text form and is being translated [17]. In this process, we need to open the network to use this function with our mobile phone. When the sensor setting in the mobile phone hears hearing audio, it will quickly search on the storage server of the Internet of Things through the communication network and display the audio text form before us. The process diagram of voice conversion is shown in Figure 5.

Of course, smart sensors will lag behind the network due to the speed of audio speech, so sometimes what they hear may not be completely correct, and there may be some minor errors, but this can be judged by sentence meaning. Among the smart sensors of the Internet of Things, the principle of its design is shown in Figure 6.

As shown in Figure 6, the Internet of Things is like an interconnected network, and when smart sensors receive English listening audio, the sensors will quickly integrate data and information stored in various places in the Internet of Things through the communication network. The principle of information integration is as follows:

$$Inf_1 = \frac{1}{2}\sum_{t}^{g}(X+T)*v, \tag{5}$$

$$Inf_2 = \frac{1}{2}\sum_{t}^{g}(S+N)*v. \tag{6}$$

Formulas (5) and (6) are the principle of the intersection and integration of four far-distant information in the Internet of Things. Where g is a weight value in the smart sensor, t represents the network speed, which is the speed of the network speed, and v is a matrix in the process of integrating the information of the Internet of Things memory with 4 storages that are far apart, as shown:

$$v = \left\{\begin{matrix} g & Y & g \\ H & g & R \\ g & M & g \end{matrix}\right\}. \tag{7}$$

In the same way, the information integration principle of other storage servers can be obtained as follows:

$$Inf_3 = \frac{1}{4}\sum_{t}^{g}\frac{|H-R|}{|Y-M|}*\eta. \tag{8}$$

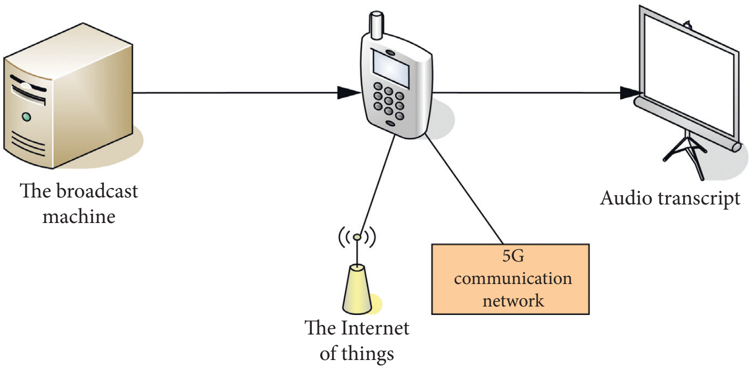

Figure 5: Process diagram of voice conversion.

In formula (8), because the four storage distances are similar, the network speed will be faster. Converge in four directions at the same time, and then quickly integrate and output in the smart sensor, and a matrix that maintains the balance of information will be generated in the above process. Its form is as follows:

$$\eta = \begin{Bmatrix} X & S \\ N & T \end{Bmatrix}. \tag{9}$$

Then it is integrated with the information of the other four storage servers. The principle is as follows:

$$Inf_4 = \frac{(Inf_1)}{(Inf_2)} * g * \frac{Inf_3}{k} * t. \tag{10}$$

In formula (10), κ is an information integration matrix, and its form is as follows:

$$k = \frac{1}{\begin{Bmatrix} X & Y & S \\ H & t & R \\ N & M & T \end{Bmatrix}}. \tag{11}$$

Finally, the principle of the complete English audio converted in the mobile phone is as follows:

$$Inf = Inf_4 * g * \frac{1}{k}. \tag{12}$$

In this way, the entire process of the IoT smart sensor for English audio needs to be completed. If it wants to collect the brain waves of the English listening test, it needs to use the Internet of Things smart sensors to perceive and convert the brain waves, and perhaps use smart sensors to perceive them.

4.3. The Design of Brainwave Acquisition Terminal for English Listening Test. Brain waves are the rhythmic discharge effect of the human brain in the physiological process. It is formed by receiving stimuli or spontaneous reactions to human body functions, and the brain electricity is the result of the comprehensive discharge of neurons. In our daily life, the brain generates EEG signals due to external stimuli. In the English listening test, our brain is stimulated by audio to produce brain wave signals about English listening. The schematic diagram of the EEG signal acquisition equipment is shown in Figure 7.

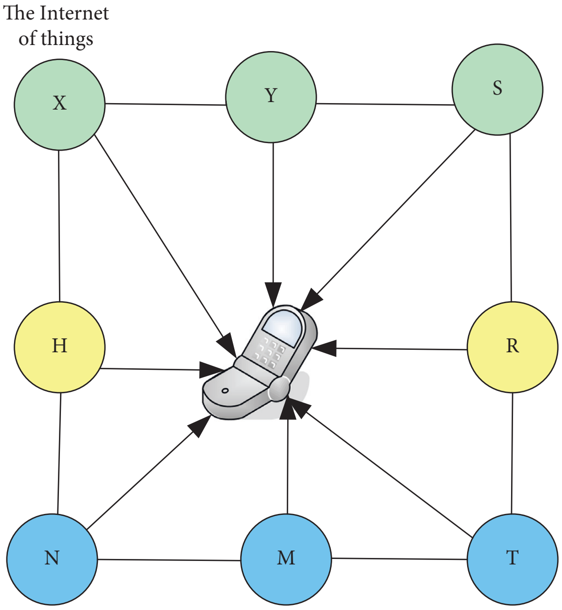

Figure 6: Schematic of the design.

What this article needs to design is the brain wave collection terminal based on the smart sensor of the Internet of Things, which is susceptible to interference in the English listening test, so the brain wave signal will also be interfered. There are two main sources of interference. The first is our own interference, and while we are collecting EEG signals for English listening tests, we will also collect bioelectric signals such as ECG, EOG, and EMG. These signals are difficult to distinguish and remove in the process of our collection, so we need to use IoT smart sensors to reduce or even eliminate the generation of these signals [18]. Another interference is the interference of the surrounding environment during the English listening test, and our surroundings are full of electromagnetic fields. These electromagnetic fields can easily enter the EEG signal through electromagnetic induction, so signal interference is a problem that we should fully consider in the design process.

Figure 7: Schematic diagram of EEG signal acquisition equipment.

Therefore, in the process involved, we need to reduce the noise of the audio before the sound enters the human brain so that the impact on the EEG signal of our English listening test will be reduced [19]. In addition, blinking must be avoided as much as possible during the hearing process to reduce the interference of biological signals on brain electrical signals. Of course, it is best to reduce noise, because biological signals are unavoidable. The EEG signal acquisition terminal design of this article is shown in Figure 8.

In the schematic diagram in Figure 8, it is obvious that when the English audio is played, the audio will enter the modem first. This modem will eliminate the noise generated during the hearing test, so that the interference from the external environment is excluded in the first step. Then enter the Internet of Things smart sensor to improve the quality of timbre and other aspects. After entering the human body to stimulate the brain to generate brain waves, a round of process has been completed here. After entering the brain, it is necessary to use equipment to collect the brain waves during the English listening test. First, the Internet of Things sensor is added to the brainwave acquisition equipment, and then the brainwave output from the brain will first pass the Internet of Things smart sensor to identify the brainwave generated by the biological signal and reduce the effect of its influence. Then it enters the brain wave collection terminal, and finally enters the brain wave display.

In the brain wave collection of the English listening test, the brain electrode is the medium connecting the brain wave and the collection terminal, and the high-performance brain electrode can reduce the introduction of interference. However, polarization voltage and electrode artifacts still exist, and these appear as DC signals in the circuit, as long as the DC blocking is used. In addition, because the resistance of brain waves and brain electrodes is very large, the acquisition circuit of brain waves needs to have a large input impedance capability [20]. In addition, coupled with the blessing of IoT smart sensors, it is possible to minimize the interference signal to the brain waves in the English listening test. From this it can refer to the circuit diagram of the brain wave acquisition equipment, as shown in Figure 9.

In Figure 9, in our brainwave acquisition device, direct current is used, so we need to convert our alternating current to direct current. There are more prominent resistors, which can play a certain impedance role on the brain waves and the resistance of the brain electrodes.

5. Experiment and Analysis of Brainwave Collection Terminal for English Listening Test

5.1. Test of English Listening and Audio Perception. In the teaching process, we can only check the student's learning situation through the English test, which can check the student's perception of English listening audio [21]. Therefore, in this experiment, we will select ten students with the same level of English and similar learning abilities to take the English listening test, and have tested their perception of English audio. The perceptual ability of English audio is designed to test the ten students' perception of English segments, supersegments, and sound changes in continuous speech [22], and record the test results of these ten students. The test content and scores are shown in Table 1.

Table 1 shows the content of the test required for this experiment. It finds these ten students in a quiet classroom and conducts English listening tests on them, and uses the results to judge their English perception and English listening proficiency. Then their test scores are shown in Figure 10.

From the overall score in Figure 10, it is undoubtedly that the English listening level of student No. 2 is higher. His English listening learning situation is the best because his listening test score reached 52 points, and his ability to perceive English listening is the strongest. But from the analysis of the accuracy of the question type, student No. 4 has the best learning situation for the question type sound change test, and has the strongest ability to perceive sound change; however, from the segment test, students No. 1, No. 2 and No. 7 tied for the first place, all scored 18 points, and these three students have the strongest perception of the sound segment; from the question-type supersegment test, student No. 6 scored 18 points. This student has the strongest ability to perceive English supersegment. If it is judged from the performance of each question type to judge the student's learning situation, it is difficult to distinguish which of them has the best learning situation. But judging from the overall results, such a judgment is too general. Because every student has his own strengths and weaknesses, it is difficult to make accurate judgments about the student's learning situation. In addition, it is easy to fall into a misunderstanding by using grades to judge students' learning. That is, he will consider which part of the student has the

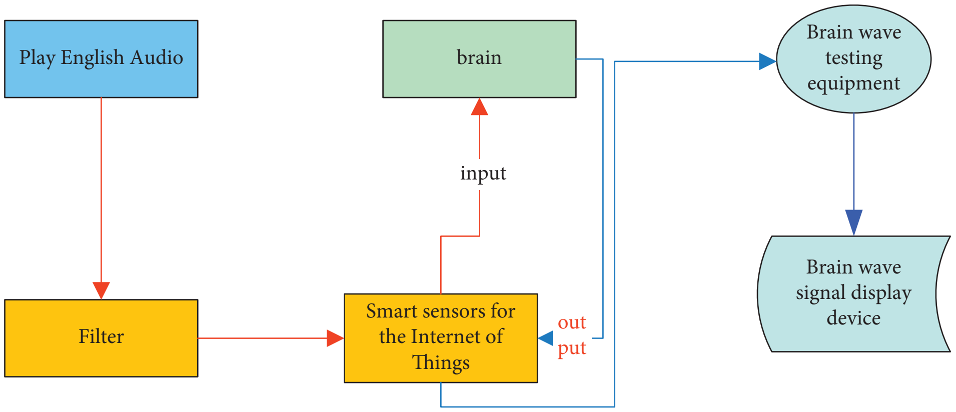

Figure 8: The EEG signal acquisition terminal design in this article.

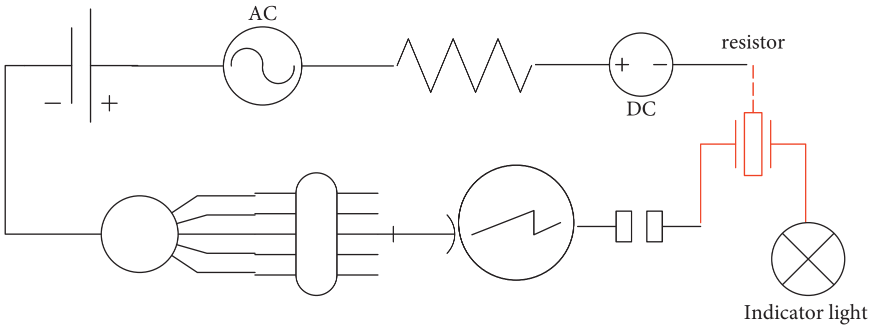

Figure 9: Circuit diagram of brainwave acquisition equipment.

Table 1: Test content and score.

Testing content	Question type	Number of question	Subject score
Segment test	Objective question	20	20
Ultrasonic section test	Subjective question	20	20
English sound change test	Objective question	20	20

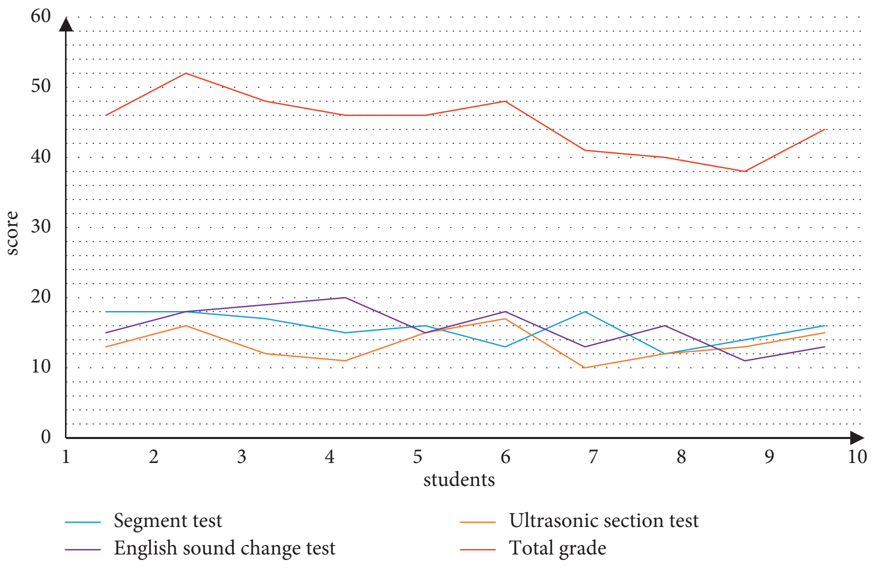

Figure 10: The score chart of the student test.

lowest score, and he should fill up which part of the question type. We understand that the grades of the supersegment question type of student No. 1 are the lowest among the three question types, so we generally recommend him to make up for this aspect of listening. But this kind of judgment is only superficial, so it is not accurate enough to judge the student's learning situation through grades. Judging from the analysis of the chart, it is rather one-sided to judge the student's learning by grades. Because every student will have some parts that he is good at, and some parts that he is not good at, and there may be factors that do not perform well in the test.

5.2. Experiments on Brainwave Acquisition Terminal Pairing and Learning. We all know that brain waves are divided into four types, of which the brain is most easily "opened up" in the alpha wave state, the mind is concentrated, and the thinking is clear [23]. So when the α wave generated in the mind in the English listening test, the learning situation is the best; when β waves dominate the brain waves, it has a key benefit for positive attention enhancement and the development of cognitive behavior; when the θ wave is the dominant brain wave, the human consciousness is interrupted and the body is deeply relaxed [24]; the last type of brain wave is generated during deep sleep, so this is unlikely to be generated in the English listening test site, so it is impossible to collect δ wave in this experiment [25]. For this reason, we still add the brain waves of these ten students during the English listening test on the basis of the previous experiment. The collection device is the computer wave collection terminal based on the intelligent sensing of the Internet of Things that we study in this article, and its accuracy will be higher. The test situation is shown in Table 2.

The results of their listening test are shown in Table 3.

According to the descriptions in Tables 2 and 3, it can be seen that in the English listening test, the first and fifth students have the best mental state, and both of them scored 50 points. The brainwaves collected by the second and fourth classmates are the same, and their mental state is the same. However, the test score of the second student was 41, and the score of the fourth student was 52. Obviously, the fourth student's learning situation is better; the last 3 students in the table may be drowsy during the test, so their grades are not very satisfactory. In addition, the collected brain waves are basically dominated by theta waves. Therefore, it is necessary to maintain a good mental state during the learning process, and the learning effect will be better.

Table 2: Brain waves collected in English listening test.

Student	Dominant brain wave	Subdominant brain waves
1	B	α
2	A	θ
3	B	θ
4	A	θ
5	B	α
6	B	θ
7	Θ	β
8	B	θ
9	Θ	β
10	Θ	β

Table 3: Listening test score sheet.

Student	Segment test	Ultrasonic section test	English sound change test	Total score
1	18	16	16	50
2	17	16	18	41
3	15	13	16	44
4	16	16	20	52
5	19	14	17	50
6	15	16	14	45
7	12	14	13	39
8	14	13	12	39
9	11	12	11	32
10	10	11	15	36

5.3. Experimental Summary of This Article. Two experiments were designed this time. One is to analyze the students' learning ability from the English listening test scores, and the second is to analyze the students' learning situation from the brainwave signals of the students during the test combined with the test scores. Judging from the comparison of the two experiments and the data, in the first experiment, it is not comprehensive enough to judge the students' learning by their grades. Especially in each of the different types of tests, the level is uneven, and the learning situation is only on the surface through the total score. In the second experiment, brain waves were collected during the test, which can deeply analyze the mental state of the students during the listening process. Looking at their learning situation in combination with their grades is completely different from the results analyzed in Experiment 1. The learning situation of students from the English listening test is only a small part, but it is necessary to complete the modeling through this data and analyze their comprehensive learning situation again [26].

6. Discussion on Brainwave Acquisition Terminal for English Listening Test

When designing the brainwave collection terminal for English listening test, this article discusses the entire production process of English listening audio and has a deep understanding of the audio changes of English listening audio after it is played. In order to ensure the stimulation of the human brain by the sound volume of the audio during the production process, the principle of noise reduction is used to adjust and demodulate the audio. In addition, the smart sensor of the Internet of Things protects the played audio from the influence of the space and the surrounding environment, ensuring that the sound coming into the brain is consistent. In addition, brainwave signal memory is affected by the external environment and physiological signals. Therefore, this article uses the intelligent sensors of the Internet of Things to distinguish and weaken the brain waves affected by the external environment and physiological signals to achieve the accuracy of the brain wave signals. This article studies devices based on IoT smart sensors, which are more sensitive to brainwave collection. At the same time, the smart sensors of the Internet of Things can also be set up so that they can intelligently identify various types of brain waves. And it displays the brainwave signals we need in the display screen, so that it can be better used in our English listening test [27]. On the basis of smart sensors and previous brainwave devices, adding the Internet of Things and combining the two to invest in the field of education will be of great help to the completion of daily teaching content. This article has verified through experiments that the brainwave acquisition device studied in this article can collect brainwaves during the English test, and it helps teachers to deeply understand the test status of students in the listening test and can combine the test results to analyze the learning situation of the test. If the brainwave acquisition signal studied in this article is applied to the students' usual learning process, the students' usual learning data can be obtained, and the teacher can have a more specific and intuitive experience of analyzing the student's learning situation and help teachers improve teaching methods [28].

7. Conclusions

The brainwave acquisition terminal for English listening test based on the intelligent sensor of the Internet of Things studied in this paper has great reference significance for the application of science and technology in the education field. This article discusses the production process of English listening audio and the application of the Internet of Things in its production process. It combines the Internet of Things and smart sensors and studies the ability of the Internet of Things and sensors to perceive English audio and voice conversion capabilities, which lays the foundation for the subsequent brainwave collection terminal design. In this paper, IoT sensors are applied to the brainwave acquisition equipment for English listening test, and the accurate acquisition of English brainwaves is realized. It provides technical support for in-depth understanding of students' learning conditions, and to a large extent can help complete daily teaching tasks and promotes the maturity of brain wave acquisition device technology in the field of education. Of course, the brainwave acquisition terminal studied in this article is still in the preliminary development stage and is not very mature. This article hopes that it can be further improved in future research.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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