Computer Network Assisted Test of Spoken English

Lu Zuo*

Foreign Language Department, Henan University of Chinese Medicine, Zhengzhou, Henan 450046, China

With the development of computer network technology, the means of foreign language teaching have changed. Computer aided spoken English test is a new test method, and there is a great advantage compared with the traditional oral test. In order to further understand the superiority of the computer aided spoken English test, this study took the sophomores of Foreign Language Department in Henan University of Chinese Medicine, China, as the subjects and carried out the traditional interview-type spoken English test and computer-assisted spoken English test. The score system based on Hidden Markov Model (HMM) was used, and then the two tests were carried out. The performance in the two tests was compared, and the attitudes of the participants to the computer assisted Spoken English test were analyzed in the form of questionnaires. The results showed that the computer aided spoken English test could better reflect the true level of the students, and the teachers and students clearly stated that the computer aided spoken English test could relieve tension and reduce the burden of teachers. The research verified the feasibility of the computer-assisted spoken English test, which provides a reference for the promotion of the computer-assisted spoken English test.

Keywords: computer aid, spoken English test, university English, feasibility

1. INTRODUCTION

With the reform of English teaching in universities, schools have paid more attention to the training of students' English speaking ability. The traditional spoken English test was carried out in the form of interview, one vs. one to one, two to one or two to three, which requires high on the teacher resources. Moreover the test is featured by high cost, low efficiency and strong evaluation subjectivity. Moreover face-to-face interview is easy to make students nervous and anxious. Lim et al. [7] found that students were in a moderate anxiety level during the spoken English test and the anxiety caused large influence on the performance of students. With the development of computer network technology, Computer Assisted Language Testing (CALT) has come into the sight of scholars in China. Computer-aided spoken English test is a way of indirect test. The test is carried out by means of computer and human-computer dialogue. The examinee can complete the test of a large number of students in the same time, and only a small number of teachers are required to invigilate and assist the test in the examination

hall, which greatly saves teachers' resources, time and effort and has high efficiency. It has been extensively applied in language teaching. Buckingham et al. [2] Through the experiments on Turkish children, Buckingham et al. [2] found that using computer as a mediator could help them practice spoke English and improve their spoken English ability and willingness to communicate when parents lack sufficient English proficiency to support their children to complete their English tasks. Based on the CALT theory, Guo et al. [3] investigated and analyzed the Chinese learning of a Catholic University in Brazil and compared CALT with the traditional language teaching and found the advantages of computer aided language teaching. Van Han et al. [4] studied the impact of computer aided language learning on the listening module of English International Communication (TOEIC), and found that computer assisted language learning had a significant role in improving the listening performance of students. Fu et al. [5] made a comparison between computer assisted spoken English test and the traditional spoken English test and revealed the obvious advantages of computer-assisted spoken English test. Through comparing the teaching effect of computer aided teaching and traditional teaching method for, students from the seventh grade, Kaplan et al. [6] found that the

*Email: luzuo82@yeah.net
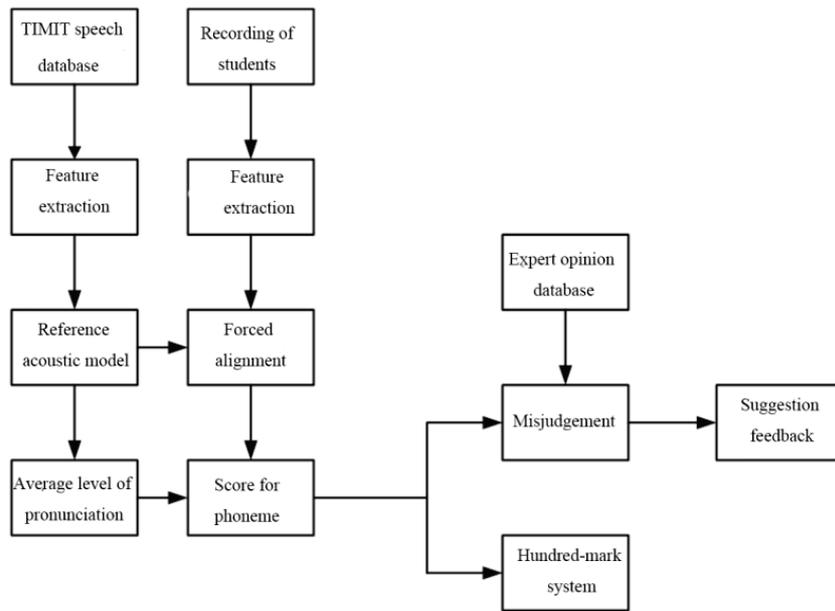
Figure 1 The flow of the speech recognition module.

teaching effect of computer aided teaching group was obviously better than that of the traditional one. Soleimani et al. [7] considered that computer assisted instruction was beneficial to the oral expression of learners by comparing the learners who received or did not receive computer assisted teaching. Sajedi [8] also confirmed the potential of computer-assisted language teaching in enhancing the ability of learners through comparative experiments. In this study, a computer aided spoken English test system was designed. The research subjects were divided into two groups, i.e. the computer aided spoken English test and the traditional spoken English test, and the test results were compared, and the teachers and students participating in the computer aided spoken English test were investigated via questionnaire to understand their attitudes towards the tests.

2. COMPUTER BASED SPOKEN ENGLISH TEST SCORING SYSTEM

The system firstly scored speech via Sphinx 4 speech identifier [9], then regarded the average pronunciation level as the new evaluation standard, and finally scored speech taking standard, phoneme and average pronunciation level into account. The flow of speech recognition is shown in Figure 1.

As to the autonomous scoring module, the features of speech were extracted and aligned compulsively with the feature sequence of the standard speech to obtain the status sequence of the maximum probability value. Then Hidden Markov Model (HMM) based log posterior probability was used to determine the wrong speech and detect the wrong pronunciation of students.

Scoring process is the recognition process based on HMM. After feature extraction, the output observation sequence of the speech which needs to be scored was set as $O\left(o_1, o_2, \ldots o_T\right)$. The standard reference HMM was expressed by $\Phi\left(A, B, \pi\right)$ (π : original status distribution; A: status transition probability; B: output probability set).

In the model, there are many hidden status sequences $S = \left(s_1, s_2, \ldots s_T\right)$. Speech assessment is a process of obtaining the probability of the input speech observation sequence O ($P\left(O|\Phi\right)$) when π is known. Segmentation alignment was performed using Viterbi algorithm to obtain the hidden status sequence s corresponding to observation sequence O. Then HMM was trained repeatedly, and the parameters were updated. Then the optimal probability $P\left(O|\Phi\right)$ of the model was output for posterior probability score. The phoneme posterior probability of HMM is:

$$p\left(q_i|O_i\right) = \frac{p\left(O_i|q_i\right)}{\sum\limits_{q=1}^{M} p\left(O_i|q\right) p\left(q\right)}$$

where M stands for the number of phonemes in all the texts in the reference model. When the optimal probability $p\left(O_i|q_i\right)$ is known, posterior probability can only be known after the prior probability of phoneme q, i.e. $p\left(q\right)$, is obtained. After summary, the evaluation result $p_i = \sum\limits_{t=t_i}^{\tau_i+t_i} \lg\left[p\left(q_i|O_i\right)\right]$ is output; τ_i refers to the start time of phoneme q_i, and t_i refers to the duration of the pronunciation of phoneme q_i.

The conversion from log posterior probability score to hundred-mark system score is:

$$score\left(P_{q_i}\right) = \frac{100}{1 + \exp\left(-\varphi P_{q_i} + \lambda\right)}$$

where Φ and λ are obtained after training, and P_{q_i} stands for the posterior probability of i-th phoneme.

Hundred-mark system score can be obtained through converting the formula. Differential Φ and λ are obtained by training according to different expert grading standards to realize the scoring levels under different levels of difficulties. The final scoring results are feedback.

Table 1 Comparison of the performance of the students in the spoken English tests.

Test form	Computer assisted spoken English test	Interview-type spoken test
Number of students	720	720
The highest score	97	90
The lowest score	64	71
The average score	77.96	81.48
Standard deviation	6.27	4.63

Table 2 The proportion of students at different levels.

Proportion of students (%)	Computer assisted spoken English test	Interview-type spoken English test
Excellent (85–100)	12	9
Good (70–85)	35	41
Qualified (60–70)	38	39
Unqualified (below 60)	15	11

3. THE PROCESS OF COMPUTER ASSISTED SPOKEN ENGLISH TEST

3.1 Research Subjects

The research subjects were 720 sophomores from Foreign Language Department in Henan University of Chinese Medicine. A 20-min computer assisted spoken English test was added to the normal spoken English class for students to adapt to the form of the computer assisted spoken English test and eliminate the influence of poor emotion on the test performance in the initial contact.

3.2 Research Procedures

After one month of adaption, computer assisted spoken English test and the traditional interview-type spoken English test were carried out. The performances of the students in the two tests were collected and compared. Then the students involved were investigated via questionnaire to understand their attitudes towards the computer assisted spoken English test. The questionnaires were recycled and analyzed.

3.3 Test content

The content of the two tests was the same, including recitation and impromptu speaking. The content of recitation was from a TEM4 spoken English exam.

Whenever Mr. Smith goes to Westgate, he stays at the Grand Hotel. In spite of its name, it is really not very "grand," but it is cheap, clean, and comfortable. Since he knows the manger well, he never has to go to the trouble of reserving a room. The fact is that he always gets the same room. It is situated at the far end of the building and overlooks a beautiful bay. On his last visit, Mr. Smith was told that he could have his usual room, but the manager added apologetically that it might be a little noisy. So great was the demand for rooms, the manager said, that the hotel had decided to build a new wing. Mr. Smith said he did not mind. It amused him to think that the dear old Grand Hotel was making an effort to live up to its name. During the first day Mr. Smith hardly noticed the noise at all. The room was a little dusty, but that was natural. The following afternoon, he borrowed a book from the hotel library and went upstairs to read. No sooner had he sat down than he heard someone hammering loudly at the wall. At first he paid no attention, but after a while he began to feel very uncomfortable. His clothes were slowly being covered with fine white powder.

Soon there was so much dust in the room that he began to cough. The hammering was now louder than ever and bits of plaster were coming away from the walls. It looked as though the whole building was going to fall. Mr. Smith went immediately to complain to the manager. They both returned to the room, but everything was very quiet. As they stood there looking at each other, Mr. Smith felt rather embarrassed for having dragged the manager all the way up the stairs for nothing. All of a sudden, the hammering began again and a large brick landed on the floor. Looking up, they saw a sharp metal tool had forced its way through the wall, making a very large hole right above the bed!

Impromptu speaking included three subjects. The subject was determined by random selection.

a. Describe an embarrassing situation in which you got very angry.

b. Tell a story that illustrates the need for love.

c. Describe one of the most unpleasant dreams you've ever had.

3.4 Test Results

(1) Comparison of students' performance

The performance of the students in the two tests is shown in table 1. The full mark was 100 points.

It could be seen from Table 1 and 2 that most of the scores that the students obtained in the two tests concentrated between 60 points and 85 points, i.e., qualified level and good level, indicating the scores in the two tests were similar. But the highest
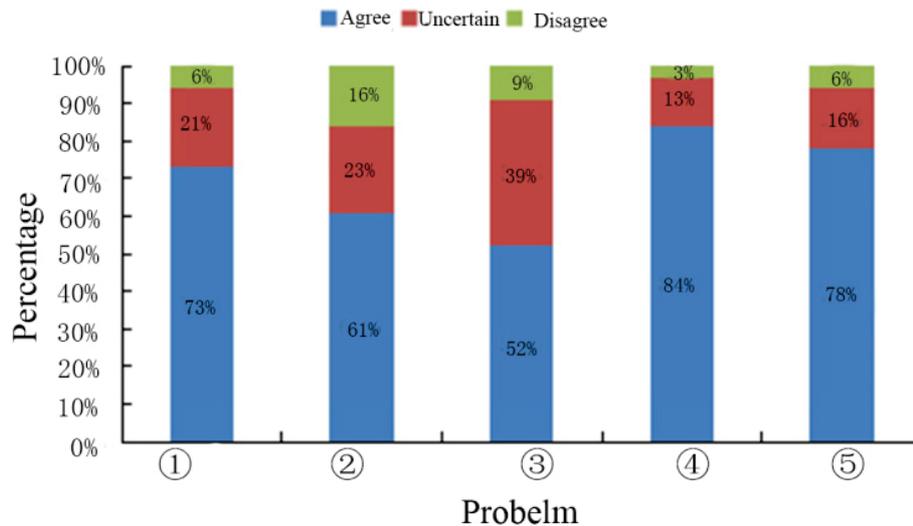
Figure 2 The investigation results.

score in the computer assisted spoken English test was higher than that in the interview-type spoken English test, and the lowest score and average score in the computer assisted spoken English test was lower those in the interview-type spoken English test, suggesting the students with excellent spoken English ability were more likely to get a good score and poor students were more likely to get a poor score in the computer assisted spoken English test. It might be because that the score in the interview-type spoken English test was prone to be affected by subjective factors. Teachers scored the performance of students based on general impression, and they avoided giving a too high or low score. But the score in the computer assisted spoken English test was directly given by the scoring system, which ensured fairness and reliability.

(2) Questionnaire results

The questionnaire included five items, i.e. I like the computer assisted spoken English test, the computer assisted spoken English test can reflect my real spoken English level, the computer assisted spoken English test can relieve may anxiety, the pressure of the computer assisted spoken English test is smaller than that of the interview-type spoken English test, and the scoring in the computer assisted spoken English test is more fair. There were three options for each item, i.e. agree, maybe and disagree. Totally 720 copies of questionnaire were released, and 715 copies of effective questionnaire were recycled. The investigation results were shown in Figure 2.

The attitude of the students participating in the test on the computer aided spoken English test could be understood through the questionnaire. 73% of the students showed a good attitude to the computer assisted spoken English test. Only 6% of the students did not like the form of the computer assisted spoken English test, indicating that the acceptance of the students on the computer assisted spoken English test was favorable. 61% of the students thought that the computer assisted spoken English test could reflect the true spoken English proficiency, but at the same time, 23% of the students were not sure and 16% of the students disagreed. For this problem, the students' opinions were different. The way of man-computer dialogue made some students think that the computer assisted spoken English test could not show the interaction of the spoken English test. 52%

of the students thought that the computer assisted spoken English test could relieve tension, but 39% of the students were not sure and 9% of the students disagreed. Many students still felt nervous in the computer assisted spoken English test, but compared with the interview-type spoken English test, 84% of the students thought that the computer assisted spoken English test was less stressful and avoided face-to-face interaction. In terms of grading, 78% of the students thought that the score of the computer assisted spoken English test was more fair and closer to their actual level.

4. DISCUSSION

As computer technology gradually becomes a teaching means, the computer assisted language teaching and test has been extensively applied [10]. Students who receive the computer assisted teaching perform better in individual learning and cooperative learning than those who receive the traditional teaching [11]. The computer assisted teaching has positive influence on disabled students including students with autistic-spectrum disorder [12] and can help students who have learning disorder learn better [13]. Language test is an important part of language teaching, and computer is helpful in language test [14, 15]. With the constant development of computer technology, computer has tended to be more and more reliable and practical in language test [16].

It is not difficult to find that the computer assisted spoken English test has great application prospect after comparing the computer assisted spoken English test with the traditional spoken English test. First of all, in the perspective of students' scores, the two scoring results were mainly concentrated in the qualified and good stages, but in the computer-aided spoken English test, the students' high and low scores were more significant. The number of excellent and qualified students were slightly higher than the results of the traditional interview spoken English test, which showed that the computer-aided sproken English test could make a more accurate evaluation of students' abilities. According to the results of the questionnaire survey, most of

the students liked the computer spoken test, especially in the fourth and fifth questions, 84% of the students thought that the pressure of the computer spoken English test was lower and 78% of the students thought that the score of the computer spoken English test was fairer, which showed that the students had a high acceptance of the computer assisted spoken English test. The further promotion of the computer assisted spoken English test in the professional English spoken English test is practical.

For the students, the computer aided spoken English test greatly relieved their nervousness and stimulates their interest and motivation in learning spoken English. In addition, through the computer assisted spoken English test, the students also realized that the computer examination made them pay more attention to the training of language expression in daily learning and increase their vocabulary reserve to avoid being dumb in the spoken English test. The students also preferred the fairer scoring way of the computer aided spoken English test and considered that it can help them understand their own spoken English proficiency better.

However, the computer aided spoken English test is difficult to achieve real natural communication and reflect communication and interaction. Computer-assisted spoken English has some requirements on the computer skills of students, and high-level computer familiarity can promote the performance of students [17]. Moreover in the process of testing, students cannot ask for repetition if they did not hear the question clearly and also cannot be hinted if they have no idea at the question. It increases the difficulty of the test to a certain extent. The wordless situation while facing with computer may induce the resistance of students. Moreover the failure of the test software or computer will have a great impact on the emotions of students.

5. CONCLUSION

The computer aided spoken English test system was designed in this study, and the computer aided spoken English test and interview-type spoken English test were performed on students. The computer aided spoken English test was more deeply understood through the comparison of the performance of the students in the two tests and the questionnaire survey. The results demonstrated that the computer aided spoken English test could relieve the tension of students, improve fairness, and reduce the burden of teachers. The computer aided spoken English test is a new method of testing with many advantages and some shortcomings. Therefore more studies and exploration are needed. But in a word, the computer aided spoken English test has a broad development prospect.

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