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A Study on Recovery in Voice Analysis through Vocal Changes before and After Speech Using Speech Signal Processing

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Abstract

Generally speaking, the lecturers have a very large voice and a voice with a high vocal tone. In this study, we propose a new method to perform a vocal massage by placing a reflective cup on the mouth in order to make the hoarse voice normal. We learned about the sound characteristics of hoarse voices and suggested a way to cope with them. When applying the method of removing hoarseness after lecture, the average voice recovery of 94% was obtained. In addition, the clarity of the voices following the resounding of the hoarse voice compared to the voices before the lecture became clearer.

Keywords: hoarseness, vocal cord nodule, sound reflection cup, vocal cords massage, voice resilience

INTRODUCTION

We communicate by voice as a means of communication. The voices are generated through vocal organs, but the meaning or atmosphere of sound represents the person's knowledge or emotion. Since the voice organs are composed of skin tissue or skeleton, when the condition is bad or excessive, swelling or inflammation occurs in a specific region of the vocal tract. If the vocal organ is inflamed or scratched, the voices become inaccurate and hoarseness appears. If you hear a hoarse voice during a conversation, the person you are listening to feels uncomfortable because you can't understand the words well, and makes the conversant feel sick. Therefore, care should be taken not to infect external viral infections, such as vocal cords or colds in vocal organs, which are appropriate for their physical characteristics.

Even in the case of the general public, it is often the case that the lecture is performed when the loud voice and the high sound are louder than when the lecturer speaks. It is because when the average person talks, the number of vibrations of the vocal cords is 1.5 times higher than usual voices, and the vocal muscles and the vocal cords are excessively stressed. Therefore, the vocal cord nodule is hardened. When I taught college students over two hours of lectures at university, I found that the degree of thirst was about 12%, but I gave lectures to parents in their 50s and over for lectures, and more than 50%

In this way, when voices used as means of communication in everyday life are voiced aloud or vocal tone is raised, vocalic nodules are generated and hoarseness comes out. This study explains how to recover hoarseness to the original voice because the occurrence of hoarseness is a way to warn the speaker of the danger of the vocal organ. Chapter 2 explains the characteristics of the sound waveforms of the hoarse voices. Chapter 3 explains the newly proposed method for recovering the hoarse voices. Chapter 4 examines the validity of the method through experiments and results.

CHARACTERISTICS OF HOARSE VOICES

The voices are divided into voiced and unvoiced sounds according to the sound source. Unvoiced sound The air from the lungs occurs between the rubbing of the lips and teeth, so it does not cause vocal tremor and does not cause a hoarse sound. On the other hand, the voiced sound, Sv (n), causes the air flow from the lungs to escape through the cracks of the open and closed muscles of the vocal cords G(n). The loud voice is the vocal cord nodule caused by the fatigue between the cracks of the right vocal cords, and the vocal cord nodules It is mostly due to low elasticity.

$$Sv(n)= p\{n\} * G(n) * v(n) * l(n) \quad (1)$$

The hoarseness is mainly caused by the unstable muscles of the vocal cords and the gates, so the sound spectrum shows such characteristics. Figure 1 compares the sound spectrum of phonetic and hoarse voices. When the vocal cord is fatigued, the muscles of the vocal cords are unstable, so that the tonal range of the vocal spectrum is widened and the vocal structure of the vocal cords is weakened. And the characteristic of the voicing sound is unclear at the high tone part, so that the width of the resonance frequency is relatively broadened.

In the treble part, the energy of the treble part is lower than that of the bass parts. The reason is that when the voice rests,

there is a tendency to get stronger and to speak well well without opening your mouth. If you open your mouth smaller than usual, the resonance of the treble will be relatively low. The most common occurrence of hoarseness in the vocal tract is the muscles near the vocal cords or vocal folds. When these muscles become fatigued, their effect on the second resonant frequency of the sound spectrum appears, which causes the sound spectrum to be weaker than usual and less visible. So thirsty look for stricken voice when rested second making it 0 people ringing characteristics are unstable and pronunciation is unclear, neck when resting “o”, “u”, “e”, “ye”, difficult uttered a diphthong like, this pronunciation is mainly appear lot of hoarseness in.

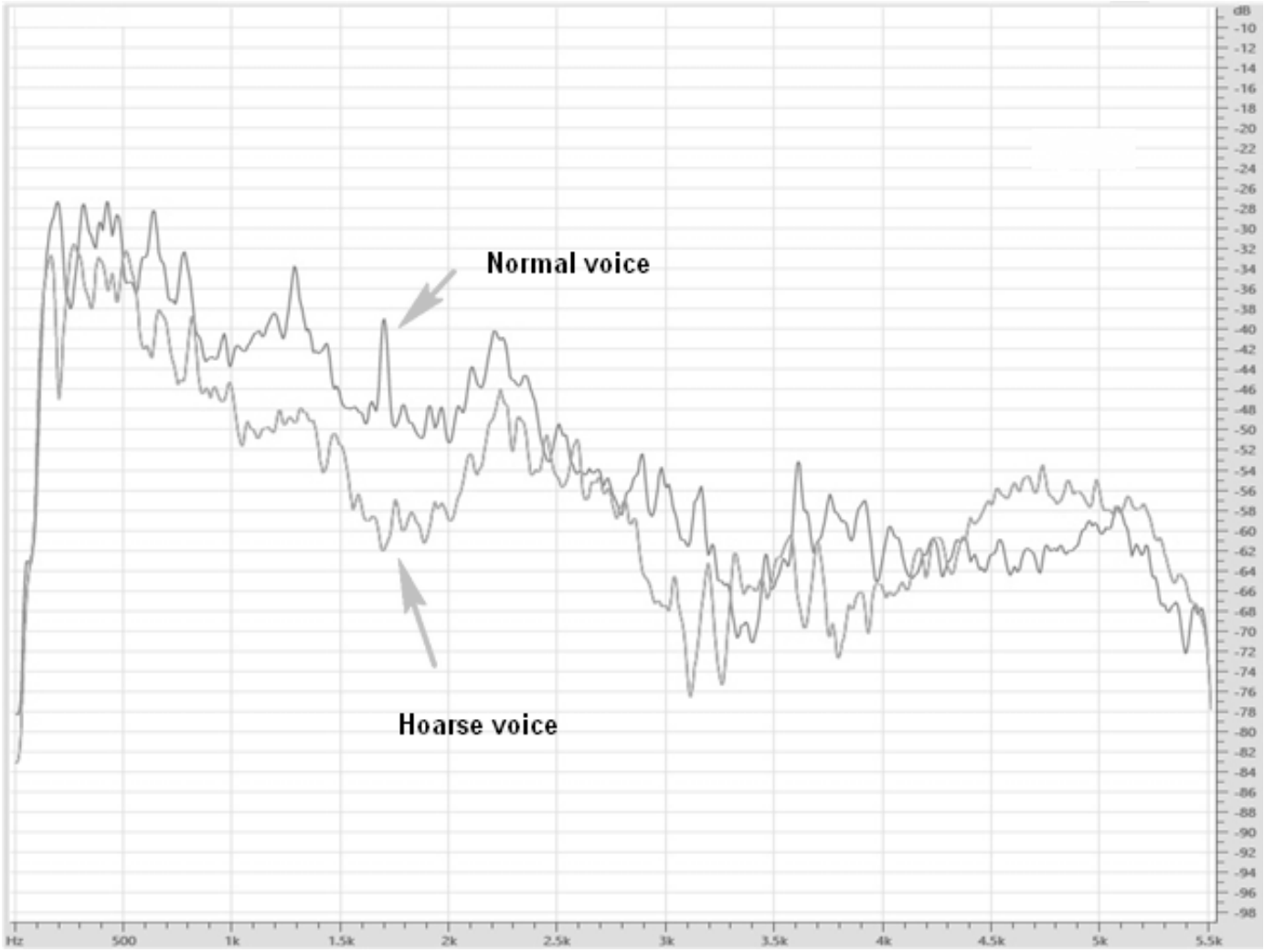

Figure 1: Comparison of sound spectrum of usual voice and hoarse voice

PROPOSED METHOD OF RECOVERY OF HOARSENESS DUE TO VOICE REFLECTIONS

The vocalization of the double vowel, in which the hoarse voices are observed, allows the air from the lungs to pass through the vibrations of the vocal cords by the muscles of the gates to obtain the fundamental tone. The occurrence of hoarseness due to the vocal cord nodule is caused by the fatigue of the vocal cord muscles. One way to stabilize these vocal tiredness and restore the hoarse voices to normal voices is to massage the vocal fold muscles. If the elasticity of the vocal cord muscles is weakened due to the incongruity or harshness, and if the vapors are difficult to perform due to the presence of waste products, touching the vocal fold muscles to massage them will relieve the fatigue. In order to massage the vocal cords, until now, you have to drink a juicy beverage through the esophagus by the esophagus next to the vocal cords, or by sucking on the Halls or mint candy, so that the saliva slowly flows into the esophagus, There was a way of giving. However, these methods have no immediate effect on the vocal fold muscles. Therefore, I would like to propose a new way to utilize my voice as a way of massaging the vocal cords as shown in Fig. 2.

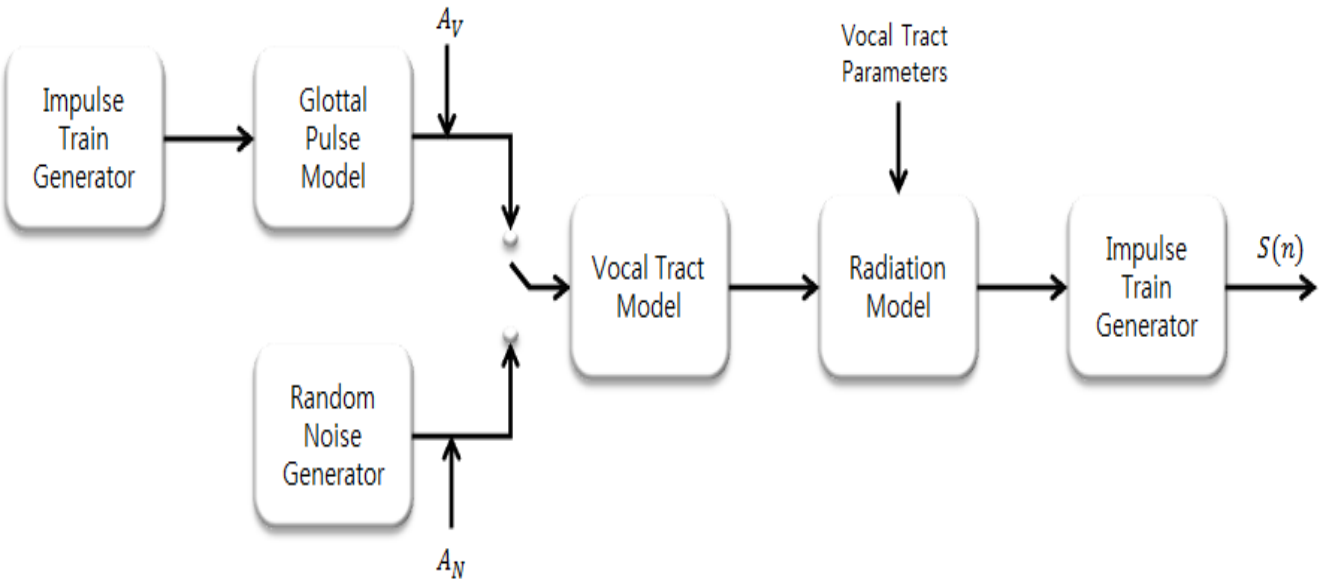

Figure 2: A block of diagram of speech production

As shown in Figure 2, when you measure the voice emitted from a person's mouth with a sound level meter, the maximum amplitude is more than 90dB. Whenever you talk about this loud energy toward your opponent, you will emit into the air. Sound is vibration and energy, which is made by shaking the vocal muscles. On the other hand, the voices of the voices of the vocal tones are the best sounds of the vocal muscles, and their voices include the tremble frequency that can best ring the vocal organ. In other words, if you give your voice back to your throat like your picture, the fundamental frequency of the voice will make your vocal muscles sound the best, so you can feel the massage effect right away.

EXPERIMENTS AND RESULTS

Five subjects' voices were analyzed to see if the hoarseness was recovered by the sound reflection device. The subjects selected from the experience that they could easily rest their throat even if only three songs were singed in the karaoke room. Before singing, the two sentences of the three piglets were uttered three times and used as an experimental sample of the voice through a sampling rate of 11 KHz and 32 bit quantization. Next, after singing five or more songs in the karaoke room, the same sentence was uttered with hoarseness and recorded.

Next, I performed a voice massage cup in front of my mouth and a voice massage. In order to perform the vocal massage with the voice, I repeatedly uttered three times repeatedly saying "a", “e”, “I”, “o”, “u" very loudly in a loud voice, with the reflection cup right in front of my mouth as shown in Fig. The size of the half-cup used was slightly larger than the diameter of the mouth, so that most of the sound was reflected when the voice was emitted. The problem is that the depth of the cup is important. If it is too short, the treble is canceled and the voice recovery effect is reduced. If it is too long, the low frequency band is eliminated and the vocal massage effect is reduced. Therefore, the depth of the cup is about 10 ~ 15cm and the mouth size and depth are the best. Figure 3 shows a comparison of the usual voices, husky voices, and resolved voices in order to find out how much the voices are restored. Overall, the sound spectrum of the vocal cord muscles in the vocal reflex cups was similar to the usual voice. In other words, resonance at high frequencies above 2KHz is similar to that of usual resonance, and resonance is more pronounced than resonance.

Figure 3: Comparison of recovered voice with hoarse voice in the spectrum

Therefore, when the similarity of the spectrum is compared with the position and width of the resonance frequency and expressed as a percentage, the similarity of the spectrum is lowered to 75% compared to the usual voice, but the sound spectrum when the sound- The similarity was increased to 94%. Generally, if the degree of similarity is 90% or more, it can be determined that the voice is a usual voice.

CONCLUSION

We communicate with each other through voices and feel each other's sympathy. However, when the voices are too loud and the voices are loud, lumbar nodules appear when the lecture comes. In this study, we propose a new method of performing a vocal massage with a reflection cup in front of the mouth to relieve hoarseness. I learned about the sound characteristics of hoarse voices and suggested a way to cope with them.

The average voice recovery rate of 94% was obtained by applying the hoarseness method after lecture to 5 speakers. In addition, the clarity of the voices following the resounding of the hoarse voice compared to the voices before the lecture became clearer. Now it is possible to maintain accurate and stable voices by easily applying the method of solving the vocal cord nodules of vocal organs through their own voices.

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