

A Study on the Reproduction of Beast Sounds using Analysis of Acoustic Characters

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Abstract

This study was conducted to identify the value of cultural contents development by measuring the similarity and preference of sound tools that describe the crying of the beasts compared to the actual sound. As a research method, the actual sound of the beast was analyzed by the acoustic analysis program and the characteristics were studied to derive the description method. As a result, the beast has a saint of the size of a large jar, and it is similar to the sound caused by the friction sound because the vocal cords are shaking. Based on the results of the analysis, a jar of the size that would sound corresponding to the saint of a beast was prepared and a laundry plate needed to friction the entrance was prepared to describe the crying of a beast. The sound of the beast's crying Foley sound created by using the tool was analyzed by the acoustic analysis program and the actual sound of the lion and beast, which are the actual beast, and their acoustic characteristics were compared and analyzed. As a result, the two sounds were very similar, and the listeners were highly preferred. The results of the Foley sound contents research that led to this process opened the necessity and possibility of developing various Foley sound contents.

Key words: early broadcast, background sound, frog cry, real sound, connotation, creativity, originality, sound content

1. INTRODUCTION

Beasts were used for expressing deep forest scenes and fears, as they are very ferocious nocturnal predators, mainly active at night in forested forest areas. In modern times, it is used in scenes of zoos, as background sounds, or in dramas about beasts. In addition, children's favorite fairy tale audio books or animations are often satirically appeared in the animation, so the cry of the beast is necessary. The radio drama, the legendary hometown that was broadcast for a long time in the past, used many beast-themed narrations and used the cry of the beast. Now, the portable digital recorder can directly visit the beast's habitat or record it at the zoo and use it for broadcasting. The instruments are original and interesting and can be sublimated into cultural contents such as performances, exhibition experience contents, and creativity education contents. In this paper, we verified the similarity and preference by comparing and analyzing the beast crying sound with the actual beast crying, and verified whether the production principle and usage

of the beast crying sounding tool have value for use as contents [1][2][3][4][5][6][7][8].

2. STUDY OF BEAST CRYING INSTRUMENT

The beast cry has a characteristic of generating strong low frequency sound using thick neck and strong saint and vocal cords. In particular, the strong low frequency sound of beast crying is the unique vocal principle of beast that generates not only low frequency sound of human audible frequency band but also very low frequency sound outside audio frequency band [3][4][5][9][10][11]. The principle is that the air that is inhaled by the beast's lungs is strongly expanded and pushed up, causing resonance in the thick and strong saints, shaking the sturdy vocal cords, and generating the beast's distinctive cry with a large mouth and tongue.

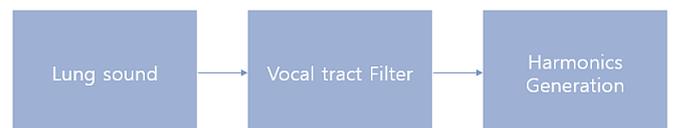


Figure 1. Principle of beast sound

It is necessary to carefully analyze the characteristics of the actual sound that you want to describe in order to make the necessary sound. The beast has a long, large body with a thick neck, a large wide tongue, and sharp teeth. As a predator, he has strong, flexible muscles and a strong, large dose of lungs. This structure and characteristics of the body plays a role in generating a cry that can feel the charisma unique to the beast. The cry of the beast is a resonance of the thick and strong saints and the trembling sound of the thick and coarse vocal cords are intermingled by the large mouth structure and the tongue, creating a unique sound unique to the beast. The sound is a combination of resonance and trembling, and it needs a ring and a vocal cord that can generate resonance. Applying this principle, we prepared a jar as a substitute for a resonator for resonance and a washboard as a substitute for a vocal cord for trembling. The jar is a useful tool for causing large resonances at scale, and the washboard has large protrusions, which can mimic the trembling of the beast's vocal cords by rubbing

against the mouth of the jar. As shown in Figure 1, the jars are resonance rings that act as beast's lungs and vocal tracts. The washboard serves as the beast's large and strong vocal cords. The size of the jars determines the degree of resonance, and the number, size and size of the washboards distinguish the tone and width of the vocal cords. The method of using the beast crying sound tool should be expressed based on the rhythm, rhythm, and repeatability of the beast crying sound, determining the friction width between the protrusion of the washboard and the urn, and maintaining the degree of resonance to adjust the intensity.

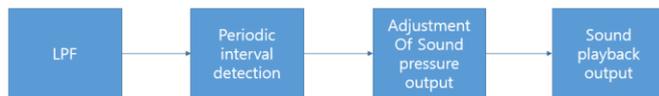


Figure 2. How to use the beast cry sound tool

Figure 2 shows the beast's ritual tool using a jar and a washboard, which simulates the beast's cry by rubbing the protrusions of the washboard at the mouth of the jar. The large jar is fixed on the floor, and the washboard is held horizontally with both hands, covering the jars, and tilted at an angle of 45 degrees to give friction from side to side. If you use a small jar, tilt the washboard, flip the small jar with one hand, rub the entrance to the washing board protrusion, and mimic the beast cry. The frictional speed and strength of the jar and the washboard allow the beast's cry to be described as being strong, weak, fast or slow. In addition, various techniques of friction can be used to express the beast cry. The inside of the jar's body can mimic the low frequency characteristics of the beast cry by amplifying the sound of friction with the washboard at the entrance, causing resonance. Beast cry sound using a jar and a washboard is a tool designed to mimic the distinctive low-frequency tone, volume and volume of the actual beast cry.

3. COMPARISON AND ANALYSIS OF BEAST CRY SOUND AND REAL SOUND

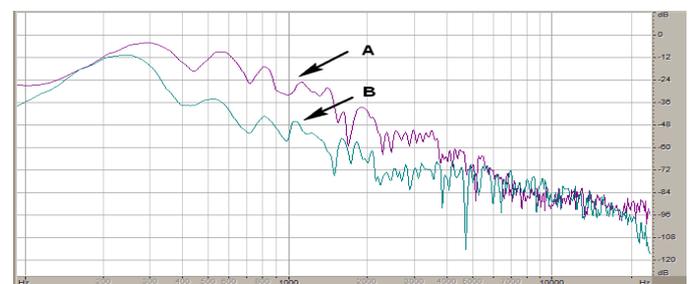
The cry of a beast is the sound of living creatures and is the sound of the highest predators among carnivores with unique frequency and energy as sounds. The characteristics of the crying beast are caused by the phenomenon of amplifying the shaking of beast's unique vocal cords with resonance. It also has sound characteristics that generate strong low frequency and ultra-low frequency energy irregularly. In order to compare and analyze the sound of beast cry and the real sound, the sample was prepared by sampling the sound of beast cry and the sound sample using jar and washboard. The collected beast cry and real sound were analyzed by dividing into time domain, frequency domain, spectrogram domain, energy domain and Moss test domain. Through the time domain, the similarity between the tone and the width of the beast cry was identified, and the frequency distribution was analyzed through the frequency analysis, and the sound quality and the volume were compared through the spectrogram analysis. The energy graph was used to compare the energy of the real sound with the

sound of the sound. Also, the verification result through the MOS test was additionally used as a verification procedure for similarity. The similarity between the actual sound of the beast cry and the tone and width of the pseudonym can be grasped by analysis of the time domain. In the waveform analysis for comparing and analyzing the sound of beast cry and the real sound, the energy of time domain components is analyzed, and the result is obtained. The data after the energy conversion of the original sound is called $P_1(n)$, and the energy value of the negative sound is called $P_2(n)$. Similarity of each frequency component was measured by the following equation. In the time-domain analysis of beast crying in Figure 3, the actual beast crying starts loudly during the first 1 second, has a distinct formant, and finishes with a strong voice once more after 2 seconds. Spectrum was compared and analyzed in order to compare the characteristics of the beast cry and the real sound of the beast cry. In the waveform analysis for the comparative analysis of beast crying sound and real sound, frequency domain components were analyzed using FFT concept to find out the characteristics of vocal sound through vocal saint and voice.

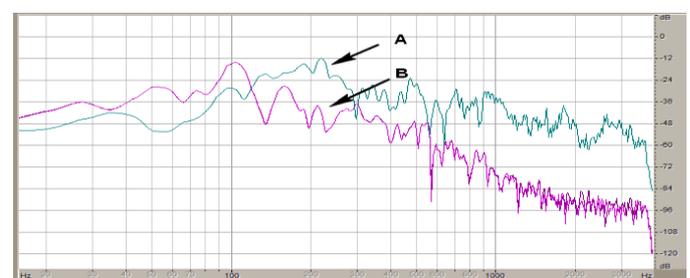
$$D_t = \frac{1}{N} \left[\sum_{n=1}^N (P_1(n) - P_2(n))^2 \right] \quad (2)$$

Equation (2) is the energy for spectral similarity in the frequency domain.

The data after frequency conversion of the original sound is referred to as $D(n)$ and the FFT conversion value of the pseudo sound is referred to as $D(n)$. Similarity of each frequency component was measured by the following equation.



(a) Comparison of Beast Sounds



(b) Comparison of Lion Sounds

Figure 4. Average Spectrum Comparison of Beast Cry and Real Sounds

Fig. 4, the beast cry of the frequency comparison analysis graphs of the real sound and the false sound show that they have almost the same frequency bands in the real sound and the sound. However, the real sound of beast cries consists of all four formants below 1,000Hz, but the sympathy shows high resonance peaks with wide band whistle, namely the best resonant frequency, between 200Hz and 300Hz. It shows sporadic small peaks in the high frequency section. Although the overall frequency graph is similar, differences in the formant location, size and number of formants, and the width of the band whistle are shown. As a result of the analysis, the beast cries are all expressed in the low frequency band below 1,000Hz and the energy becomes weaker toward the high frequency band. It can be analyzed that the beast cry imitates very similarly to the characteristics of the actual beast cry.

Through the spectrogram analysis of the actual sound and the sympathy of the beast cry, the component elements represented by the sound are analyzed more clearly.

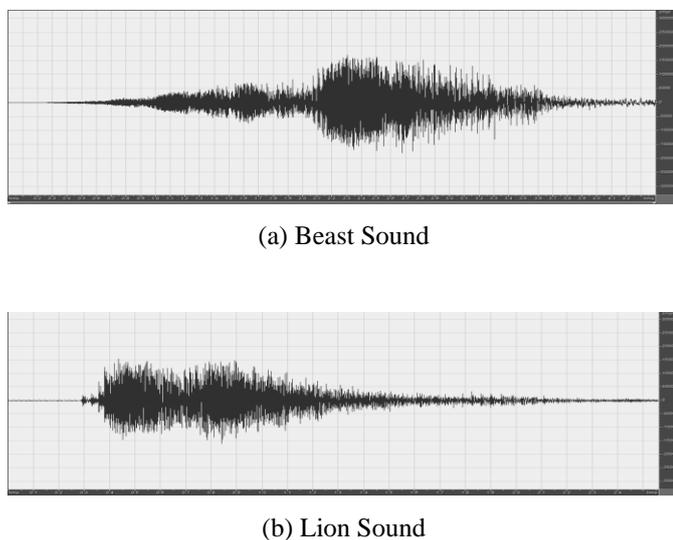


Figure 5. Analysis of beast cry spectrogram

The spectrogram in Figure 5 expresses the concentration and band whistle of the volume versus frequency range. Beast cry of the real sound and the false sound both show strong energy in the low frequency range and form weak energy in the high frequency band. It can be seen that the real sound is expressed very similarly to the real sound. However, the high-frequency region in the pseudo sound generally produces stronger energy than the actual sound. This can be seen as the result of intentional movements to simulate real sounds and consciousness to emphasize.

The mean opinion score test was used as a verification tool to increase the reliability of various comparisons and analyzes that were conducted through the responses of five real listeners who listened to the real sound of the cry of a beast and the voice. The beast cry moss test method tells listeners two kinds of intentions that mimic the actual beast cry and the actual beast cry and assign similarity and preference scores. The similarity score is a score for the selection of sound of a realistic tendency,

and the preference score is a score that results from the preference when used as an effect sound. The score was calculated as the highest score with five points of similarity score and preference score.

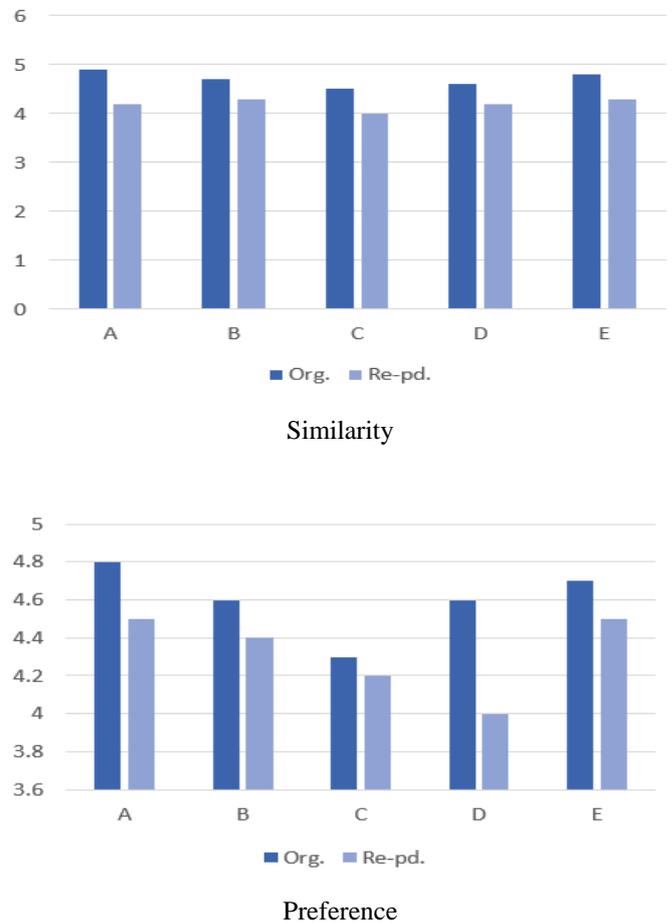


Figure 6. Comparison of similarities and preferences

First, Listener A listened to the actual sound of the beast's cry and gave a similarity score of 4.7 When the rhythm was heard, it gave a score of 4.3 which is very similar to the real sound, but the naturalness is somewhat less than the real tone, but gave a good score of 4.5, indicating that it is somewhat preferred for effective use. Most of the other listeners also judged the actual sound of the crying beast and gave a preference score of 4.5 or higher for the effect sound. When I heard the rhythm, I recognized that it was the rhythm and understood the similarity with the real sound. Although they differed slightly depending on their perspective, they responded similarly.

4. CONCLUSION

The study was conducted to analyze the principles of making the sound by studying the characteristics of the sound of the beast. The method was set up to analyze and describe the sound source using the acoustic analysis tool using beasts and lions as a sample among the beasts. Lion and beast are similar in size and the thickness of the neck is similar, so

the crying is similar. The beast's voice has a proper sound of saints that fits the size of its neck, and the growl sounds like a loud, frictional sound. In short, the sound of friction with a ring is the characteristic of the sound of the beast's cry. As a tool to describe the crying of the beast, a proper jar of the size similar to the size of the beast's neck was prepared and a laundry plate was prepared as a tool to mimic the shaking friction sound of the beast vocal cords. I put a laundry plate at the entrance of a proper size jar and recorded the sound by imitating friction to match the beast's crying cycle. The results of comparing and analyzing the sound of the beast's cries described by using the actual voices and tools of the two beasts as a lion and a bear and confirming the similarity and preference of the bear's cries, showed that they showed very similar sound characteristics. This result shows that it is highly valuable to use as sound description Foley sound contents. This wild-beast crying poly sound contents should be continuously studied and developed along with the development of various poly sound contents.

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