

## **A Study on the Sound of Dadmi according to a Type of Cloth using an Acoustics Analysis**

**Ik-Soo Ahn<sup>1</sup>**

<sup>1</sup>*Information and Telecommunication of Dept., Soongsil University, Seoul, Korea  
369, Sangdo-ro Dongjak-gu, Seoul*

<sup>1</sup>*Orcid Id: 0000-0003-1144-1963*

**Myung-Jin Bae<sup>2\*</sup>**

<sup>2</sup>*Information and Telecommunication of Dept., Soongsil University, Seoul, Korea  
369, Sangdo-ro Dongjak-gu, Seoul*

<sup>2</sup>*Orcid Id: 0000-0002-7585-0400  
(\*Correspondence author)*

**Seong-Geon Bae<sup>3</sup>**

<sup>3</sup>*School of Software Application, Kangnam University, Gyunggido, Korea*

<sup>3</sup>*Orcid Id: 0000-0003-3252-0062*

### **Abstract**

There are various studies on the effect of sound on human body. In this study, various studies were carried out to investigate the effect of the human body on the sound quality. It is a work of traditional Korean life which is a work for spreading the wrinkles of fabric cloth, and it is acoustically interesting because it makes it feel lighter and clearer, so it relieves stress. In the meantime, we have studied how the pleasant tenderness sound occurs and works. In this study, we investigated how the sound quality varies depending on the type of fabric and which fabric produces the best sound. Several fabrics were used to compare the changes in the texture of the fabric. As a result, the clarity and preference of a silk, calico, rayon, and cotton were higher in the order of quality. In recent years, the reason for finding and developing the sound of a more refined and timed musical tone is that the autonomous sensory meridian response (ASMR)

---

\* Corresponding author: Myung-Jin Bae, Professor  
Department of Information & Telecommunication, Soongsil University,  
369 Sangdo-Ro, Dongjak-Gu, Seoul, Korea.  
E-mail: [mjbae@ssu.ac.kr](mailto:mjbae@ssu.ac.kr)

becomes a social issue in terms of human emotional recovery. In this sense, it is worth to use as a sound content that gives healing and healing to busy modern people tired from everyday life.

In the future, it will be necessary to find Korean traditional tools for living, and to research and develop the sounds that are generated as traditional sound contents.

**Keywords:** Dadmi, Sound, Sensation, Cloth, ASMR, Healing, Sound Content

## 1. INTRODUCTION

From the old days, Dadmi is one of the three happy sounds of Korea, along with the baby crying and reading the book, which are known as friendly and responsive sounds. At the opening ceremony of the Seoul Olympics in 1988, it was introduced as one of Korean traditional sound themes and became known to people all over the world. Dadmi is a work that uses the traditional tools of life in our country, and it was frequently used in the houses of the countryside and the elderly, from the modern society. The term Dadmi is a purely sophisticated compound word of the work of flattening and unfolding the cloth. In other words, it means to straighten the cloth. However, I do not know if it is a coincidence or not, but it is making a clear and clean sound and it is ringing our heart. The sound itself is also great, but the rhythm and rhythm of tapping the subject makes it seem as though they are playing instruments. In this paper, we have studied the characteristics of the Dadmi quality by dividing it into two types of external and double quality. Furthermore, in this paper, we will study the characteristics of each sound that occurs depending on the type of cloth handled in the working. In order to investigate the quality of the cloth, we used four kinds of cloth such as silk, calico, rayon, and cotton. The prepared cloths were folded well and placed on the stone and taped with a bat to make a sound. Dadmi was applied to the outer treadmill method and recorded using a digital tape recorder in front of 1 meter. The sound of each recorded fabric was analyzed by acoustic analysis and MOS test. In the acoustic analysis, the sound composition, energy, and frequency of each fabric were analyzed to analyze the sound of each fabric. Through the Morse test analysis, the preference of the sound was investigated through the reaction of the listener who listened to each cloth. These studies will be important data for choosing the cloth to generate the optimum sound when using sound as performance and sound contents<sup>[1][2][3][4][5][22][23][24]</sup>.

## 2. DADMI TOOLS

A dadmi is the work of putting a cloth on the stone and waving it with two bats. Basically, the tool used for dadmi consists of a base stone and a pair of plucking bats. A dadmi is mainly solitary, sometimes working as a set of two people. This work alone is called a single dadmi, and it is said that a pair of two is a couple dadmi. The stone made a hard granite stone of a suitable size (50 to 70 cm in width, 20 to 25 cm in length, 15 to 20 cm in height) in a rectangular parallelepiped shape. The reason for making the

upper part of the plaster stones so smooth and slightly upward is to protect the fabric to be plastered and to make the plastering effect better. The reason for making the four legs on the lower part and making space on the abdomen is to relax the relative repulsive force that is transmitted to the arm when carrying out the dadmi and to make it easier to lift when moving. However, I do not know if it was accidental or intentional, but I made a leg in the lower part of the dadmi stone, or made a space by letting the part of the ship fall off the floor surface. In addition, the bat used for the 'scissors' is made of birch or ash tree, but the hand grip is made hollow and easy to hold. It is interesting to note that when a sidewalk strikes a fabric on a plaster stone, it produces a distinctive sound of a solid wooden material, which makes the sound of the more beautiful dadmi. In this way, our ancestors feel awareness and self-esteem when they see that they are not only able to choose effective and efficient designs and materials in their living tools, but also with the wisdom of life enough to even think of the pleasures of enjoying sound [3][4][5].

### **3. THE TYPE OF CLOTH TO BE USED FOR DADMI**

Types of shoes can tell the person's identification such as gender, age, and job. First of all, the sound of suit shoes or heel implies that the person is a grown up and may work for a company.

There are many kinds of cloth. Among them, we used the cloth which is often used in a working dadmi in Korea and examined its characteristics. Cloths often used for dadmi are a silk, calico, rayon, and cotton. The characteristics of each fabric were examined [6][7][8][9].

#### **3.1 Silk**

Silk is a fabric made from yarn extracted from a silkworm that grows in the mulberry tree. It is a cloth originally called a silk produced in Ming Dynasty of China. We often call it a silk, but it has an elegant luster and a rich texture that other fabrics do not have, and the texture is smooth and rubbed or creased.

In Korea, a traditional silk was woven in traditional belts throughout the country and self-sufficient as cloth. Among them, the village of Sungjoo dongsil village in Gyeongsangbuk province was so skillful as to put a silk on the royal family. Even today, the village of Sulju-do, Silla-dong, Gyeongsangbuk-do has been designated as Important Intangible Cultural Property No. 87 because it grows mulberry trees and succeeds the traditional technique of making a silk.

#### **3.2 Calico**

It is wide in silk, and is a thinly woven cloth, very thin in color, very white, and often used for making bedding or harmony. India is the origin of the 17th century East India Company founded in the UK and imported a large amount of the world. It is also called

calico, because it was produced in Kelly Cut, the origin of the cloth, which is also called "cotton" in Korean. In Korea, since the opening of the port, Qing dynasty traders and Japanese merchants have imported processed goods from the UK. It is said that it is made of fine wool. In addition, it was called Calico because it was clean like a jade and the bleached state was processed.

### **3.3 Rayon**

An artificial silk refers to an artificial silk containing the meaning of silk made by a man. It is said that the quality is similar to a silk, because it uses a silk with Chinese artificial silk fabric. A viscose rayon is abbreviated as viscose or rayon in English. As you can see in English, rayon and humanoids are the same fabric. The raw material is semisynthetic fiber, that is, regenerated fiber, which is obtained by dissolving natural pulp or cotton piece with chemical solvent and extracting it. The reason why there are so many shops that use the name "Punggi" is famous as a special product of Punggi-eup in Yeongju, Gyeongbuk. Since the raw material is a natural pulp or a short fiber of a cotton, it is less likely to generate static electricity, and is thin and soft compared to a reinforced artificial leather. It is low price but similar to silk and easy to manage, so it is also used as a substitute for silk. It is light and quick to dry and does not stick to the body, so it is used variously for the lining, underwear and bedding of summer fabric.

### **3.4 Cotton**

Cotton is a cotton fabric, recorded in various documents of the Joseon Dynasty as cotton cloth and neck, and the cotton cloth woven as a conventional loom is named as cotton cloth. The reason why the cotton was spread to our country is that the Koryo Dynasty scholars introduced the cotton craftsman, Chungcheon, and also taught the technique of picking the yarn and making the cloth. As such, cotton has been used for many seasons as a practical fabric and bedding material, and it is used as various daily commodities materials. In order to make clothes with cotton, it is washed well with clear water, and the rice is fed with grass, dried on sunny soil, and then used to finish. Cotton is simple and rough, but its texture, color and aesthetic qualities have been popular among Korean people for a long time, which was more popular than cheap cotton weaving with automatic loom. However, this cotton squeezing technique has almost disappeared with a decrease in the consumption of handmade cotton. However, Naju's cotton squeezing has been designated as an important intangible cultural heritage and continues its tradition.

## **4. ACOUSTIC ANALYSIS**

Scratchy sound produces a clear, clean sound when hard stones and resilient wooden bats hit. In addition, the tapping method has a rhythm and rhythm, which makes it feel like a percussion instrument. In the study on the existing sound quality, the sound quality was analyzed based on the analysis according to the material of the tool and the

analysis according to the usage method. We analyzed the basic tone energy and tone characteristics of tonal quality, and the composition of tone according to the material of the instrument. We analyzed the response of the celadon by analyzing the rhythm and rhythm according to two persons who are batting quality. In this study, the study on the change of the musical tone according to the type of cloth is focused on the selection of the cloth to express the sound of the musical instrument in the clearest and lightest in the previous studies. This study is meaningful in that it is a study to make the quality of the musical instrument and the sound according to it become the traditional Korean sound contents. Acoustic analysis was performed on four fabrics adopted for the study. Spectrogram analysis to analyze the energy of different textures according to cloth

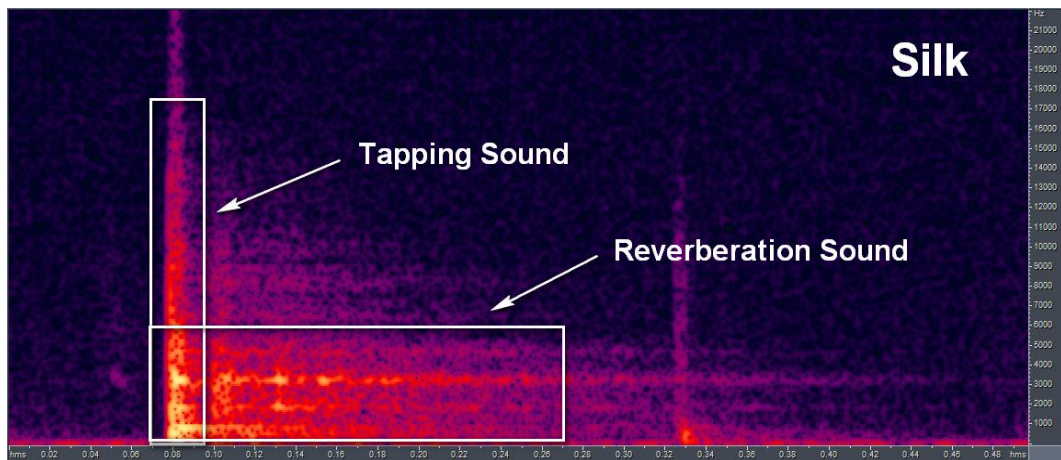
### 3.4 Spectrogram Analysis

The spectrogram graph was analyzed to determine the frequency - specific sound energy of the textured sound according to the type of fabric. This analysis is intended to use as a data for predicting the psychological hearing felt by a person by confirming the distribution of the energy constituting the sound in the part of the audio frequency band.

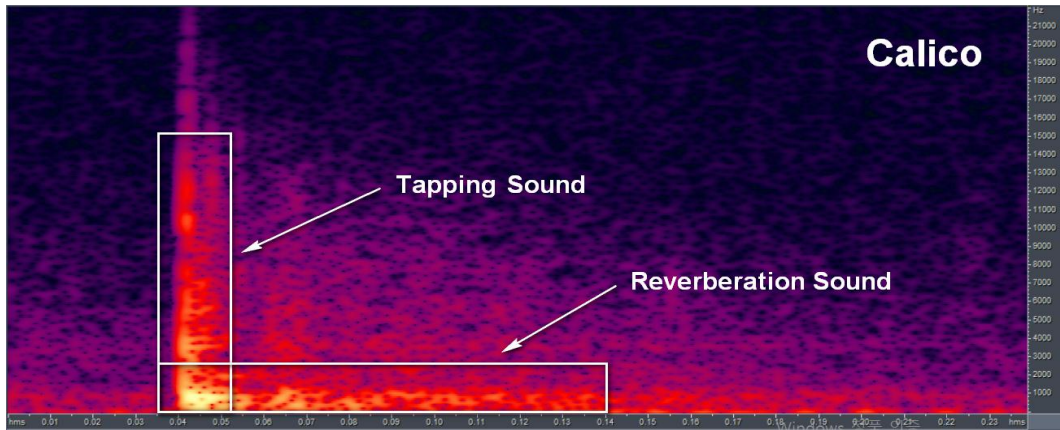
$$D_{LS} = \sqrt{\frac{1}{2\pi} \int_{-\pi}^{\pi} [10 \log_{10} \frac{P(\omega)}{\hat{P}(\omega)}]^2 d\omega} \tag{1}$$

$P(\omega)$  is an original signal,  $\hat{P}(\omega)$  is a synthesis signal.

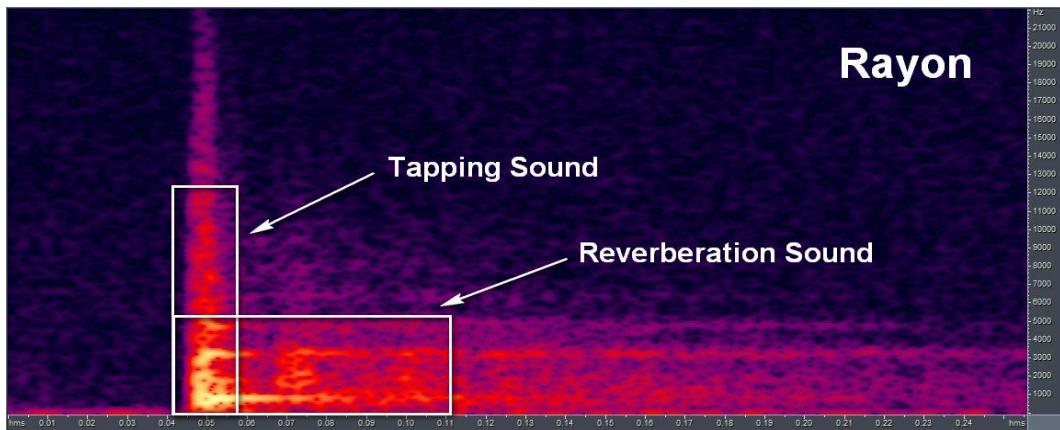
Equation 1 is a formula for measuring spectral distance using Log-spectral distance.



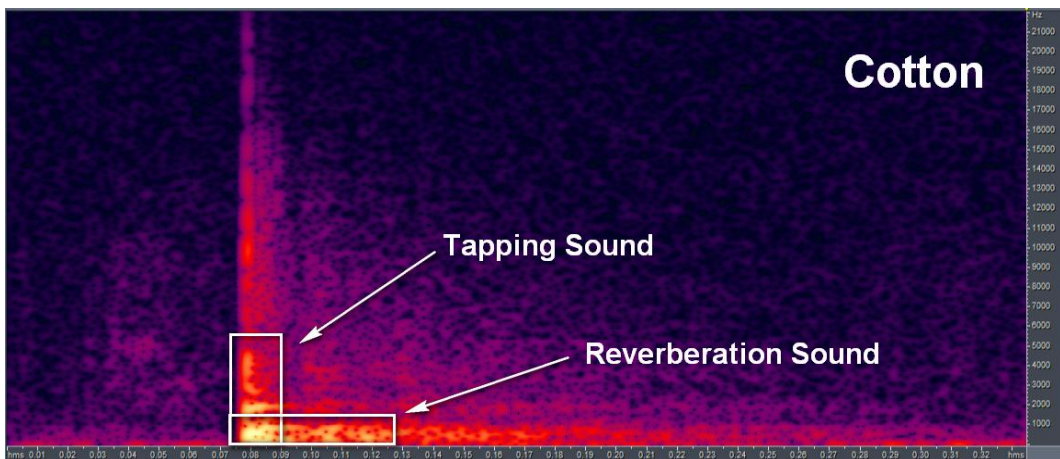
a. Spectrogram graph of silk



b. Spectrogram graph of calico



c. Spectrogram graph of rayon



d. spectrogram graph of cotton

**Figure 1.** Spectrogram graph of texture sounds according to cloth



The characteristics of the sound energy distribution of the dadmi sound generally have three sources of energy.

The first is widely distributed in the low frequency band below 1,000Hz, the second is strongly distributed in the central part of the 1,000-2,000Hz band, and the third is strongly distributed in the center part of the 3,000-4,000Hz band. To check the energy of other dadmi sounds according to the cloth, I changed the cloth on the dadmi stone and checked the spectrogram graph by using the dadmi bat to ignore the rhythm and melody and to sample the tapping sound of 1 tap. The energy of the other dadmi sounds according to the cloth also holds the energy of the basic dadmi sound, but a. cotton to d. rayon. As you can see from the spectral graph up to rayon, the overall energy ranges differ from each other and decrease as shown in the square box display. The spectrogram analysis showed that silk's dadmi sound is the most pronounced, broad and strong energy distribution, which is considered to be the richest and wider sound among the four fabrics <sup>[10] [11] [12]</sup>.

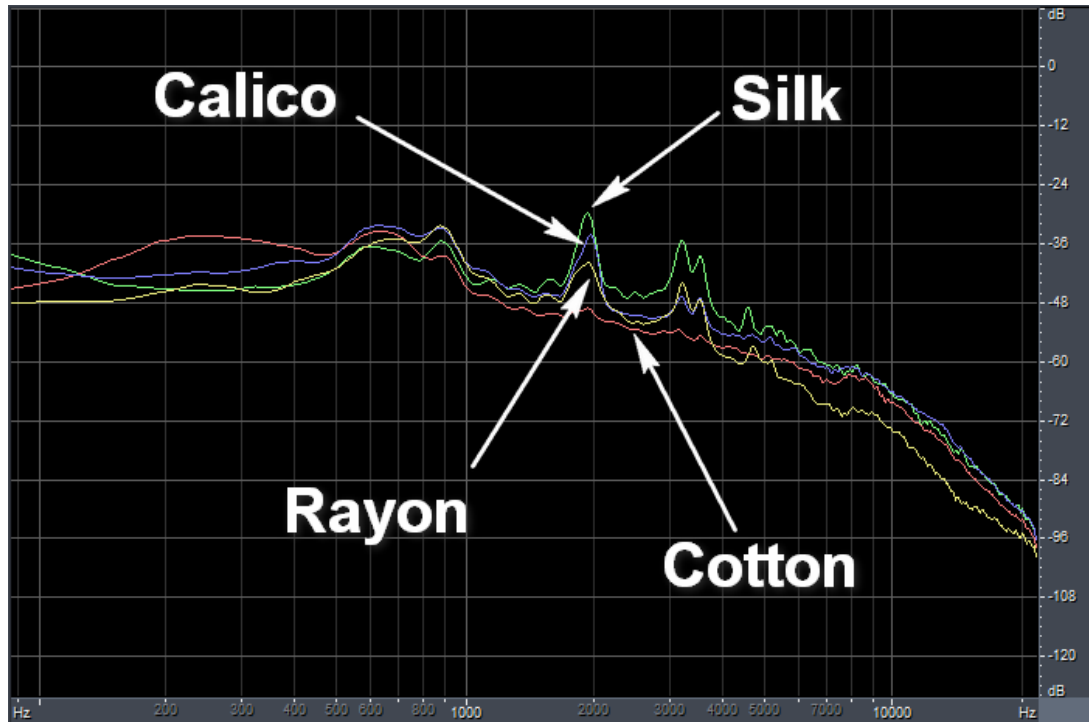
### 3.1 Spectrum

In order to compare the sound characteristics of different dadmi sounds according to cloth, frequency analysis was carried out by spectral graph. A dadmi sound sample for comparative analysis alternated four cloths, ignoring the rhythm and melody, and tapping the dadmi bat once to sample the sound. E1 (n) is the data after the digital conversion of the input dadmi sound, and E2 (n) is the energy value of the sound information. The difference of each frequency component was measured by the following equation.

$$Frequency\_energy = \frac{1}{N} [ \sum_{n=1}^N (FE_1(n) - FE_2(n))^2 ] \quad (2)$$

The difference of each frequency component was analyzed by the above equation and sound information was measured. Equation (2) is a formula for converting sound information into data.

Let FE1 (n) be the data after the frequency conversion of the input sound, and FE2 (n) be the FFT conversion value of the sound information. The information of each sound was measured by the following equation.



**Figure 2.** Comparison of spectral graphs of textures

There was a difference according to the degree of frequency - specific characteristics of different musical tones according to cloth. As can be seen in Figure 2, all four of the fabric's plucked voices are common, showing a prominent frequency peak in the 1,500 Hz to 4,000 Hz band, which is the most audible frequency band that human hearing most clearly receives.

As mentioned above, the four types of cloth sounds show a common frequency band, but the dB values related to the volume and the sound are different in the order of pongee, calico, persimmon, and obscurity.

The comparison of the spectral graphs of the plucked sounds according to the fabric shows that the pongee produces the most clear and clearly perceived sound compared to the other cloths <sup>[13] [14] [15]</sup>.

#### **4. MEAN OPINION SCORE (MOS) TEST FOR FABRIC SOUND QUALITY**

The acoustic psychomotor test for different dadmi sounds depending on the cloth type was performed through five listeners. I heard the dadmi of four cloths silk, calico, calico and rayon, and decided to express the score of which cloth sound is most clear, pleasant to listen to, and favorable. The highest score is 5 points, and the method of ranking the average score by cloth was adopted. Morse test is a very necessary analysis because it is a study for the purpose of making the sound contents to impress to the people because the reason for studying the change of the dadmi sound according to the kind of the cloth. In the end, people must listen and respond.



**Table 1.** Acoustic psychomotor test for fabric sound quality

Cloth type	A	B	C	D	E	Avg.
Silk	5	4	5	5	4	4.6
Calico	4	3	4	3	3	3.4
Rayon	3	3	3	4	2	3.0
Cotton	2	1	2	2	1	1.6

Top Score : 5point

As shown in Table 1, the morse test results were scored in the order of silk 4.6, caclico 3.4, rayon 3.0, and silk 1.6. As predicted from the results of the acoustic analysis, the auditory psychology of those who participated in the MOS test showed similar results. In each comprehensive comment on the dadmi sound according to the fabric of the celadon that participated, the silk sound was the clearest, clearest, and strongest, and it felt the best of the four sounds. Next, the voice of caclico was clear and clear like silk, but it was second rank because sound of sound was slightly weaker overall. The third rayon sound is clearer and less clear than cotton and calico, and the sound is relatively weak. Finally, the sound of silk is the sound of the clumsiest sound of the four cloths, with almost no sound. Of course, the dadmi sound itself is that all four of the cloths have basically clear and clear sound content, and that there is a lack of clarity and resonance among them. As a result, silk's dadmi sound was the clearest, clearest, and best sounding in moss test <sup>[16] [17] [18][20][21]</sup>.

## 5. CONCLUSION

Dadmi is one of the traditional living tasks that we use to spread the wrinkles of cloth by using tools called dadmi stone and bat. At the opening ceremony of Seoul Olympics held in Seoul, Korea in 1988, I have been impressed by showing the light rhythm, melody and harmony of dadmi to the world. The dadmi method folds the cloth on the dadmi stone and knocks it with two bats, which makes the listener happy because it is clear, clear and light. In order to discover and utilize the special sound of dadmi sound as sound contents, we have already studied acoustic psychological analysis of sound quality. In this study, we investigated which cloth among the fabrics mainly used in dadmi is best suited to utilize the sound of the finished product as sound contents. Spectrogram analysis and spectral analysis were performed as an acoustic analysis method and Morse test was performed for acoustic preference analysis. As a result,

silk's dadmi sound was analyzed and selected as the clearest and cleanest sound in both acoustical analysis and MOS test. Based on these results, it is concluded that the use of pongee cloth is most effective for the development of sound contents using dadmi sound. In the future, we will continue to work on creating Korean-language contents using sound by studying the sounds of traditional Korean tools and instruments from the study of this dadmi sound.

## REFERENCE

- [1] Choi Eun-jung, "The Sound of Trimming" [Literature and Spring Festival] (No. 53), 2005.12, 72-75.
- [2] Kim Gil-ja, "The Sound of Scissors", The Times of the Essay 10, 3, 4, 2015.3, 210-212.
- [3] Cho Jeong-yeon, Choi Seok-ro, "Girls who are making clothes", Preamble Party, 2008.9.
- [4] Cho Byeon-Yeon, Choi Seok-ro, The Sound of Right Angle ", Preamble Party, 2008.9.
- [5] Jeong, JH, Choi, JH, Bae, MJ, "A Study on Analysis of Texture Characteristics", Proceedings of the 27th Conference on Speech Communication and Signal Processing, KSCSP 2010, Vol.27, No. 1, pp.53-54.
- [6] Shin Yong-Gyu, Shin Hoon, Kook Chu, "A Questionnaire Research on the Subjective Sound Recognition", Transactions of the Korean Society for Noise and Vibration Engineering, Volume 15, Issue 5, 2005, pp.558-563.
- [7] Shin Yong-Gyu, Shin Hoon, Kook Chan, Kim Sun-Woo, "A comparison study on auditory scenery for sound environment improvement in Traditional Korean style housing(Han-ok) complexes in rural areas - Focused on the Traditional Korean style housing villages in Jeollanam-do, Journal of Korean Society of Rural Planning, Volume 19, Issue 2, 2013, pp.63-73
- [8] Hong, Sung-Hoon, and Myung-Jin Bae, "A Study on the Sounds to Enhance Concentration", IEICE Conference on Computers and Communications, Vol. 30, No. 2, pp. 671-672, 2007.
- [9] Ik-Soo Ahn and Myung-Jin Bae, On a Foley Sound Content of the Bird's Song, "International Information Institute, J. of Information, ISSN: 1343-4500 (SCOPUS indexed), Vol.20, No.2A , pp. 917-922, February 2017.
- [10] Ik-Soo Ahn, Hyung-Woo Park and Myung-Jin Bae, "A Study on the Sound of Tiger Roaring Sound," BRIS Journal of Advances in S & T, MAGNT Research Report, ISSN: 1444-8939 ISI-indexed), Vol.3, No. 9, pp. 293-298, Dec 2015.

- [11] Ik-Soo Ahn and Myoung-jin Bae, "A Study on a Foley Sound of Stepped on Snow," International Information Institute, Information: An International Interdisciplinary Journal, ISSN: 1343-4500 (SCOPUS indexed) No.10, pp.4123-4130, October 2015.
- [12] H.J. Yoo, "A Study on Optimization of Sound Warning Alert for Drowsy Alert", Welcome Sound Sound Research Institute, 2016.
- [13] H.W. Go and Y.H. Kim, "Setting and Analysis of Awakening Control Standard for Avoiding Sleepy Driving", Korean Society of Autonomous Vehicle Engineering, 1997 Fall Conference, Vol. 2, pp.1171-1176, 1997.
- [14] Ik-Soo Ahn, "Research on the dramaturgy and initiatives of sound effects for radio drama", Major in Planning Department of Cultural Contents The Graduate School of Art Chung-Ang University, pp. 90~96, 2012.
- [15] Ahn Iksoo, Seonggeon Bae and Myungjin Bae, "A study of Foley Sound based on analysis and compare of the bird's chirping," Acoustical Society of America, Journal of the Acoustical Society of America, ISSN:0001-4966(SCI indexed, impact factor 1.55), Vol.138, No.3, pp. 1791, September 2015.
- [16] Ik-Soo Ahn, Seong-Geon Bae and Myung-Jin Bae, "A Study of Sound Contents Development based on Analysis and Compare Foly Sound to Actual Sound of Wind ", International Journal of Engineering and Technology, ISSN:0975-4024(SCOPUS indexed), Vol.7, No.3, pp.951-955, JUN-JUL, 2015.
- [17] Ik-Soo Ahn and Myoung-jin Bae, "Developed Foly Sound Contents using Analysis the Sound of Horse Hoof", International Information Institute, Information: An International Interdisciplinary Journal, ISSN:1343-4500(SCOPUS indexed), Vol.18, No.4, pp.1301-1306, April 2015.
- [18] Ahn Iksoo, Myungjin Bae and Seonggeon Bae, "An analysis the actual sound and Foley sound at stepping on dead leaves," Acoustical Society of America, Journal of the Acoustical Society of America, ISSN:0001-4966(SCI indexed, impact factor 1.55), Vol.137, No.4, pp. 2204-1~7, April 2015.
- [19] Ahn Iksoo, Myungjin Bae and Seonggeon Bae, "A study on sound contents development based on analysis a Foley sound and a real sound of thunder," Acoustical Society of America, Journal of the Acoustical Society of America, ISSN:0001-4966(SCI indexed, impact factor 1.55), Vol.137, No.4, pp. 2204-8~14, April 2015.
- [20] Ik-Soo Ahn, Myung-Sook Kim and Myung-Jin Bae, "A Study on the Foley Sound Effect of Ocean Waves", International Information Institute, Information: An International Interdisciplinary Journal, ISSN:1343-4500(SCOPUS indexed), Vol.17, No.12(B), pp.6543-6550, Dec. 2014.
- [21] Maeng-Jin Gang, Jeong-Gyu KIm, "Efficiency Improvement about Digital Evidence Investigation in Korea" The Korea Contents Association, Article 7

No. 2, pp.180-190, 2007.

- [22] Korean Institute of Criminology Research the consecutive number of volumes, 83-111, p.29, 2013.
- [23] Hong Sung-Hoon, Myung-Jin Bae, "A Study on the Sound Enhancement of Concentration", IEICE, Vol. 30, No. 2, pp. 671-672, 2007.
- [24] Myungjin Bae, Myungsuk Kim, Professor Bae's Sound Story, Gimm-Young Publishers, Inc, 2013.