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Study on the sound of water flowing by the Types of Gwanak Mountain valleys

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Abstract

The Republic of Korea have a lot of mountains. It divides the area by the boundary of the mountain, and the mountain is located in the center of the city. As such, mountains are highly valued. The purpose of this study is to analyze the sound of valley water as a means of promoting mountain as a sightseeing spot. Among them, I selected Gwanak Mountain, which is popular among Seoul and Gyeonggi residents, analyzed the type of the valley and the sound of valley water, and examined the preference. In order to select the sound of valley water to use for the study, we picked five different valleys with different characteristics while choosing the mountain trails that climb the valleys mainly in the mountain climbing course of Kwanak Mountain. First, we analyzed the types of five carefully selected valleys, and we pick the sounds of those places. Then an acoustical frequency analysis was performed and people were examined for their preferences. The results of this study will be important data to inform that mountain valleys can produce a unique sound depending on the type of the valley, which can provide pleasure to mountain climbers. The five valleys of Mt. Kwanak are various and distinctive in type, and the water sounds are also clear, cool and individual, which will be a factor to help the pleasant hiking.

Key Words: Mountain, City, Sightseeing spot, Sound of valley water, Kwanak Mountain, Type of valley, Mountain trail

1. Introduction

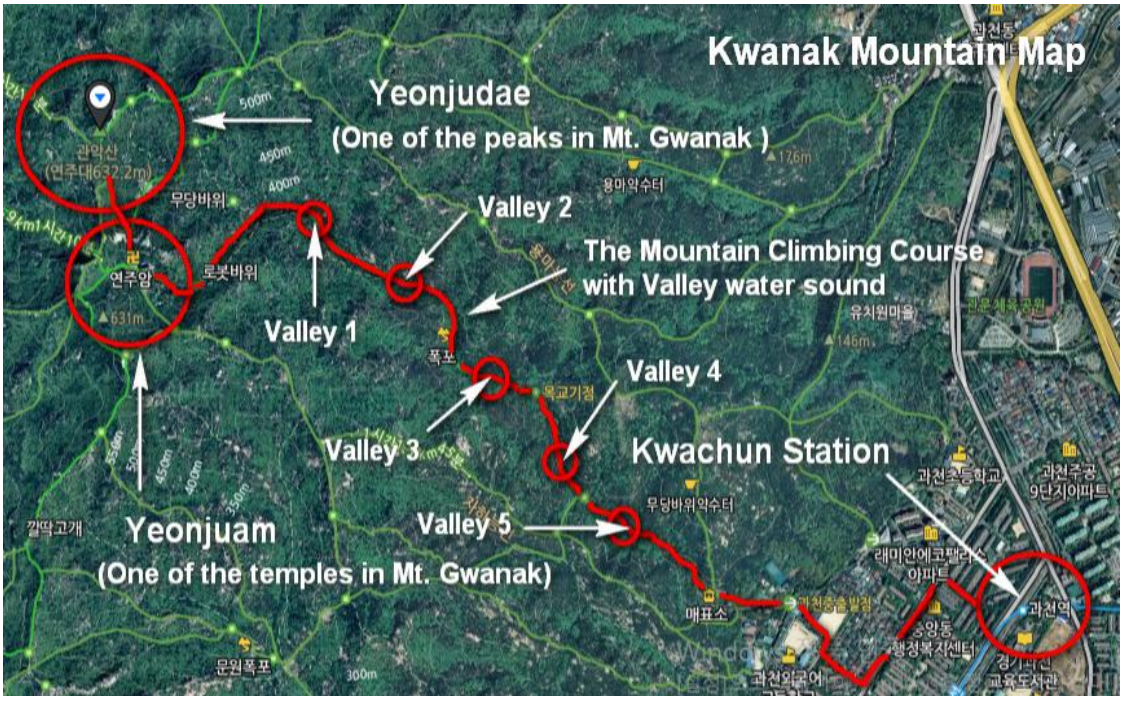
Since there are so many mountains in our country that about 70 percent of the country is formed as mountainous areas, there are many famous mountains selected as tourist sites. Especially when foreigners come to Korea, they envy that there is a mountain in

the city center. In the mountains, the five senses are satisfied and natural healing can be done physically and mentally. Green forest and valley scenery is to satisfy sight, phytoncide is to satisfy smell, earth and rock, and the breeze that rubs the skin satisfies the sense of touch, the taste of water flowing down the river.In this paper, we studied the sound of the valley water on Mt. Gwanak in order to select it as an element of tourism promotion. Gwanak Mountain, located near the center of the city, was designated as a natural city park in January 1968, and is a popular mountain for residents of the metropolitan area. Gwanak Mountain stands 629 meters above sea level and is a beautiful mountain that is distributed to Gwanak-gu and Anyang City in Gyeonggi-do. Gwanak Mountain uses the mountain's name "Gwanak," a Gwanak district where the mountain is located, so Gwanak-gu residents boast of it as a symbol of Gwanak-gu and a cultural heritage. Also, Gwanak Mountain is close to Seoul and Gyeonggi-do City, and is not so large, so many people visit this Mountain. The hiking course also varies from the beginner course to the steep course to the short distance and the long distance course. In this thesis, to study the sound of water in Gwanak Mountain Valley, we selected a hiking course from Gwacheon Station to yeonjuam , which has the beautiful valley hiking course. As the sound of valley water was formed according to the shape of the valley, five valleys were selected according to the shape of the valley. The sound of Mt.Gwanak Valley water was filled with digital recorders in five select valleys. For the study of water sounds by type of Mt.Gwanak valley, an acoustic frequency analysis and a preference survey were conducted using MOS test. The research results will be used as promotional material for Gwanak Mountain, and this research will help other famous mountains across the country study and publicize the sound of water by type of valley.[1][2][3]

2. Selecting the Valley of Gwanak Mountain

There are many different hiking paths on Mt. Gwanak, including one from Seoul National University, one from Sadang Station, one from Gwacheon Station, and one from Anyang.In order to catch the water sound of Mt. Kwanak valleys for the study, I chose a hiking course that would climb through Gwacheonhyanggyo from Gwacheon Station. The Gwanak Mountain hiking course, which climb from Gwacheonhyanggyo, is a course that goes up in a valley compared to other courses, has many different types of valleys and is good to climb while recording the sound of valley water. It is 3.2km to the top of Gwanak Mountain and takes about an hour 30 minutes to walk an adult. The recorder used a digital recorder with built-in microphone and selected a 90 degree-radius phonetic director. First, we observed the entire valley type as we climbed Gwanak Mountain, and as we came down, we collected five valley water sounds.[4][5]

a. YeonjuDae in Mt. Kwanak



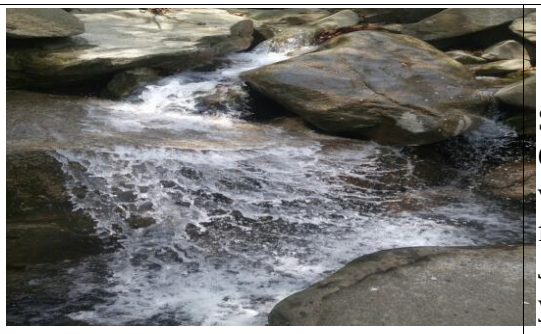
b. Mt. Kwansk climbing course for collecting the valleys

Figure 1. Top of Kwanak Mountain and Map of The climbing course map

3. **Analysis of water sounds by the type of Mt. Gwanak valleys**

To collect the sound of water in Gwanak Mountain valley, two days after the proper amount of rain was designated as a hiking day. That day was on April 25, 2018. This is because when it rains too much, the water in the valley is exaggerated and cannot record the true valley sounds. Or, if the valley is dry because of not too much rain, it can hardly be recorded. In order to record the sound of the valley water correctly, you have to schedule a hike in two days after the proper amount of rain. This is because the water flow in the valley is properly settled and stable so that the sound of the true valley can be recorded without distortion.[6][7][8]

First, we scanned the entire Gwanaksan Valley as we climbed it, and selected five valleys with good sound water as they came down from the top.

 a. Valley 1 - Wide skirt valley	A in Figure 1 is a valley named Width Skirt Valley among the valleys of Mt. Gwanak. This valley is a fan-shaped valley that spreads over a wide rock and flows over the edge of the lower edge. Just looking at the broken stream makes you feel cool and refreshed.
 b. Valley 2 – Wide vertical valley	The b in Figure 1 is named a wide vertical valley flowing vertically. The wide vertical valley spreads 90 degrees wide and falls straight off the sloping rock surface, creating a sound that cools the surrounding air and cools the summer heat.
 c. Valley 3 - cross valley	In Figure 1, c is named as a cross valley where the streams that were flowing separately from each other intersect. As the two streams of water merge into one place, they create a more abundant sound of valley water, creating cool scenery and sound.

 d. Valley 4 - twin valley	The d in Figure 1 is named a twin valley where the water of the valley, which flows down both sides, falls apart from the rocks. The water flowing in both directions falls down holding the sound of each stream as it is, making each stream narrow but cool and clear.
 e. Valley 5 - Valley under the Rock	The d in Figure 1 is called the Valley under the Rock because it flows down and between the wide rocks attached to the mountain. The valley water flows down as it splits through rocks and rocks, creating a cool, majestic sound in the space beneath the rock, creating a resonant sound.

Figure 2. Characteristics of Gwanak Mountain Valley

We also studied the valley of Gwanak Mountain to study the sounds of shapes in the valley. In order to investigate Gwanak Mountain Valley, a hiking trail was selected as a hiking course starting through Gwacheonhyanggyo from Gwacheon Station, where you can climb along the valley. We chose the hiking trail that ran along the valley, and we could see the valley that ran all the way up Mt. Gwanak. In order to record the sound of the valley water perfectly, we also set a climbing schedule on April 25, 2018 two days after the appropriate rainfall.The beautiful sun of April made the trees greener and the water in the valley clear, and the sound of the valley resounded. As expected, the valley of Mt. Kwanak has reached the top of the city in various forms as the best famous mountain in the city. We recalled the point of the valley that we had scanned on our way up, recorded one on our way down and could collect five sounds of the valley on Gwanak Mountain. The sound of Gwanaksan Valley water was named Wide skirt Valley, Wide Vertical Valley, Cross Valley, Twin Valley, and Valley under the Rock.In Figure 2, we recorded the characteristics of the five shapes of the valleys and were able to prepare samples of the valley water for acoustical analysis and for the MOS test.

An acoustic spectrum frequency analysis was performed to scientifically analyze the sound of valley water on Mt. Gwanak. We used "Cool Editor Pro 2.1 from Syntrillium

Software Coporation" as an analysis tool for water sound analysis of Gwanaksan valley. The average value of sample rate was analyzed by setting the sample rate to 44,100, the channel to Mono, and the resolution to 16 bits. The sound frequencies for the five sound of valley water selected in various types of valleys of Gwanaksan Mountain were compared with frequency graphs.

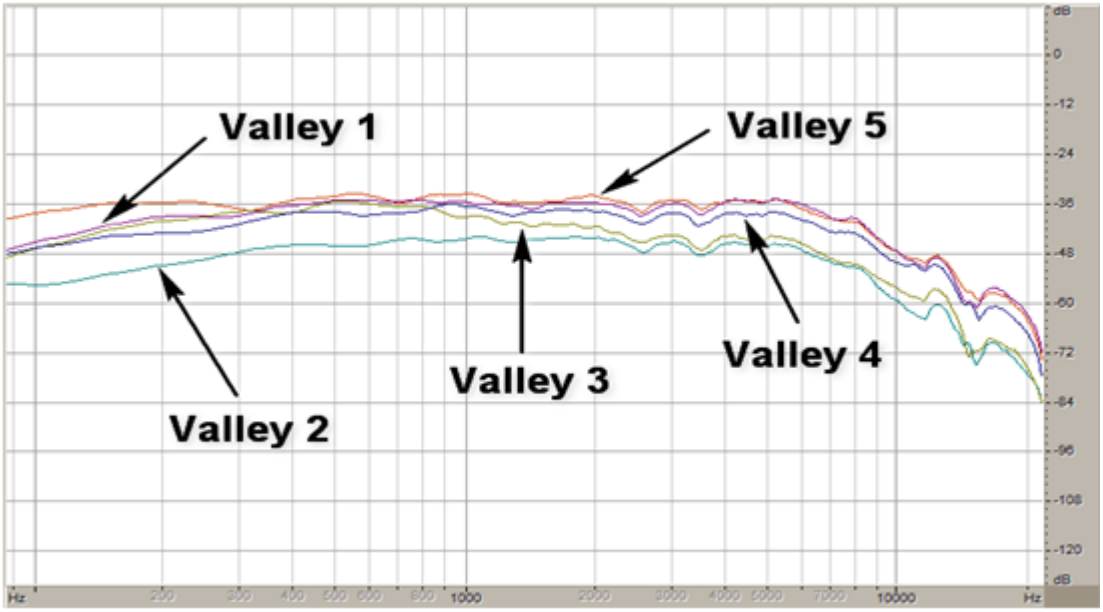


Figure 3. Spectrum of water sound of Valleys in Mt. Gwanak

Figure 3 is a graphical representation of the frequency of the valley sound of Gwanak Mountain. The characteristics of the graph show a very similar graph for all five sounds. It is proof that the acoustical properties of the water sound in Gwanak Mountain Valley have generally high energy levels with a clear, refreshing and cool feeling in common. However, the sounds of the five valleys differ slightly from each other because the shapes of the valleys have unique characteristics. The valley 1 is a graph that shows the sound characteristics of valley water flowing out like a wide skirt, and low frequency bands show the second of the five valley water characteristics, but overall it shows high energy. The valley 2 is a graph showing the sound characteristics of valley water flowing vertically, so it has low energy levels from low frequency bands to full frequency bands because not many water flows vertically. The valley 3 is a graph of the sound characteristics of valley water flowing through two streams. When water intersects, the overall high frequency band from medium frequency band to high frequency band is lower than low frequency energy. The valley 4 is a graph of the sound characteristics of valley water that flows vertically from two places. As the stream flows down into two streams, the width of valley water flows down, it has high frequency characteristics similar to high frequency water flowing in wide. The valley 5 is a graph that shows the sound characteristics of valley water flowing vertically under rocks, creating a resonant sound quality in a cave that generates high frequency band energy. The sound of

water that flows down the narrow gap is creating high sound energy in both medium and high frequency bands. The sound energy of the five valleys can be summarized by the size of the valley 5> valley 1> valley 4> valley 3> valley 2. Although the sound of the valley water on Gwanak Mountain is all different from fine differences, the overall sound quality can be seen as fresh, energetic and pleasant sound characteristics that show the overall energy chosen in the low, medium, and high frequency bands.[9][10][11]

4. Preference investigation of water sound in Mt. Gwanak valleys

MOS(Mean Opinion Score)test was performed to investigate the preference of the valley water sound of Gwanak Mountain by type. This is a way to tell five types of water from a valley to five listeners and assign preference scores. The highest score was 5 points and the ranking was calculated by converting the scores of 5 people into averages. For fear that the listener might have preconceived opinions, five valley water sounds were called "Valley 1" and "Valley 2" by simple numbers. When we call it the Wide skirt Valley and the Wide vertical Valley, we can imagine the shape of the valley and even think about the sound of the water.[12][13][14]

Table-1. Preference investigation of water sound in Mt. Gwanak valleys

Valley ＼ Listeners	A	B	C	D	E	avr
Valley 1 (Wide skirt valley)	4	3	4	4	3	3.6
Valley 2 (Wide vertical valley)	2	1	2	2	2	1.8
Valley 3 (cross valley)	3	2	2	1	3	2.2
Valley 4 (twin valley)	4	3	3	3	4	3.4
Valley 5 (Valley under the Rock)	5	4	5	4	5	4.6

High score: 5point

The results of the preference investigation showed that valley 1 was 3.6 points, valley 2 was 1.8 points, valley 3 was 2.2 points, valley 4 was 3.4 points and valley 5 was 4.6 points. These results were the same as those shown in the analysis of frequency characteristics of the valley sound of Mt.Gwanak. The preference ranking for valley water sounds was followed by valley 5> valley 1> valley 4> valley 3> valley 2. It is believed that the sound of water in the valley under the rock topped the list because it has high energy in the entire audio frequency band. Next, it is judged that the reason for the second-place preference is that the sound of the Wide skirt valley has high energy in the wide range of audible frequencies. It is believed that the sound of the twin valley was chosen as the preferred choice for the third ranking because the sound of the two streams coming together in pairs produced high energy. It is believed that the reason why water sounds in cross valley were selected as a preference for the 4th rank was because the two streams crossed one place and the cool water in high frequency areas decreased from the sound of the two streams. Finally, it is judged that the reason for the selection of wide vertical valley sounds was the fifth lowest preference since the sound of water flowing vertically over flat rocks produced relatively lower energy than other valley water sounds.

5. Conclusion

As part of the tourism promotion of Gwanaks Mountain, which Seoul residents and Gyeonggi-do residents enjoy visiting, the water characteristic of the valley was studied. For research, we selected Gwanak Mountain hiking course, which leads up the valley, and selected five valleys. First, We analyze the characteristics of five different types of Mt. Gwanak Valley. Second, the frequencies of the five valleys were analyzed and compared. Third, we examined preference by using a mos test method, with five valley water sounds. At First, We looked at five types of Gwanak Mountain Valleys, and found five characteristics of the wide skirt Valley, a wide vertical valley, a cross valley, a twin valley, and a valley under the rock. And then, after analyzing the sound frequency of the valley sounds of Gwanak Mountain, the overall sound quality shows a spectral graph with a common characteristic of clear, refreshing and cool sound. However, the five valley water sounds show only a tiny difference of energy, all of which are cool and refreshing. However, overall sound size and sound characteristics by frequency band were slightly different. Finally, in the results of the MOS test, the preference ranking of five listeners listening to five valley water sounds was similar to the results that could be inferred from the valley shape-specific characteristics and sound frequency analysis. As such, the sound of Gwanak Mountain's valley water is unique to Gwanak Mountain and can be concluded that it provides freshness and joy to hikers. In this way, we have confirmed that the sound of valley water is valuable in promoting beautiful mountains as well as Gwanak Mountain, as well as in Korea's famous mountains.[15][16]

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