Research Article

Heow Pueh Lee, Kian Meng Lim, and Saurabh Garg*

A case study of recording soundwalk of Fushimi Inari shrine in Kyoto, Japan using smartphone

https://doi.org/10.1515/noise-2019-0008
Received May 01, 2019; accepted Nov 04, 2019

Abstract: We present soundwalk of Fushimi Inari Shrine in Kyoto, Japan from the main gate facing the Inari railway station to the summit. The soundwalk was captured from Samsung Galaxy S8 running NoiseExplorer: an app we have developed for Android and iOS. Fushimi Inari Shrine is the main shrine of the god Inari and sits at the base of a mountain also named Inari which is 233 meters above sea level. It also includes trails up the mountain to many smaller shrines which span 4 kilometers and takes approximately two hours to walk up. This shrine is ranked as the number one most popular sightseeing destination among tourists visiting Japan. A salient feature of the shrine is the rows of nearly 10,000 torii gates in striking orange color, which is known as the Senbon torii. The soundscape at the main gate and the main shrine was found to be dominated by the sound of cicadas. However, midway along the torii gates along the path towards the summit, cicada sound subsides, and the soundscape is more representative of typical footpath on mountain paths. The Leq noise level of 59.6 dBA is well below the typical noise level of other Japanese tourist attractions.

Keywords: Soundwalk, Noise mapping, Fushimi Inari shrine, Soundscape

1 Introduction

Soundscape forms an important part of experiencing any place, whether it is a nature park, historical place, or a tourist attraction. A soundscape is not just an auditory experience but a combination of both auditory and visual experience as well as how a person interacts with the immediate environment. Soundwalk is the process of mindful listening, observing, and occasionally recording the soundscape of a place. McCartney [1] suggested that soundwalking should be done at a normal walking pace. Soundwalk not only helps us to connect with our surrounding soundscape but can also be used a tool by city planners to reduce effects of the noise pollution by masking it with waterfalls and trees.

Fushimi Inari Taisha or Fushimi Inari Shrine is the head or the main shrine of the god Inari, located in Fushimi Ward in Kyoto, Japan. The shrine sits at the base of a mountain also named Inari which is 233 m (764 ft) above sea level and includes trails up the mountain to many smaller shrines which span 4 km (2.5 mi). It takes approximately two hours to walk up. Inari is the god of rice, but merchants and manufacturers have traditionally worshiped Inari as the patron of business. This popular shrine is said to have as many as 32,000 sub-shrines (bunsha) throughout Japan. The shrine became the object of imperial patronage during the early Heian period. From 1871 to 1946, Fushimi Inari Taisha was officially designated as one of the Kanpei-taisha (first of the government supported shrines). The layout of the Fushima Inari Shrine is shown in Figure 1. Partly because it was used as a setting for the movie Memoirs of a Geisha, this shrine has been ranked as the number one most popular sightseeing destination among tourists visiting Japan.

The highlight of the shrine is the rows of torii gates called Senbon torii. The custom to donate a torii started to spread since the Edo period (1603-1868) to get a wish to become true or to thank for a wish that became true. Along the main path there are around 10,000 torii gates painted in bright orange color. A typical section is shown in Figure 2 with striking orange color painted on the torii gates.

The approach to appreciating and managing the natural sound-world is possibly unique to Japan. And travelers to that country will often be surprised by unusual and carefully ‘placed’ soundscapes evident in everyday life. The idea of wa (harmony) is an important element of the Japanese aesthetic and this extends to the sonic environment as well. Nagahata et al. [3] reported that Japanese had been losing their own inherited sound culture. On the
contrary, the soundscapes of shrines and temples had not been affected by historical changes.

Some studies have discussed the soundscape of religious sites such as Buddhist temples and cathedrals [3, 4]. Zhang et al. [4] concluded that although there was increased awareness about the protection of historic buildings including temples and shrines, the protection of the soundscape or the sound environment, which was deemed to be an integral part of the overall environment of historic buildings or sites, was often ignored. There is a reported soundwalk of historical sites in Japan and even a report on the 100 soundscapes of Japan covering Japan’s greatest natural, cultural, and industrial sounds [5]. Recently, the soundscape and analysis of the frequency spectrum of Miyajima and Itsukushima shrine in Japan was presented in [6]. However, there is no reported systematic study of the soundscape or analysis of the spectrum of Fushimi Inari Shrine. The present study is motivated by the spectacular visual impact of the shrine as well as by the rich variation in soundscape which appeared to be different from the soundscape of other shrines in Japan.

In this paper, we present the soundscape of Fushimi Inari Shrine recorded from Samsung Galaxy S8 smartphone. Smartphone was used instead of scientific equipment such as sound level meter (SLM) because smartphones are cheaper and lighter compared to bulky and expensive SLMs. Unlike SLMs Smartphones have an inbuilt GPS receiver which is essential for generating noise maps. Additionally, with the help of citizen scientists [7–9] it is possible to easily capture a much more detailed soundscape than is possible with small research teams. This paper illustrates that it is feasible to use a smartphone to record soundscape.

We found that Fushimi Inari Taisha has a unique soundscape. The shrine was originally setup for worshiping the god of rice. The Chinese saying is that when the cicadas begin to sing, it is time for the paddy rice to show awns [7]. An interesting finding is that the soundscape at the main gate and the main shrine is still dominated by the sound of cicadas and midway along the torii gates along the path towards the summit, the cicada sound subsides,
and the soundscape becomes more representative of typical footpath on mountain trails.

2 Methodology

The soundwalk for Fushimi Inari Shrine was recorded from Samsung Galaxy S8 with the help of NoiseExplorer: an app we have developed for Android and iOS. NoiseExplorer can simultaneously record audio as WAV files and location information along with SPL in log files. WAV files are used to generate average spectrums and spectrograms while log files are used to generate noise maps. NoiseExplorer is discussed in more detail in [6]. The microphone in the Samsung Galaxy S8 was calibrated against a type 1 reference microphone using the technique described in [8]. The calibration technique uses a set of simultaneous environmental recordings from a smartphone and a type 1 reference microphone to calibrate the smartphone microphone. It was shown that the technique achieved an accuracy of 0.7 dB for 99.7% of measurements over a 9 hour of environmental noise.

The soundwalk was recorded while holding smartphone in hand at a comfortable distance away from the body and walking at a normal pace with a group of people. 29 recordings (47 minutes long) were made over a period of 1 hour and 25 minutes on the morning of July 13, 2018. All 29 recordings captured during soundwalk were used and we did not perform any kind of audio processing on them. Recording do not span the total duration of walk to keep in mind the social dynamics, etiquette’s, and safety.
Figure 5: Soundscape from the main entrance opposite the train station to the starting of the path lined with thousands of torii.

Figure 6: The spectrogram of the Soundscape from the main entrance opposite the train station to the starting of the path lined with thousands of torii.
3 Results and discussion

The overall soundscape for the soundwalk is shown in Figure 3. The soundwalk was conducted in the morning of 13 July 2018. It was a sunny day with moderate number of visitors, especially at the beginning of the soundwalk.

3.1 Soundwalk from the main entrance opposite the train station to the starting of the path lined with thousands of torii

The start of the soundwalk is the main gate of the Fushimi Inari Taisha (Figure 4). The soundscape and the associatedrogram are shown in Figures 5 and 6, respectively. A striking feature of the soundscape for this part of the soundwalk is the sound caused by cicadas. This can be deemed as a special feature for the Fushimi Inari Taisha which was originally setup for honoring the God of Rice.

3.2 Soundwalk from the starting of the torii gates to Kumatakasha

The starting point of the torii gates towards the summit of the mountain is shown in Figure 7. The beginning part of the soundscape for this part was still dominated by the sound of cicadas. The cicada sound subsided after a turning near the Kumatakasha. Few minutes after cicada sound subsided, there is water stream sound for part of the journey to Kumatakasha due to the drain flowing next to it (Figure 8). The soundscape and the associated spectrogram are shown in Figures 9 and 10, respectively.

3.3 Soundwalk of round trip from Kumatakasha to the summit

The soundscape and the associated spectrogram are shown in Figures 11 and 12, respectively. The overall noise level is in general lower than the noise level of typical shrines in Kyoto, especially along the path towards the summit. The $Leq$ noise level is 56.9 dBA dominated by the cicada sound compared to the $Leq$ of 64.1 dBA at the Miyajima and Itsukushima Shrine in Kyoto [6]. The main
A case study of recording soundwalk of Fushimi Inari shrine in Kyoto, Japan using smartphone

Figure 9: Soundscape from the starting of the torii gates to Kumatakasha

Figure 10: Spectrogram of the soundscape from starting of the torii gates to Kumatakasha
Figure 11: Soundscape of round trip from Kumatakasha to the summit

Figure 12: Spectrogram of the soundscape for round trip from Kumatakasha to the summit
A case study of recording soundwalk of Fushimi Inari shrine in Kyoto, Japan using smartphone

The footpath made by concrete blocks and stones (Figure 13) is mainly dominated by human voice due to the popularity of the shrine for the tourists to Kyoto.

4 Conclusions

In this study, we have presented soundscape of Fushimi Inari Shrine to illustrate that smartphone can be used as a relatively inexpensive and convenient alternative to expensive and bulky scientific equipment for recording the soundscape of a place. With the help of crowd-sourcing it is possible to build a rich and realistic soundscape of a place easily. The present study is an example towards this ultimate goal. The soundscape was found to be dominated by cicada sound near the main shrine and sound from the nature for path to the summit. The noise level was found to be below 77.8 dBA for most part of the soundwalk. The Leq sound level is 59.6 dBA for the entire path.

Acknowledgement: The authors would like to acknowledge the financial support by the Ministry of Education under the Tier 1 Academic Research Grant (R-265-000-639-114).

References

[1] McCartney A., Soundwalking: Creating Moving Environmental Sound Narratives, The Oxford Handbook of Mobile Music Studies, 2014.
[2] Keikeiakaka, Fushimi Inari Taisha (Shrine), I worshiped in about two hours(Kyoto), https://i-love-japan.info/?p=1463.
[3] Nagahata K., Maeda K., Iwamiya S.-I., Statistical analysis of historical changes of Japanese soundscapes represented in the world of Haiku, J. Acoust. Soc. Jap. 1996, 52(2), 77-84.
[4] Zhang D., Zhang I.M., Liu D., Kang J., Soundscape evaluation in Han Chinese Buddhist temples, Applied Acoustics, 2016, 111, 188-197.
[5] Rogers K., The 100 Soundscapes of Japan: A list of Japan’s greatest natural, cultural, and industrial sounds, 2016, https://soranews24.com/2016/05/14/the-100-soundscapes-of-japan-a-list-of-japans-greatest-natural-cultural-and-industrial-sounds
[6] Lee H.P., Lim K.M., Garg S., A Case Study of Recording Soundwalk of Miyajima and Itsukushima Shrine Using Smartphone, Acoust. Austral., 2019, 46(3), 349-361.
[7] Liu G.K.-C., Cicadas in Chinese Culture (Including the Silver-Fish), Osiris, 1950, 9, 275-396.
[8] Garg S., Lim K.M., Lee H.P., An averaging method for accurately calibrating smartphone microphones for environmental noise measurement, Appl. Acoust., 2019, 143, 222-228.
[9] Jeon J.Y., Hwang I.H., Hong J.Y., Soundscape evaluation in a Catholic cathedral and Buddhist temple precincts through social surveys and soundwalks, J. Acoust. Soc. Amer., 2014, 135, 4, 1863-1874.
[10] Schweizer I., Darmstadt T., Probst F., Bartl R., Darmstadt T., Muhlhauser M., Darmstadt T., Schulz A., Darmstadt T., NoiseMap: Real-time participatory noise maps, 2011, Second International Workshop on Sensing Applications on Mobile Phones.

[11] D’Hondt E., Stevens M., Jacobs A., Participatory noise mapping works! An evaluation of participatory sensing as an alternative to standard techniques for environmental monitoring, Pervasive and Mobile Computing, 2013, 9(5), 681-694.

[12] Maisonneuve N., Stevens M., Niessen M.E., Hanappe P., Steels L., Citizen Noise Pollution Monitoring, Proc. of the 10th Ann. Int. Conf. on Digital Government Research: Social Networks: Making Connections Between Citizens, Data and Government, 2009, 96-103.