

Influence of Live Classic Concert on Stress and Relaxation in 3D High Presence Environment

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Abstract— We investigated how people feel about a live classic concert by providing it with 3D virtual image using a large size screen with high quality audio sound. Nose skin temperature of a subject was measured to understand if the live image provides relaxation or stress.

We found that the stress and discomfort from the virtual presence was gradually removed during the concert and the audiences feel comfortable and relaxed, as if the live music was played in front of them. This can be a new concert appreciation style for persons who want to enjoy a classic concert with their close friends or families without being concerned about making noises.

Keywords— high presence environment, 3D live broadcasting, large size screen, biomedical response, facial skin temperature

I. INTRODUCTION

Music concerts are attracted by audiences who like to feel its live presence from the surrounded environment. Many concert halls are equipped with high quality sound systems to enjoy the music itself as well as the atmosphere.

In addition to this, listening to live music reduces psychological stress and heals listener's mind and body by adjusting blood circulation [1]. People especially recommend a live classic music concert for relaxation, but a problem is its strictness to silence during the concert. Since most audiences expect high quality sound without unwanted noises or interruption from other audiences or mechanical equipments,

some audiences feel nervous during the concert not to cough or make noises. This also prevents persons who want to enjoy with their close friends or families from going to classic concerts.

To reduce their nervousness, it may be a good idea to have a new concert environment providing both high presence live video image and high quality sound. By providing sense of presence in such a small group environment, people can enjoy "being there" experience without feeling nervousness to be silent and they are moved to feel excitement or impressiveness [2]. However, providing extremely high presence may affect human body and mind negatively [3]. For example, improper 3D images can cause serious viewing discomfort with eye strain [4].

In this paper, we investigate how the high presence environment affects audience's feeling by measuring biomedical responses, such as brain wave, electrocardiogram, nose skin temperature, and so on. As a high presence environment, we used an event of live 3D broadcasting of classic orchestra concert. A large 3D rear projection screen and a high quality 5.1ch surround speaker system were set for the event.

II. EXPERIMENT

The classic concert 3D broadcasting was planned and operated by Keio University, WIDE Project and May Corporation on December 31st, 2010. 3D cameras and their

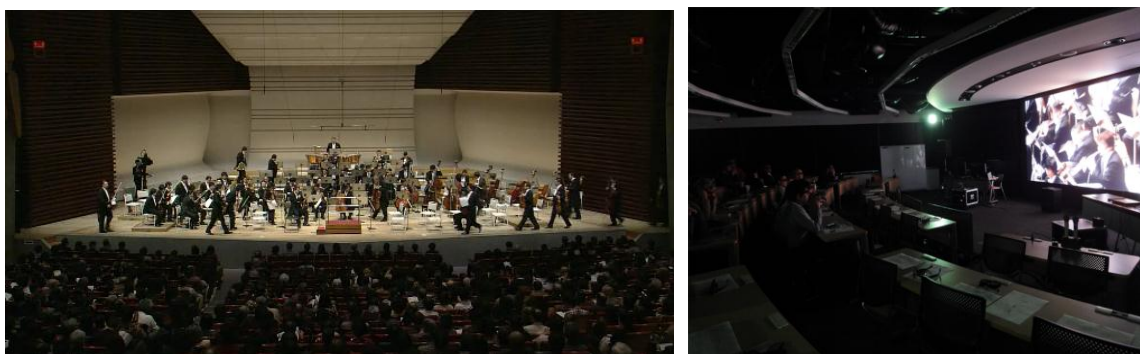


Fig. 1 The concert hall in Tokyo (left) and the experimental space with 4K3D screen (right)

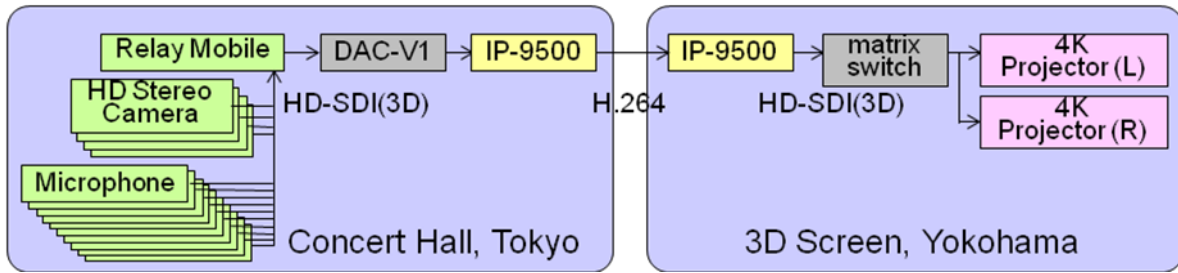


Fig. 2 Equipment connection for video/audio data transmission

operation were conducted by NHK Media Technology. The 3D image was transmitted from the concert hall in Tokyo to a 3D screen in Yokohama using side-by-side H.264 compressed data through IP network (Fig. 1 and Fig. 2). The 3D screen is a 180-inch rear projection system using two polarization-controlled 4K projectors.

We chose a subject from the audiences who is a healthy woman age 50's and understands classical music well. Brain waves and electrocardiogram were taken by attaching proper equipments on the subject person. Facial skin temperature was also measured using infrared thermography camera TVS-500EX (Fig. 3).

Thermograph is an appropriate equipment to evaluate one's stress by measuring subject's skin temperature [6]. Attaching equipments or devices on the subject person's body sometimes make them nervous and gives stress against the test. Thermograph is taken without their awareness. When stress was given to a subject, their nose skin temperature tends to drop. Using this phenomenon, we can evaluate one's stress level by comparing nose skin temperature with forehead skin temperature [6-9].

We also conducted surveys to understand audiences' feeling before and after watching the 3D live concert, although the results were not discussed in this paper.

III. RESULTS

In this paper, we focus on facial skin temperature through thermograph test results, and other biomedical response results will be discussed at the conference. First of all, resting state temperature was measured before the concert started. The skin temperature difference between nose and forehead

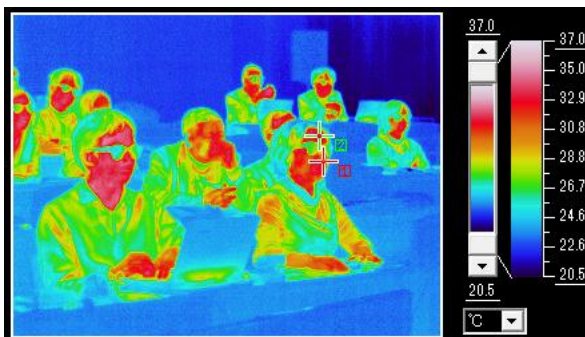


Fig. 3 Display image of infrared thermography during the experiment

was not significantly seen, which is considered as the subject was relaxed. This stage was named "initial stage" shown in the Fig. 4 and Fig. 5.

The concert started slowly at the time of 2 minutes from the beginning of measurement. The nose temperature started dropping after few minutes from the concert start. It was significant drop by almost 2 deg C. This represented the subject started feeling stressful or excitement with the unusual environment. By interviewing the subject, we understood that this was not negative feeling, but unbelievable presence from the large 3D screen with 5.1ch surround audio sound. In the "stress stage", nose temperature was not stable and it went ups and downs for several minutes.

After ten minutes from the beginning, we observed nose temperature rising and stabilizing. The nose skin temperature keeps slightly lower than forehead by 0.5 deg C, but it was now stable. We understood that the subject shifted from "stress stage" to "relaxed stage" and was ready to enjoy the music, having comfortably excited experience of 3D image.

Another interesting finding from the test is increasing forehead skin temperature. As you see in Fig. 4, it gradually increased after 8 minutes. This phenomenon was understood that the subject was going to be relaxed and feeling comfortable with the music, which is similar to the previous study on live music [1]. In other words, the high presence environment we provided was good enough for the subject to feel as if she was in the concert hall.

IV. CONCLUSIONS

We found from the results of nose skin temperature measurement, that the 3D live classic music on 180-inch screen with 5.1ch surround audio excited and surprised audiences by its unusually high presence at the beginning. We also found that the stress and discomfort from the presence was gradually removed and the audiences feel comfortable and relaxed shown in facial temperature increase. It was similar phenomenon to live music played in front of them.

The high presence environment provides a feeling as if it is the concert hall. This can be a new concert appreciation style for persons who want to enjoy a classic concert with their close friends or families. By providing high sense of presence environment for such a small group, people can enjoy "being there" experience without being concerned about making noises.

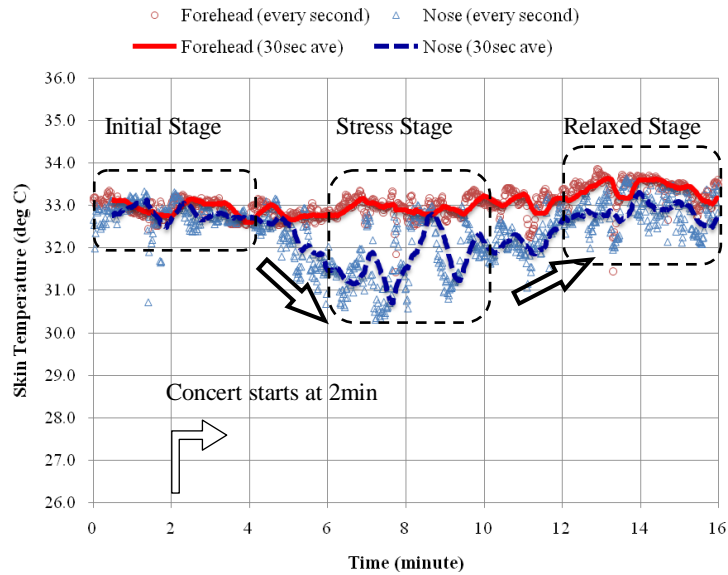


Fig. 4 Skin temperature trend of nose and forehead

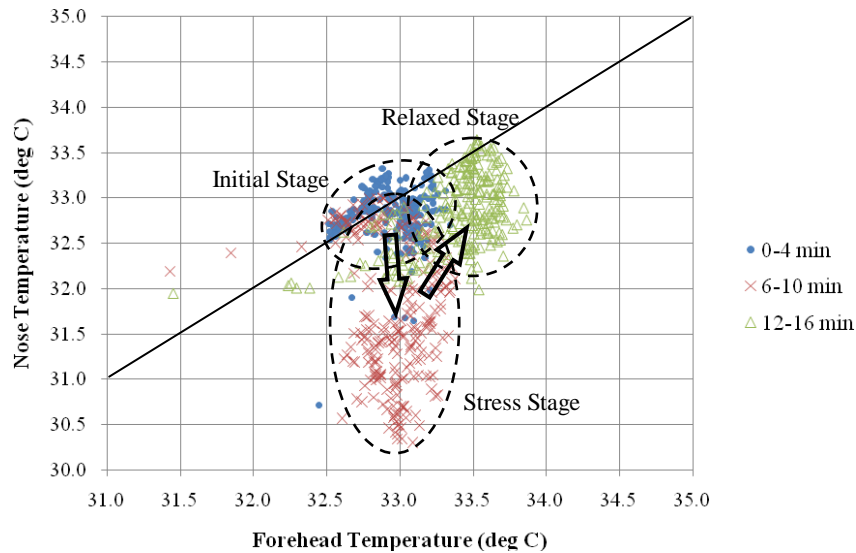


Fig. 5 Scatter diagram comparing nose with forehead skin temperature

ACKNOWLEDGMENT

This research is partly supported by the Japan Society for the Promotion of Science (JSPS) through its “Funding Program for World-Leading Innovative R&D on Science and Technology (FIRST Program) and by Keio University Global COE (Center of Education and Research of Symbiotic, Safe and Secure System Design) Program. We also like to appreciate Kiyomi Mitsui and Junji Yamada for their dedications to help the testing and to analyze data.

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