論　文　要　旨
Thesis Abstract

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主論文題名　（Title）

A Study on an EEG-based Virtual Reality Live Concert and Analysis of the EEG Signal Response in Concert-Like Experiences

内容の要旨　（Abstract）

In recent years, the way of attending events in groups is being distorted by the development of new systems of communication. In the case of music concerts, the industry is changing and including technology. This is affecting the consumers' way of participation. Nonetheless, digital concerts still need to overcome limitations such as user experience, feedback, and dimensionality.

To enjoy an immersive experience focused on the concert, passive BCI systems can overcome other digital concert problems, dealing with dimensionality through virtual reality, while providing feedback without losing the focus. In this thesis, we propose four directions to improve passive BCI systems for concert-like experiences. To do so, we analyze a BCI-VR live concert and explore how it can solve the problems faced by digital concerts. First, we study the adequacy of passive visual feedback systems to reflect the subjective experience; differences in individual or group experiences are also compared. Secondly, we develop an individual threshold that adapts the feedback to each subject's brain signal, removing bias unrelated to the experience. Thirdly, reducing software and hardware limitations can improve the acceptability of BCI applications, so an EEG signal forecasting method is proposed to enhance the quality of experience and signal stability. Finally, we study frontal single-channel electrodes for the recognition of different emotions to adapt the application to the best brain regions while considering the hardware limitations of user-oriented settings.

The results of the visual feedback suggest that the brain signal feedback influences the user experience, additionally, differences between individual and group experiences are found. The new threshold indicates the adequacy of individual thresholds for adjusting to each individual and for reducing undesired bias effects. The signal forecasting method indicates that theta and alpha frequency bands over frontal locations are best suited for predictability, while this can be implemented in other frontal bands too. The emotion recognition research suggests that single-channel electrodes can detect emotional changes, while this is done with lower accuracy than multi-channel approaches.

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