Nervixxx: An Introduction of Biosignal to Live Video Performance

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1 INTRODUCTION

Nervixxx is a video performance system which introduces biosignals. Specifically, we utilized the EEG (electroencephalogram) which is the most informative of the biosignals, and the EMG (electromyogram) which has a high controllability. Manipulating the tangible objects, users can intuitively mix motion graphics data and apply visual effects. At the same time, users can control the playing speed and the parameter for each visual effect by wearing a wireless EMG sensor on their arm. Also, users' brain waves can be used real-time as a motion graphics data by wearing an EEG sensor. By introducing neural computing and tangible computing to video performance, it is possible to realize the intuitive manipulation of applications and increase the appeal of the actual performance. Moreover, the individuality of each user is reflected to the expression.


Left : user's performance, Right: the body of Nervixxx.

2 Biosignals and Neural Interface

In all of the biosignals that can be obtained with a general neural interface, there are cases in HCI that applies the brain waves (EEG), heart rate (ECG), skin resistance (GSR) and muscle potential (EMG). EEG can be obtained by recording the electrical activity in the brain by placing the electrode on the head. ECG can be obtained by counting the number of heartbeats (the contraction) the heart makes in 1 minute. EMG can be obtained by recording the action potential of the muscle fiber when it is adrenalized. GSR can be obtained by measuring the electrical resistance of the skin when the respiratory glands are active due to a sympathetic stimulation.

When applying these biosignals to HCI, it is necessary to develop a method to match the characteristics of biosignals. For example, EEG, the root of conception, emotion and expression, has a lot of information but lacks intentional control. GSR (Galvanic Skin Response) and ECG (Electrocardiogram) can be measured precisely, but are difficult to control arbitrarily and do not have much real time change. On the other hand, EMG has an arbitrary control and can be controlled real time.

Based on these characteristics, we decided the neural interfaces in Nervixxx. First, we utilized EMG of both arms in order to control the parameters of motion graphics data and visual effect data. EMG is appropriate to control some parameters precisely because people can control their EMG in real time and intuitively. Next, we utilized EEG in order to generate motion graphics data. EEG is the signal that results from conception, emotion, and expression on the users' face, and can create a lot of patterns. Thus, EEG is appropriate as root of motion graphics data.

3 SYSTEM

Nervixxx allows the users to achieve Video performance intuitively by operating tangible objects, which the motion graphics data and the visual effects data are allocated to, on the table-top. The tangible objects for the motion graphics data are called as "material objects" and those for the visual effects data are called as "effect objects". For example, when the users put two material objects on the table, the motion graphics data corresponding to each material object are mixed. Then, when an effect object is put on the table-top with a material object, the visual effect is added to the motion graphics data.

While the users can load and mix the motion graphics data, and adapt the visual effect to them by operating the tangible objects, the users can control some parameters of the motion graphics data and the visual effects data by the data captured from EMG sensors attached to the users' arms. As for the motion graphics data, the playing speed is allocated to the EMG of one arm of the user. As for the visual effect data, some parameters of them are linked to the other arm's EMG. For instance, in the case of 'Kaleido' tag, two parameters - the number of rotations (1.0 – 3.0) and scale (1.0 – 0.3) - are controlled by one arm. These interlock between the EMG and some parameters of them allows the users to make use of the individuality to the performance.

As another use of the users' individuality, Nervixxx visualizes the brainwaves presented by EEG sensors and utilizes it as one part of the motion graphics data. In the case of using EEG, the user has only to wear the EEG sensor on his/her head and to put "brain object" on the table-top. The distribution of the EEG is visualized as linear data. Then, the users can enhance the performance by operating with the EEG combined with some effect objects as same as other material objects.

4 CONCLUSION

In the future, we are planning to have additional biologic sensors and analyze EEG. As for additional biologic sensors, ECG and GSR sensors that are not used at present are planned to be added. By using these, it enables expressions that are based on deep psyche. Also, as for analyzing EEG, it is preferred to be used as advanced information for conception, emotion and expression. In the present system it is only used as an electric signal and as data for wave lines. In order to use advanced information as above, there is a need for pattern analysis to be embedded in the software. Pattern processing of EEG enables to make arbitrary objects in virtual 3D space move directly as seen in existing commercialized controllers. This enables to apply a visual effect just with EEG.