Prediction of Visually Induced Motion Sickness by Artificial Neural Network

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Abstract
It is required socially the viewing environment in safety, because the risk of visually induced motion sickness (VIMS) is increased by developing the image presenting devices. VIMS is a harmful influence to observers, such as pallor, sweating, dizziness, nausea, and eventually vomiting. The present study examined the possibility for the prediction of VIMS with psychological and biological information from Artificial Neural Network (ANN) during viewing the VIMS inducing movies.

We used an LCD projector to back-project a visual stimulus on a 70-inch screen. A visual motion stimulus was the first-person viewpoint movie including a motorbiker drove off-road bike in the wilderness. A movie consisted of a gray scale image for 300-s, before and after a moving image for 120-s. For training ANN, we measured the biological and psychological manifestations. The manifestations are an electrocardiogram using operational bioinstrumentation system and the subjective evaluation of VIMS strength using subjective response box. During a trial, whenever the observers experienced VIMS, they continuously indicated the change in the strength of VIMS with a 5-point scale. To use trained input data for ANN, we calculated Low Frequency (LF), High Frequency (HF) components, and LF/HF ratio from heart rate variability. Six adult males participated in the study and they had normal or corrected to normal visual acuity.

The results showed that the mean absolute percentage error and the mean squared error for 100-s ahead prediction were 0.006 and 6.614, respectively, Thus, we suggested that the VIMS strength could be predicted by ANN.