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Paper Title: Charge density and acceleration perception in vestibular electrical stimulation

Authors: Iori Tsuta and Minh Thu Thi Vo (Tokyo Institute of Technology, Japan); Takashi Shibata (University of Toyama, Japan); Tohru Yagi (Tokyo Institute of Technology, Japan)

Email: tsuta.i.aa@m.titech.ac.jp

Abstract

Although research using VR to present visual information has been conducted in various fields, VR sickness may occur due to a mismatch between the presented visual information and the user's vestibular sensation. Therefore, we propose a wearable vestibular sensory presentation method using vestibular electrical stimulation. In this study, we conducted an experiment to clarify the relationship between the charge density of the electrodes and the acceleration perceived by the subject during vestibular electrical stimulation. The experimental results showed that there was a positive correlation between the electrode charge density and the perceived acceleration, and that the perceived acceleration varied linearly with the electrode charge density in the sitting posture. In the standing posture, the magnitude of the perceived acceleration per 1 C/m² decreased with increasing charge density, indicating that the relationship between the two is nonlinear. In the vestibular sensory presentation using the galvanic vestibular stimulation (GVS) in this study, there was a correspondence between the electrode charge density and the magnitude of perceived acceleration, suggesting the possibility of presenting arbitrary acceleration by controlling the charge density.