

# Shaking The World: Galvanic Vestibular Stimulation As A Novel Sensation Interface

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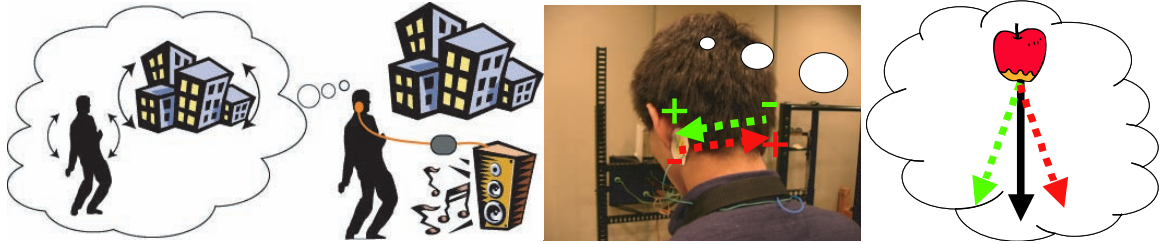


Figure 1: Shaking The World: Galvanic Vestibular Stimulation As A Novel Sensation Interface

## Abstract

We developed a novel sensation interface device using galvanic vestibular stimulation (GVS). GVS alters your balance. Our device can induce vection (virtual sense of acceleration) synchronized with optic flow or musical rhythms. The device can also induce lateral walking towards the anode while human walking.

**Keywords:** Communications Technology, Cognitive Psychology / Perception, Human-Computer Interfaces

## 1 Introduction

In galvanic vestibular stimulation (GVS), the vestibular system is stimulated by a weak current through an electrode placed on the mastoid behind ear. The vestibular system is sensitive to GVS intensity changes and responds by altering the magnitude of the response accordingly. GVS moves your balance toward the anode. This stimulation is has been used as the clinically functional test of vestibular. In this project, we apply GVS as a novel interface for virtual sense of acceleration. GVS can not only induce vection (virtual sense of acceleration) without an expensive mechanical motion platform. It can also make walkers deviate from the normal intended straight-line path. With our device, radio-controlled walking, automatic collision avoidance, and GPS walking navigation are possible. Moreover, the system is particularly useful for interpersonal kinematical sense sharing as an amusement by synchronizing the stimulation to the action. Movies will move you synchronized to the camera action. You and I can move each other with head action. Especially, something we call Rhythm Synchronized Amusement by GVS provides novel and fantastic experiences beyond other conventional media. A slow tempo swings your body. As the tempo of music becomes faster, you will feel as if your visual field and body are shaking synchronously with the rhythm. Let's shake together at our booth!

## 2 Exposition

This device can support non-verbal human behavior directly. Walking guidance and postural support are the most direct uses. Automatic avoidance of collisions or falls, GPS walking navigation, flow control of pedestrians, and so on would be possible. It can also work as a novel interface of kinetic sensation. Rhythm Synchronized Amusement provides an especially fantastic and novel experience. The electrodes are placed behind the ears the same way that headphone pads are form of. It is easy to combine the electrode with headphone pads. Sharing kinetic sensations among people through GVS may be a novel communication.

We developed a novel sensation interface device using GVS. It can be available to support human behavior directly. Direct walking navigation is a novel usage of GVS as a human interface. There is no feeling of enforced action. Because users are navigated very naturally and almost unconsciously, they are not distracted by the stimulation and would be aware that their behavior was an effect of the stimulation after they have done it. We designed this device also to provide a virtual sense of acceleration without an expensive mechanical platform synchronized to the flow of movies. In addition, we found the stimulation synchronized to rhythms of music provides a very fantastic experience as a novel sensation. It is useful also as a novel amusement media. Especially, by the high-frequency rhythmical stimulation of more than 12 Hz, you will feel as if your visual field and body shake tremblingly along with the rhythm. This experience is a novel sensation on human sensory display.

## 3 Conclusion

Until now, GVS has only been used as clinical functional test for the vestibular system. We developed a novel sensation interface using GVS. It can be available to support human behavior directly. Direct walking navigation is a novel usage of GVS as a human interface. We design this device also to work as a display for virtual sense of acceleration without expensive mechanical platform synchronized to the flow of movies. In addition, we found the stimulation synchronized to rhythms of music provides a very fantastic experience as a novel sensation. It is useful also as a novel amusement media.

This device is one of instruments for "Resonant Communication" as all-senses communication. We intend to communicate the non-verbal feeling like kinetic senses, which can not be shared conventionally. We expect that this vection reproduction by GVS will become a standard function of communication like sound reproduction in mobile telephones or portable music players. We also aim to demonstrate and create awareness of the use of GVS as a novel sensation media.

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