

A Study about Emotional Digital Art using Hypersonic Effect

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Abstract. In this paper, we developed emotional digital interactive art using hypersonic effect. We can't feel ultrasound because it is in non-audible range. Ultrasound means a frequency of 22 kHz or more, it is called (High Frequency components) HFCs. In sound of nature, the sound of the waves is used in meditation music. Sound of waves gives stability to people. Because, the sound of the waves includes ultrasound and ultrasound induce alpha waves. Based on the sound of waves, we developed ultrasound similar to the sound of waves in artificially. The audience appreciates sound and image. First is silent, second is the sound of waves and last is the sound of waves + developed ultrasound. The audience appreciates our digital art work with sound and image. Spectators can experience hypersonic effect in last step. Hypersonic effect means increase of alpha wave and decrease of beta waves. Mental states of spectators are changed according to sound, and the results are visualized.

Keywords: ultrasound, digital art, hypersonic effect, mental states

1 Introduction

In this paper, we developed emotional digital interactive art using hypersonic effect. We can't feel ultrasound because it is in non-audible range. Fig 1. is the frequency ranges corresponding to ultrasound. The upper frequency limit in humans (approximately 20 kHz) is due to limitations of the middle ear. Auditory sensation can occur if high-intensity ultrasound is fed directly into the human skull and reaches the cochlea through bone conduction, without passing through the middle ear.[1] Children can hear some high-pitched sounds that older adults cannot hear, because in humans the upper limit pitch of hearing tends to decrease with age.[2]

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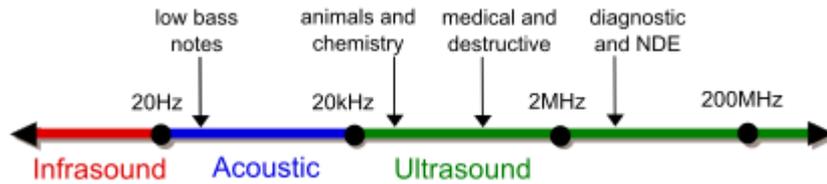


Fig. 1. frequency ranges corresponding to ultrasound

Hypersonic effect means increase of alpha wave and decrease of beta waves. Mental states of spectators are changed according to sound, and the results are visualized. The hypersonic effect is a term coined to describe a phenomenon reported in a controversial scientific study by Tsutomu Oohashi et al.,[3] which supports the idea that although humans cannot consciously hear ultrasound (sounds at frequencies above approximately 20 kHz), the presence or absence of those frequencies has a measurable effect on their physiological and psychological reactions. Attempts to independently reproduce these results have so far been unsuccessful.[4][5]

2 Development

2.1 Ultrasound

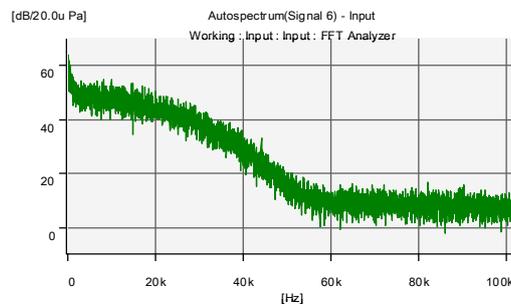


Fig. 2. Characteristics of Frequency of the sound of the waves

We developed ultrasound similar to the sound of waves in artificially. Characteristics of Frequency of the sound of the waves are as Fig 2. The sound of the waves includes ultrasound and ultrasound induces alpha waves. Hypersonic effect means increase of alpha wave and decrease of beta waves. Mental states of spectators are changed according to sound, and the results are visualized.

2.2 EEG

There are Delta waves (frequency 0.5-4Hz), Theta waves (frequency 4-7Hz), Alpha waves (frequency 8-13Hz), Beta waves (frequency 14-30 Hz) and gamma waves (frequency 30Hz and over) as Fig 2.[6] Alpha waves are associated with meditation and relaxation, all types can also be attributed to attention or concentration at slower frequencies.[7] Beta waves are related to concentration. Alpha waves appear when human mind and body are stable. Alpha waves tend to generate a lot in stress-free mental.[8]

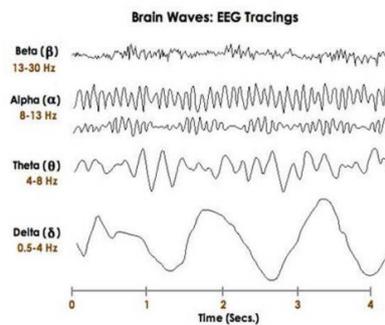


Fig. 2. Waves of Brain waves

2.3 MindSet



Fig. 3. MindSet

We used the MindSet to measure EEG of audience. The MindSet (Figure 3) wireless Bluetooth headset features brainwave-reading and mental-state-translational technology from NeuroSky, Inc., a Silicon Valley company. With earlier NeuroSky partner announcements in the toy (Uncle Milton Force Trainer™, under a Lucas Licensing deal) and video gaming industries (Square Enix Judecca™), the Toshiba-NeuroSky product launch represents the first BCI peripheral directed to mainstream PC users. The measurement hardware is Brain Wave Interface developed by NeuroSky from America. Attention and meditation is distributable by low price device. It is

suitable for unprofessional or professional using dry active sensor. Mindset analyzes and checks brain wave in a real time using Neuro feedback system and there is a technology which helps to change according to the brain wave needs. [9]

2.4 Interaction Image

According to sound, the audience mental states are changed. These change results are visualized

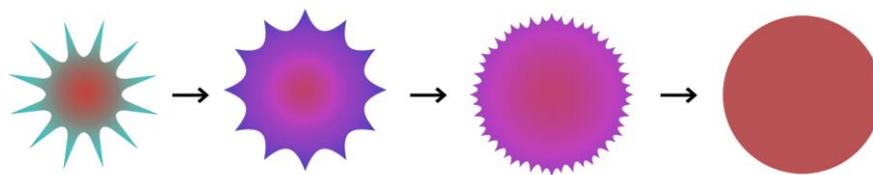


Fig. 4. Visualized image of audiences mental states (uneasiness -> meditation)

3 Result

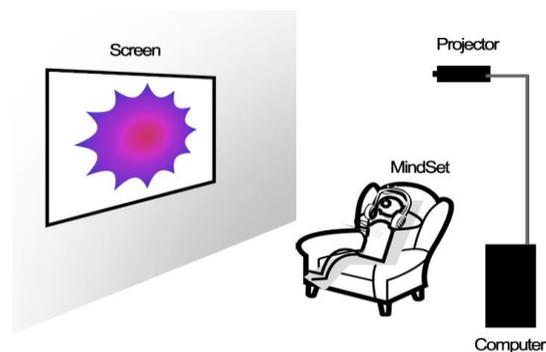


Fig. 5. Art work flow plan

The audience appreciates sound and image at the same time. First is silent, second is the sound of waves and last is the sound of waves + developed ultrasound as Fig 6 The audience appreciates our digital art work with sound and image. Spectators can experience hypersonic effect in last step. This art work system make audience can feel closer to art work using mental state.

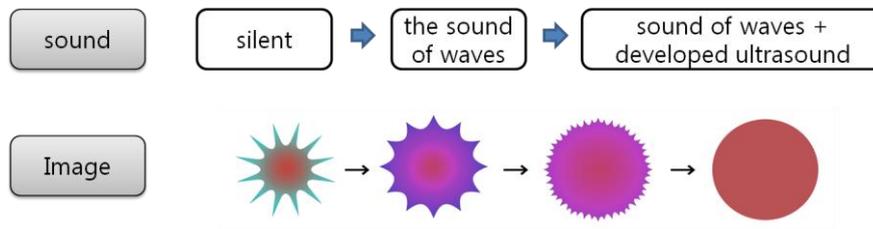


Fig. 6. Process

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