

INTERACTIVE INFRASONIC ENVIRONMENT: A New Type of Sound Installation for Controlling Infrasound

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Abstract: This project proposes a new type of interactive sound instrument for use with audiences in sound installations and musical performances. The Interactive Infrasonic Environment allows users to perceive and experiment with the vibration and acoustic energy produced by infrasound. This article describes three key aspects of infrasonic sound technologies: the artificial generation of infrasound, the human perception of infrasound, and the interactive environment for sound installations and musical performances.

1 Introduction

Our idea for building an interactive system that uses infrasound came from the myth of “Demutspfeife” in which a single tone from an organ brings humility to its listeners. The legend says that these big organ pipes are often used in churches to subdue people. While researching the field of infrasound further myths about the affects of infrasound on humans were found. We focused on the possibility for bringing infrasound to audiences in sound installations and musical performances wherein the users could experiment with infrasound on their own bodies. With this project we attempt to increase acoustic awareness by sensitizing people to very low sound frequencies. This sense is still underdeveloped in our culture.

2 Infrasound

Infrasound is sound that is lower than 20 cycles per second. Hearing does not abruptly stop below 20 Hz. As careful measurements have shown, with high enough sound pressure the ear can register infrasound down to about 1 Hz. [1] Infrasound perceived as a mixture of auditory and tactile sensation at a high threshold level. Infrasound especially affects the cavities of the human body though its affect on air pressure. Different pitches and intensities of infrasound can be perceived as changes in pressure and vibration.

3 Implementation

The Interactive Infrasonic Environment is the first interactive instrument that allows users to generate infrasound while moving around the space. It is an installation that overlaps auditory and tactile stimuli to increase the level of acoustic awareness.

3.1 The Organ Pipe

The installation hardware is based on a 19 ft wooden organ pipe placed in the center of the environment. The pitch of the pipe can be tuned with an adjuster at the end of the organ pipe. The wavelength of the pipe is modified to the characters and sizes of the room in which the installation is located. Adjustments are needed to get satisfying resonates from the specific architecture of the room. The organ pipe can generate sound frequencies down to 15 Hz.

3.2 Sound Generation

The sound of the pipe is produced via the vibration of air in the same way as a flute. The airflow is driven over an open aperture and against a sharp lip called a labium. The airflow begins fluttering and creates high and low pressure waves within the pipe's air column. The low sound wave generated has a frequency between 15 Hz and 17 Hz.

3.3 Video Tracking System

Interaction with an instrument that uses video tracking is a particular case in point, for the nature of engagement is abstract, and as such is based not so much on the physical relationship of the self to the physical space that houses the instrument or interactive installation. [2] The project uses a video camera situated high on a wall, which continuously observes the surroundings of the organ pipe, tracking the position and movement of the users. The software is programmed in Max/MSP and uses the Cyclops object to receive and analyze video input. The program rasterizes the video input and analyses the grayscales of predetermined zones. The users interact by moving around and changing their positions. These actions directly control the wind machine, which is fluently controlling the airflow and thus the volume and pitch of the organ pipe.

References

- [1] Altmann, J. "Acoustic Weapons—A Prospective Assessment: Sources, Propagation, and Effects of Strong Sound" *Cornell University Peace Studies Program*, Dortmund, 2008.
- [2] Paine, G. "Gesture and Musical Interaction: Interactive Engagement Through Dynamic Morphology" *NIME* 2004