

“Vernacular Sound”: System for Soundscaping of Everyday Objects

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Abstract

Creating sound in diverse spaces to generate timbre without limitations and enhance experience in soundscape has been an essential issue for sound artists. We used concept of ‘Vernacular’ as an appropriation for Soundscape of everyday object, allowing listener to compete the current sound consuming environment which eliminates noise during the process of sound recording. We reviewed previous works on soundscape, noise art and object used in sound art to enhance the sound space experience. We designed a system for soundscaping, Vernacular Sound, consists of two main parts: (1) audio effect which computes the sound space of the object and (2) audio visualization which enables interaction between the listener and the sound space via Kinect. With ‘Vernacular Sound’ system, our purpose is to provide new experience of listening to sound using everyday objects.

Introduction

“Vernacular” in art refers to the objects shaped by ordinary people in unselfconscious and uninhibited, out of the elements of their environment. [1] In photography Geoffrey Batchen states that the significance of vernacular photography is to explore the artistic qualities of vernacular objects, granting them the same intellectual and aesthetic potential. [2]

In this paper, the word “vernacular” is introduced in the soundscape system of a collection of everyday objects: Vernacular Sound. The aim of this work is to provide participants with a new method to manipulate sound while producing it with everyday objects, leading enhanced experience in both affected sound and interactive audio visualization.

Vernacular Sound is capable of collecting the sound space characteristics of an object; these characteristics and materials of the object can be used to construct listening rooms. The idea of studying the internal structure of everyday objects for acoustic space simulation was derived from noise artists.

In the 21st century, sounds that are frequently heard in daily life generally belong to the category of “music”; these are transmitted sounds, tuned and modified. These

sounds are played through various types of speakers via internet streaming sites, radios, smartphones, and televisions. Listeners are accustomed to typical sound traits from these media, which place importance on the analytic clarity, immediacy, and tactile proximity of sound. [3] Douglas Kahn claims that acoustics and western art music were both used to distinguish between music and noise. [4] The current sound consuming environment concentrate on diminishing noise during the process of sound recording. In such conditions, the sound space is perceived mainly as a reverberation set-up for listening to music, which compels the listener to develop a passive attitude towards the process of generating sound. There has been an several approaches to extent the passive attitude toward this noise filtered music among sound artists.

Previous Works

Environment and Sound

In his “1960 Lecture,” La Monte Young proclaimed that “getting inside of sound to some extent so that we can experience another world” is the ultimate objective of sound. [5] Similarly, R. Murray Schafer’s World Soundscape Project (WSP) in the late 1960s is a “soundscape composition,” which creates an environment of sound as a composition tool for music without elimination of noise. Since time immemorial, noise and environment in space have shown potential in creating sound. We found out that at the sound production stage, sound originating from noise and environmental characteristics are separated from music to make the music more distinct and refined. However, by using everyday objects, unusual surroundings can be fabricated, which enhance the experience of the participants in listening to sound.

Milestones of Noise-Art

Incorporating noise in sound art has been of significant importance in music. Italian futurist Luigi Russolo overcame the limitations of pure sound and composed symphonies with an infinite variety of noise-sounds. [6] Experimental sound artwork focusing on noise is also found in John Cage's Fontana Mix, which contains eclectic blends of noise sounds such as outdoor sound, recorded music, and electronic effects, which brings together casual everyday life noise to compose music. [7] In Variations II, Cage listed six lines for measuring sound components using the following variables: frequency, duration, timbre, amplitude, and the point of occurrence within the whole time span of the performance and overall structure of the event (such as number of tones). Here, the usual form of western music: melody, harmony, rhythm, phrasing and structure is replaced. From his aesthetic point of view, unintended sounds are converted into music. His composition 4'33" involves noise as a sound elaborated through compositional, auditive, and physical means associated with music by integrating noise with music. [8] The methodology of producing sound affects the sound space and the original sound characteristics.

Sound Art of Everyday Object

There are many different approaches to sound art using noise and mediums created with everyday objects. For their implementation, the intent was to use the most evident differences in certain sets of spatial traits of an object. This led us to use a bottle to produce Vernacular Sound. During the installation of the sound artwork, the bottle was used repeatedly as a sound box. All the bottles used in the artwork had different shapes and internal structures. The related artworks can be divided into two main branches: First, those that use the physical characteristics of the object to produce the unique sound triggered by wind or living beings; second, those that trigger a sound by a visitor's interaction and movements detected by a sensor.

Chelva Ferro's "Acusma" is an art installation that uses the internal structure of vessels with varying internal structures. Loudspeakers playing different recorded voices were placed inside ceramic vases. [9] On the other hand, Chen Sai Hua Kuan's installation "Bottles and Fans, 2010" uses remote controlled fans to create sound by blowing air over water-filled bottles, and the sound changes due to evaporation of water. [10] In Kadet Kuhne's interactive sound installation, a sculpture is designed to create reflections of its environment as well as resonant sound. [11] It is similar to BELL-WETHER, an interactive installation built from recycled bottles to produce natural sounds such as those produced by living beings, wind. [12] Another interactive object-based sound installation is the "Curiosity cloud" at mischer'traxler studio. It consists of interactive sensors to make sound art

using 264 blown-glass bulbs. A buzzing sound is emitted from the individual glass bulbs when a visitor moves through the work, which results in audio visualization of the noise. [13] The above mentioned artworks used actual objects to create a sound space and showed the actual origin of sound. A sensible experience of object's sound gives listeners an enhanced experience in listening to sound. Inspired by the bottle as a medium for creation of new sound scape above, With the Vernacular Sound system, we used bottle as a case example.

Our System: Vernacular Sound

Concept

The Vernacular Sound system consists of two main parts: an anechoic box for noise and visualization of the reverberation traits of individual objects. This work does not focus on the actual sound played but to experience the reverberation. There is no limitation in the selection of sound; the sound can be a recorded file or a real-time recording. For this study, we collected bottles of varying shapes and internal structures.

The anechoic box is used to compute the traits of the sound space of an object that produces the noise. The computed characteristics of each object reveal its acoustic properties. Our aim is to preserve those original properties.

Installation

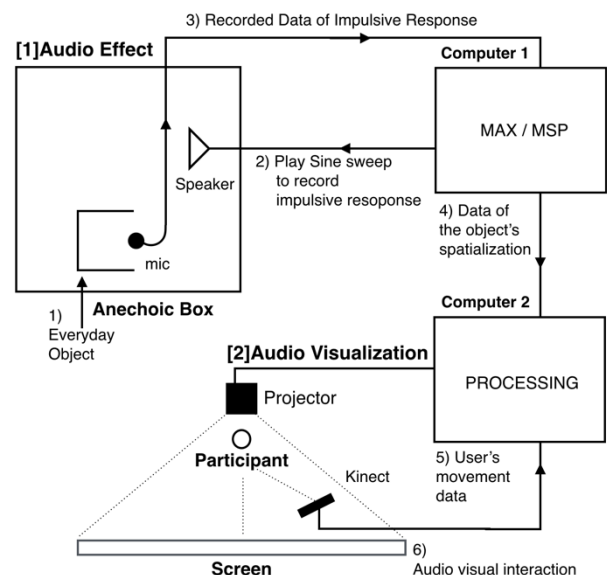


Fig. 1. *Vernacular Sound System*, 2015, All right reserved.

Installation of our work involves two techniques: Audio effect and audio visualization (see fig. 1). A hand-made anechoic box and a mic/speaker set collect sound space characteristics of everyday objects by playing a sine

sweep inside the box (see fig. 2). An object is placed in the anechoic box containing one mic to collect the sound reverbed in the object, while four speakers play the sound to compute the sound space of the object using MAX/MSP. The speaker and the mic are connected to a computer to transmit and receive the signal. The computer is connected to another computer though the same IP address for visualization. The computed sound space characteristics—amplitude reverberation, panning, velocity, and degree of difference between original sound data are visualized. We used Kinect1 to track the user's hand position (see fig. 3). Through tracking of the hand movements, interactive sound space audio visualizations provide a sense of reality. Additionally, we used headphones and a projector as an output device for each sound and visual part. The usage of this system is followed. A participant brings their own object, then put it inside the anechoic box. With mic and speaker, the system captures characteristics of the object. The participant listens the audio-effected music with headphones. Furthermore, the traits of the collected sound are projected on a screen synchronized with participant's hand movements in real time.

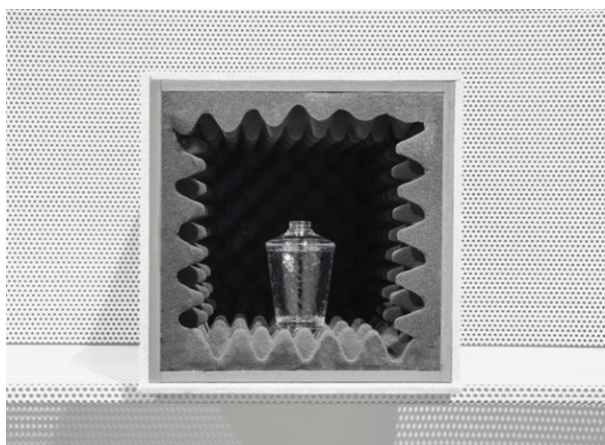


Fig. 2. *Anechoic box*, 2015, wood box with sound insulation and absorption materials, 36 x 36 x 36 cm, © Joo Young Oh. Photo

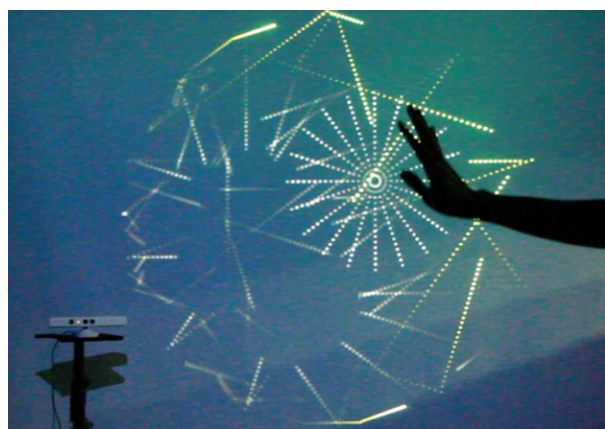


Fig. 3. *Vernacular Sound*, 2015, interactive audio visualization installation, 2656 x 1494 mm, © Joo Young Oh. Photo

Audio Effect

In sound space computation, our aim is to explore the sound environment in a novel manner using the physics of sound, since most of the music is recorded in an anechoic room that lacks sound space characteristics. By collecting sound characteristics of ordinary objects, each individual sound space forms a concept of vernacular of the sound. A set of ordinary objects have different internal structures to create a variant sound space. In this sound space, the participants feel as if they are listening to music from the object that they selected. This provides them with a new experience by overcoming existing circumstance of listening.

We used convolution reverb for processing by collecting the impulse response from the anechoic box. The purpose of the anechoic box is to function as an anechoic room, to compute the internal structure of the object that causes the noise and distortion during the sound play. Simultaneously, the anechoic box prevents other sounds from the surroundings from affecting the sound from the selected object.

The anechoic box is a hand-made cube used to block the outside noise and compute the intentional noise produced in an object inside it. Once the participant places the object inside the box and starts the process, each speaker in the box produces a sine sweep sound sequentially and the mic in the object records it. With the recorded data, we calculated the impulse responses by using the Huddersfield Immersive Sound System (HISS) Tools. [14] Each impulse response represents the individual characteristics of sound produced in four different directions. We calculated a single representative impulse response by normalizing the four impulse responses.

As a result, our system provides two types of sound. One is the background sound processed by the representative impulse response, and the other is the sound collected by the participant to obtain an immersive experience.

Audio Visualization

Vernacular Sound is visualized as an image where the sound particles radiate from the center to the surroundings whenever a sound reaches the participant's ears. The sound space in this work is a closed circular space with mirrors that reflect the shapes of the sound particles in the object. In other words, the circular space puts maximum emphasis on the reverbed noise. If sound collides with an invisible wall in the space, it is reflected and follows the law of reflection: the angle of incidence is the same as the angle of reflection. New sound particles are generated every second and are gradually absorbed into the space over time.

There are two sound sources to visualize: yellow particles that represent the reverb effect, following the panning sound; and white particles that represent noise with the spatial effect, which represents the sound that the

participant has recorded and played on the Vernacular Sound system. There are no limitations in recording sound. Any type of sound, music or noise, can be played on the Vernacular Sound system. The particles radially spread out from the participant's hand. The size of the particle is determined by the sound amplitude, while the velocity of the particle is determined by the difference between the original and the effected sound degree computed using MAX/MSP and sent for processing. The difference in the values between the original and recorded sine sweeps causes a change in the velocity of the particle. The higher the degree of difference, the higher the velocity of the particle. The variation in sound is shown in the projection with its unique audio visualization due to the spatial characteristics of the object.

Case Example : Bottle

As mentioned in the 'sound art of Everyday object', bottles were used to make the soundscape. We used bottle as case example for the Everyday objects.

Visitors were asked to bring their own bottles for a real-time computation of sound space of the internal structures of the bottles. With each bottle, the sound space could be experienced as a new environment. Participating in Vernacular Sound is part of a performance on the use of object noise to produce art.

Discussions

Vernacular Sound turns everyday objects into instrumental sound boxes. The properties of the objects, such as shape or material, lead to their unique sound structures. This means that each object serves as an environment by retaining its originality. Unlike the music recorded in an anechoic room, the sound recorded in the object placed in an anechoic box is intentionally distorted; noise is deliberately captured through reverberation of space. With computation of the traits of the object, the sound is incorporated into the objecthood of the object producing the noise.

By using everyday objects, and introducing a system for sound space computation, this work will provide a new method of perceiving and experiencing sound. The physical variations of objects can be preserved as a set of Vernacular Sound that varies in individual objects. Moreover, taking photographs of individual objects to preserve their form and traits can be connected to vernacular photography, thereby defining our system: Vernacular Sound.

Future Work

This work can be improved in two aspects: diverse and immersive experience. Previous studies focus on readily available objects. However, to enhance the Vernacular Sound experience, individuals can design their own objects, retaining their fundamental function while altering their shape or material without limitations. The objects can be designed using computational design programs and printed with a 3D printer or simulated using a computer. This enables the participants to encounter sound space with infinite variations. Visualization of sound space can be extended onto three walls with more than one projector or into a virtual space with a head-mounted display.

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