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# ON "WORLD CONSTRUCTION", VARIATION "DUODDARIS"

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**THOMAS GRILL**

Austrian Research Institute for Artificial Intelligence (OFAI)  
Vienna, Austria

University of Applied Arts  
Vienna, Austria

gr@grrrr.org

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The title of this contribution refers to a series of four sound-based artistic interventions realized in the crude landscape of the Finnish tundra. By analyzing the natural soundscape, digitally recreating constitutive elements thereof, and projecting those back into the environment using portable loudspeakers, a tilt of the natural setting was created, potentially altering and elevating the attendees' experience of the scenery. The artistic concept and the practical approach as well as the diverse technologies used for the development and realization of the pieces are explained in detail.

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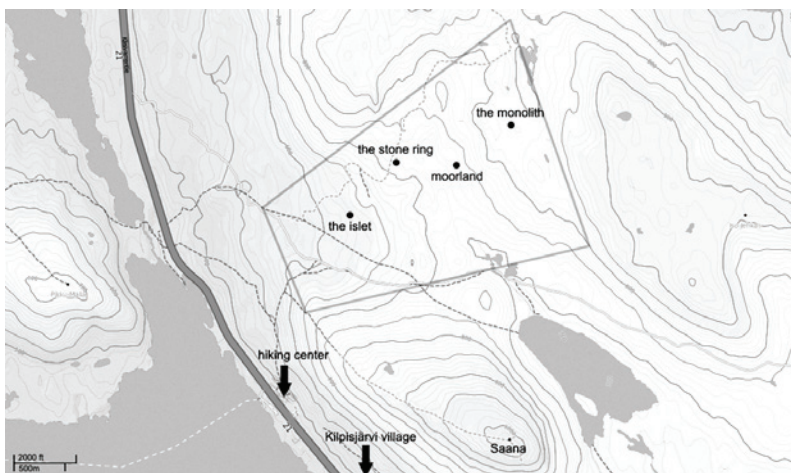


## 1. INTRODUCTION

The Finnish Bioart Society<sup>1</sup> organizes the Ars Bioarctica Residency Program together with the Kilpisjärvi Biological Station of the University of Helsinki,<sup>2</sup> situated in the northwesternmost part of Finland. I was invited to conduct my proposed project of artistic and scientific research for two weeks in July 2013. The residency guesthouse is located by the lake, a few kilometers north of the village, providing convenient access to the region north of the Saana fell up to the border to Norway, spanning an area of about 1.5×2 km (see the map in Fig. 1). Although the predominant tundra landscape looks barren on map scale, there is a fascinating diversity and richness of smaller scale features, moors, cataracts, lakes, etc., inhabited by specific animals and plants, such as birds like Plovers and the Lapland Longspur, different types of mosquitos, and various species of flowers, most noticeable bellflowers and cotton grass. Any such area is also distinguished by a characteristic soundscape – a specific combination of bird vocalizations, insect buzzing, and noises caused by water and wind.

The original residency agenda was formulated as an ‘Inquiry into textural structures of nature by means of sound’.<sup>3</sup> During the duration of the stay this intended research stemming from previous publications on textural and environmental sounds (Grill 2010, Grill *et al* 2011, Grill and Flexer 2012) became more and more shifted towards a profound occupation with the analysis of listening situations in the field and adequate interaction with the various habitats’ soundscapes.

**Fig. 1** Map of focus region north of the village of Kilpisjärvi, Finland along with marks for the sites of the artistic interventions. Map data courtesy of OpenStreetMap contributors, licensed CC BY-SA.



<sup>1</sup> <http://bioartsociety.fi/1-2>, accessed 2014 04 16

<sup>2</sup> <http://www.helsinki.fi/kilpis/english>, accessed 2014 04 16

<sup>3</sup> See the project page at [http://grrrr.org/arts/projects/ars\\_bioarctica-2013](http://grrrr.org/arts/projects/ars_bioarctica-2013), accessed 2014 04 16

My ongoing series of sound compositions and installations, *world construction*,<sup>4</sup> is an expression of my appreciation of the sounding world. Orbiting around field recordings, their analysis, deconstruction, and later reconstruction and staging, the series provides the conceptual framing to work on-site, to sample, take apart, derive and re-implant sounds of interest. Its variation *duoddaris*,<sup>5</sup> to be described in the following, builds on this fundament to frame four characteristic spots in the tundra, bringing forward specific aspects of their sonic properties, and in each case, creating a well-defined listening space directly on-site. It is an attempt to feature *concrete*<sup>6</sup> and synthetically derived sound where it is alive and in proper context – not in a concert venue, not in a white cube gallery, or any other *general* site, but at a very *concrete* place, and put it right among all the related and corresponding sounds and other sensuous impressions that make up a truly holistic experience – including vision, touch and scent.

The structure of this contribution is as follows: After referring to conceptual underpinnings and artistic precursors of the project at hand in Section 2, I outline the technical and artistic methods employed in Section 3. Section 4 describes in short the four artistic interventions developed and carried out, followed by a conclusion and outlook in Section 5.

## 2. RELATED WORK

A number of my artistic projects to date, and particularly those of the *world construction* series, have dealt explicitly with the notion and phenomenon of the *soundscape*, a term devised by Raymond Murray Schafer (Schafer 1977), which relates to an environment created by sounds. Schafer also created the term *soundmark*, derived from *landmark*, referring to sounds that are constitutive for an area. Sounds that are in the foreground, therefore listened to consciously, he termed *sound signals*. The identification and analysis of those key sounds can be seen at the core of the project at hand (cf. also the *hearing perspective* of Sam Auinger and Bruce Odland<sup>7</sup>). Clearly, and proven in practice, surveying the diverse soundscapes of a complex environment and discovering constitutive elements requires a considerable amount of exploration, and associates the act of *walking* to an “active engagement with [the] environment” (cf. Harris 2011,

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<sup>4</sup> <http://grrrr.org/arts/projects/wcon>, accessed 2014 04 1

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<sup>5</sup> Northern Sami language for ‘in the (arctic) mountains’, Finnish ‘tuntur-issa’

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<sup>6</sup> That is, recorded sound (cf. Schaefer 1952)

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<sup>7</sup> <http://www.o-a.info/background/hearperspec.htm>, accessed 2014 04 16

Section 3.4). This is true not only for the artist, but equally so for the audience, forced to hike out to remote spots, to take part in the interventions. In Schafer's long-term opera project *Patria*, the epilog *And Wolf Shall Inherit the Moon* "takes the form of an elaborate ritual performance in wilderness forest, lasts for eight days. The same participants return each year to camp in eight clans at four campsites,"<sup>8</sup> thus requiring a real commitment of the audience. This collective experience also "represents a serious attempt at a renewal of the social function of music [...]" (Dunn 2008), as also exemplified by Hildegard Westerkamps *soundwalking* practice (Westerkamp 1974), concerted "excursion[s] whose main purpose is listening to the environment," just as it is. The headphone-based *audio walks* of Janet Cardiff on the other hand, examine how the perception of the reality is affected when the character of characteristic sounds is manipulated and changed.<sup>9</sup> The compositions *Five Micro-Worlds* of David Dunn deal with microscopic sounds that are not audible to humans without the aid of special recording devices. Dunn sees his role as a composer as to "bring forth the sonic presence of these worlds for human contemplation [...]" because "our modern 20<sup>th</sup>-century culture [...] tends to privilege our understanding of reality through our sense of sight." The addressed sensitivity regarding the constitution of the sonic environment is in the focus of the discipline of *acoustic ecology* promoted by the *World Soundscape Project*.<sup>10</sup>

The project at hand consults concepts and technologies from a few works I have realized in the past: The interactive audiovisual installation *1/space* (Grill *et al* 2011) employs texture analysis techniques in both the visual and sonic domain to create an immersive artificial environment in the presentation space from image and sound snippets picked up at a remote place. *Mimikry*,<sup>11</sup> on the other hand, uses sound and image processing to let technology blend seamlessly (as much as possible) into the surrounding scenery. The electroacoustic composition *Points of View*,<sup>12</sup> produced for a 3D surround sound system creates an immersive sound environment by using a variety of mostly textural concrete sounds, and counterfeits thereof, generated by audio synthesis techniques.

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<sup>8</sup> <http://www.patria.org/pdp/ORDER/OVERVIEW.HTM>, accessed 2014 04 16

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<sup>9</sup> See concept for part 1 of the 1997 Münster walk at [http://www.lwl.org/skulptur-projekte-download/muenster/97/cardif/k\\_01.htm](http://www.lwl.org/skulptur-projekte-download/muenster/97/cardif/k_01.htm), 2014 04 16

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<sup>10</sup> <http://www.sfu.ca/~truax/wsp.html>, accessed 2014 04 16

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<sup>11</sup> <http://grrrr.org/arts/projects/mimikry>, accessed 2014 04 16

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<sup>12</sup> [http://grrrr.org/arts/projects/points\\_of\\_view](http://grrrr.org/arts/projects/points_of_view), accessed 2014 04 16

### 3. METHOD

The discussed artwork intervenes in chosen habitats' soundscapes. The initial hypothesis was that the change of a key sonic constituent – even if subtle – could bring about an amplified experience of a listener with the site, with what is happening in and to its soundscape, probably detecting some subtleties of the soundscape for the first time. This was the primary motivation of this work, and of the overarching series *world construction*.

The chosen process was to first analyze the specific *voice* of a site and identify the most salient contribution(s), be it of animal, herbal or geologic origin. A recreation and interpretation thereof was produced by use of software-based audio synthesis, to be later reintroduced to the same site, using portable loudspeakers. Note, that there was no actual stipulated *workflow* in the first place, since my way of working with media is characterized by a perpetual moving to and fro between concept, sketch board and various stages of realization, until finally arriving at something presentable which will at later stages again be revised or recycled – inherently differing to what is reported here after the fact.

#### 3.1. SAMPLING

The original intent of the residency was to record and analyze environmental sounds, much as a biologist or geologist would sample the nature she or he researches. But more than ever before when prospecting for sounds, it quickly came to my mind that those sonic expressions of nature I discovered are really only kept alive and meaningful in the context of their habitat. The noises of the Tundra are very subtle. Recordings thereof mean almost nothing without an idea of the spatial relationships of the scene, or without some knowledge of how those sounding elements appear altogether. Accordingly, I changed my intentions so that the sampling process turned more into surveying than harvesting the sounds, into apprehending the characteristics of the various soundscapes and capturing sounds only for their later recreation, not for verbatim use. Consequently, I chose to use a portable audio recorder (Sony PCM-D50), relying on its built-in electret microphones in A-B configuration and a standard wind protection. Documentation with a digital camera with automatic geo-tagging and taking additional notes about the configuration of the sites proved

indispensable for not losing track of the amassment of material accumulating in the course of three days of intense fieldwork. I recorded several hours of audio material at about 15 different spots.

### 3.2. SURVEYING AND ANALYZING

Surveying hour-long audio recordings by listening is a tiresome affair. There do, however, exist tools, which can, e.g., automatically reveal the structure of the audio or provide visual representations at various time scales. I regularly use techniques of my own development (originally for the annotation of electroacoustic music, published in Klien *et al* 2012): One is a segmentation technique based on textural properties of sound – timbre and amplitude fluctuations. Based on the self-similarity of short audio segments, the algorithm identifies the extent of homogeneous parts, points of change and parts that are similar to each other – information that can be used to efficiently browse through a long recording. The second technique visualizes the distribution of textural characteristics within a piece of audio by *clustering* short segments in two-dimensional space, using additional color-coding for the time dimension. This representation allows identifying whether sounds occur throughout a recording, or only at specific points in time, and it can be seen how they relate to each other (verbatim copies, variations, or something completely different). For studying various standard low or high-level features of the audio, the *Sonic Visualiser* software comes in handy as a very versatile software tool.

### 3.3. MODELING

As suggested by the concept, the recreation of *key sounds* – constitutive for soundscapes at the selected sites – is at the core of this project. The elemental forces of Lapland's land- and soundscape are water, wind, birds and mosquitos (apart from reindeer and humans which have not been considered) in various formings. For such general and widespread sound characters a large number of recipes can be found in the web, employing two fundamentally different approaches: A phenomenological one, trying to imitate the quality of the emerging sound using standard sound effects e.g. on typical DAW systems, or, the use of *physical modeling* techniques that implement the underlying mechanics of physical sound production,

typically requiring programmable audio synthesis systems like *Pure Data*, *Max*, or *Supercollider*. Both approaches have their merits, much depending on the actual target sound: the former approach is usually easier to implement with just a few influencing parameters, provided that the sound character can be met at all. The latter approach requires in-depth understanding of the physics involved, but can result in much more complex and multifaceted sonic results. For the project at hand both approaches were used, see Section 4 for respective details. In every case, an existing recipe was adopted, but then extended and modified for the use case. Physical modeling as used for water and bird sounds relied on code conceived and exemplarily conveyed by Andy Farnell (Farnell 2010). These synthesis algorithms were implemented as monophonic voices into the Pure Data-based framework of my *Universal Polyphonic Player*<sup>13</sup> software. This system allows the convenient generation and control of simultaneous voice events as well as the spatialization to multi-channel (in this case four-channel) speaker setups.

### 3.4. STAGING

The importance of the presentation setting for loudspeaker-based sound art is considerable. For the project at hand, inevitable technology for the reproduction of digital sounds is in stark contrast to the largely untouched natural environment. I used four portable loudspeakers with built-in MP3 players (see Figure 2) that I built for a previous instance of the *world construction* series, variation *corner passing*.<sup>14</sup>

**Fig. 2** Portable loudspeaker, closed (l.h.s.), and opened (r.h.s.), showing the transducer, amplifier, MP3 player, 9V battery, and stabilizing and damping materials.



Since these loudspeakers can blend very well into the landscape and don't need any extra audio or power cabling, they allow spanning a listening space of variable size which is hardly recognizable by anything else than the broadcasted sound. Each of the loudspeaker

<sup>13</sup> <http://grrrr.org/research/software/upp>, accessed 2014 04 16

<sup>14</sup> <http://grrrr.org/arts/projects/wcon/wcon-1>, accessed 2014 04 16

boxes contains a Roadstar MPS 020 MP3 player with a rechargeable lithium polymer battery, connected to a Kemo M031N 3.5 Watt integrated amplifier module, powered by a 9-Volt battery block. The transducers used are Visaton FRS 8 M broadband speakers, capable of delivering considerable loudness for frequencies above about 120 Hertz. Both the MP3 player's battery and a 9-Volt alkaline block last for about 15 hours of playing time at practical volume. The components are encased in 8×8×8 cm cardboard boxes using some foam stuffing to limit unwanted rattling noises at bass frequencies. The audio material was also high-pass filtered at the low corner frequency to avoid unnecessary vibration at inaudible frequencies.

In my personal artistic practice concealing technology responsible for sound presentation is not a general strategy. In fact, the loudspeaker cubes can take on various roles, e.g. also as hand-held personal audio devices, much dependent on the space and performance context. For variation *duoddaris*, the creation of an unobstructed intimate atmosphere was a goal, with a spotlight on the available unprocessed and processed natural sounds. The loudspeakers serve for framing the scenery in space and time within a quasi-boundless nature, spanning an invisible stage for the augmented soundscape.

#### 4. IMPLEMENTATION

The primary dissemination of the artistic residency was in the form of four half-hour long sound interventions on the weekend of July 27<sup>th</sup> and 28<sup>th</sup> 2013. The scheduled times were determined so as to match the daytime of the scenery as originally captured, with the first event set for 11:30pm until midnight. Unfortunately, the weather throughout most of the residency was fairly unpredictable. Since fairly dry weather was a requirement for the operation of the loudspeaker boxes, the first event had to be postponed for two days, and one event had to be cancelled.

##### 4.1. "FLOWING" AT THE "MONOLITH", ORIGINALLY SCHEDULED FOR JULY 27 2013, 11:30PM, POSTPONED TO JULY 29, SAME TIME

The *monolith* is a rock cube of about 30 cm side length placed solitarily on a larger slab of rock, located at an exposed plateau at the position 69.0715° N, 20.8568° E. At midnight, this is quite a spectacular site, with low reddish light from the midnight sun and streams of low



clouds passing through, often partially covering the site. The chosen title *flowing* refers to that strong experience of being in the midst of a horizontal reddish gray light and airflow. The artistic intervention at this spot should correspond to the wind sounds occurring at this exposed position and also match the strength of the natural signs. I opted for a fixed composition of interwoven streams of noise, over the thirty minutes duration developing from a contained beginning to a more and more extroverted and voluminous irradiation of noise. Just as freestanding boulders have forever been used as orientation signs by the nomadic reindeer herders, the noise beacon was meant to fulfill a similar broadcast function. The composition was prepared using standard editing software, with parameter automation for time-dependent attenuation, filtering, and positioning in the surround field, all applied to synthetic white noise. The color of the noise streams and their musical timing regarding the development and spatial motion was derived from the initial field sampling.

#### 4.2. SOURCING AT THE STONE RING, JULY 28 2013, 9AM

The *stone ring* is a ring-shaped assembly of boulders with a grass patch at its center (see Figure 3, l.h.s.), found at the foot of a terrace, located at 69.0682° N, 20.8283° E. Typically, such boulder fields are interspersed with small – and often invisible – streams of water, causing a resonant gurgling and dripping in the cavities in between the rocks. The stone ring is sourced by a small greenish spring, but the little water it provides immediately drains away in the periphery of the boulder assembly, not to be seen or heard again. My intervention *sourcing* gives a voice to the waters present underneath this particular stone ring, paying tribute to the omnipresent geological and biological activity that is often subtle and comes to appearance only through particular attention. The stage for the sounds is below the surface, spread among the numerous voids, the audience space situated above the ring. The loudspeakers were placed more or less invisibly in the available holes so that the sound would resonate in the cavities, emerging to the surface in a diffuse manner. Since the imagined waters were supposed to be scarce, I opted for a sonification resembling drops rather than flowing water. Starting out with Farnell's tutorial on water bubbles,<sup>15</sup> I found that – guided by the sounds sam-

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<sup>15</sup> [http://www.obiwannabe.co.uk/tutorials/html/tutorial\\_bubbles.html](http://www.obiwannabe.co.uk/tutorials/html/tutorial_bubbles.html), accessed 2014 04 16

pled at similar sites nearby – a constant pitch (just a sine tone, modulated by a logarithmic attack-decay volume envelope) works equally well, if the individual droplets are assigned slightly varying pitches. Each of the represented water sources (embodied by the four individual loudspeakers) was given an individual character, realized using different parameters for Gaussian distributions of pitch and volume, respectively. For the rate of droplets Farnell's method was kept: a simple algorithm causes the naturalistic formation of droplet groups at different repetition rates.

**Fig. 3** The *stone ring* (l.h.s.) and loudspeaker placed between the boulders (r.h.s.).



#### 4.3. "FORMATION FLIGHT" AT THE "ISLET", JULY 28 2013, 3:30PM

A warm and windless humid afternoon near some calm water is usually the best constellation for the experience of mosquitos, an important and importunate ingredient of the tundra fauna and soundscape. The *islet*, discovered at coordinates 69.0633° N, 20.8172° E, an oval-shaped swampy grass patch enclosed by two branches of a small stream, offers near to perfect mosquito dwelling conditions. The intervention *formation flight* seeks to embrace nature and all its expressions in its entirety, also including seemingly troublesome components. It is conceived as a composed chant of many contributing voices, in the course of its half-hour duration transforming mosquitos' characteristic high-pitched buzz sounds – by many perceived as pestering – into an enjoyable, almost jubilant choir, towards the end returning back to their authentic tune. This piece is also a reference to the practice of *joiking*, a traditional Sami form of singing, often dedicated and directed to a landscape or animals living therein. The underlying artificial buzz sounds were produced by adopting a recipe<sup>16</sup> dependent on *Ableton Live* software, involving a filtered and modulated saw tooth-type wave-

<sup>16</sup> <http://www.youtube.com/watch?v=6mSFHoHJJ3Q>, accessed 2014 04 16

form generator. Again, different voice characters were defined, representing individual insects. This intervention was implemented using quadrophonic loudspeaker positioning, with insect flight trajectories crossing and orbiting around the islet.

#### 4.4. "LOCALIZING/VOCALIZING" AT "MOORLAND" , INITIALLY SCHEDULED FOR JULY 28 2013 , 7PM , FINALLY CANCELLED BECAUSE OF HOSTILE WEATHER CONDITIONS

The fourth intervention was dedicated to the *European Golden Plover* (*Pluvialis apricaria*), a middle-sized bird breeding in dry open areas of moorland, such as at 69.0680° N, 20.8434° E. Their call is a very typical, simple and hardly modulated tone produced at regular intervals, audible from large distances.<sup>17</sup> The birds seem very curious, keeping a certain distance by moving on the ground, always observant and signaling their presence. Two or three birds could often be witnessed in the same area, with their calls – at slightly different pitches – superposing to a slow multi-rhythmic pattern. The concept of this intervention dealt with the expanse of the landscape, with life forms claiming their specific share, and negotiating with their cohabitants, focusing on the plover birds. Their call was cloned using a modified general recipe for bird vocalizations.<sup>18</sup> The algorithm is a model of a bird's syrinx, involving three oscillators influencing each other and a couple of other parameters controlling the audio synthesis. Several presets are provided which can serve as a starting point for matching the resulting synthetic calls to the recorded ones. I arrived at calls (again slightly different variations for the four loudspeakers) that feature the characteristic properties of the plovers' calls, while lacking some detail (e.g. the sharp onset transient of some birds' calls) and thus being recognizable as artificial. Human attendees of the intervention would take on the role of a bird by holding one of the loudspeakers, rambling in the wide-stretched moorland area and claiming their lot by emitting characteristic calls. This strategy of distributed roles, with participants spanning a large space by broadcasting audio signals to each other was already applied before in *world construction*, *variation corner passing*. I have created an artistic rendering illustrating this site's soundscape for presentation purposes, blending original recordings and synthetic complements.<sup>19</sup>

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<sup>17</sup> See <http://www.xeno-canto.org/species/Pluvialis-apricaria>, accessed 2014 04 16

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<sup>18</sup> [http://grrrr.org/arts/projects/points\\_of\\_view](http://grrrr.org/arts/projects/points_of_view), accessed 2014 04 16

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<sup>19</sup> [https://soundcloud.com/grrrr\\_org/in-the-field](https://soundcloud.com/grrrr_org/in-the-field), accessed 2014 04 16

## 5. CONCLUSION AND OUTLOOK

This contribution presented both the artistic motives as well as the technical implementation of the four sound interventions under the title *world construction*, variation *duoddaris*. The concept supporting this series of interventions translates and liberates the experience of sound and its context from an artificial, fixed performance space to primordial sites in a wide open and largely untouched landscape. The presented media is the already present natural soundscape, but slightly tilted and shifted through a conditioning of its constitutive elements, potentially triggering an altered perception of the natural scenery. On a meta-level, the artwork draws on the widespread desire for a “reaffirmation of our connectedness to wilderness” (cf. Dunn 1988), but it does so in a radically different way than, e.g., a *Discovery Channel* TV format, by demanding immediate participation and immersion into the media and its origin, both for the audience and the producer. Other aspects relating to a post-TV notion are, e.g., the integration of different media data (sound, image, geolocation) into the production, the anchoring of synthetic media content in a semantically charged natural environment, and a strong personalization due to audience participation.

The series *world construction* will be continued with more variations on the basis of the described conceptual framework. Variation *Empty Vessel*,<sup>20</sup> concerned with the soundscape of an urban neighborhood resonating in a large industrial hall, was presented as a multi-channel sound installation at *The May Space* in New Orleans, USA, from October 11th to November 23<sup>rd</sup>, 2013.

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<sup>20</sup> <http://grrrr.org/arts/projects/wcon/wcon-3>, accessed 2014 04 16

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