

Real-Time Composition of Sound Environments

Georgia Spiropoulos

IRCAM

georgia.spiropoulos@ircam.fr

ABSTRACT

In this paper I will present some aesthetic and technical aspects of my work related to real-time composition of sound environments (soundscapes and vocalscapes) through two recent works: “Geografia Sonora”, a sound and video installation on the theme of the Mediterranean sea, a navigation in an archipelago of “sound islands” of singing/speaking voices, sound signals, natural and mechanical sounds; “Vocalscapes on Walt Whitman”, an electroacoustic composition exploring the idea of “poetry as vocalscape” and as “geography” of voices and performances based in the recordings of fifteen talkers.

The works have been composed and spatialized in real time by a “sound navigation map”, a virtual score within Max/MSP, the Spatialisateur and Antescofo.

Through these two works I will show: 1) by which means a vast sound material can be organized and processed/composed automatically in order to beget a sound environment in real-time through a coherent open virtual score; 2) how such a sound environment may be seen simultaneously as a sound composition, as the trace of a shared experience, as the record of poetry and vocal performance or as the soundmark of a community and of a land.

1. GEOGRAFIA SONORA

“Geografia Sonora”¹ (2013) is a sound and video installation on the theme of the sea; an imaginary sound “constellation” of singing/speaking voices, sound signals, as well as natural and mechanical sounds from countries bordering the Mediterranean. The soundscape² [1] and the video image are generated, re-composed and trans-

Copyright: © 2014 Georgia Spiropoulos. This is an open-access article distributed under the terms of the [Creative Commons Attribution License 3.0 Unported](https://creativecommons.org/licenses/by/3.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

¹ “Geografia Sonora” has been commissioned by the curator Evelyne Artaud for “Marseille-Provence 2013, European Capital of Culture” and took part of the exposition “Cadavres Exquis” at the Granet Museum of Aix-en-Provence. It has been composed in the Muse en Circuit Studios.

² R. Murray Schafer categorize the main themes of a soundscape in terms of keynote sounds, signals and soundmarks. A keynote is the tonality in a composition and also the sounds of a landscape created by its geography and climate; signals are acoustic warning devices or message transmitters; a soundmark is a community sound which is unique. He proposes also a definition of a community as political, geographical, religious, social and acoustic entity.

formed in real time *ad infinitum*. The sound material of the installation is a collection of personal field recordings, sample donations by my “informants” recorded or found in their respective countries, and samples found in archives. The sound space is organized as an archipelago of “sound islands” grouped in families. The navigation between the “islands” (juxtaposition, superimposition and spatialization of sounds) is organized automatically by a “navigation map”, a computer program within the environment Max/MSP and the Spatialisateur. This musical journey takes place within an appropriate “room”. A video of a continuous changing texture of a sparkling sea is projected on the three walls of the room. The sea changes in color, luminosity and density and becomes a constellation of lights. The video is generated with Jitter in real-time. The visitor may move freely inside the room, walk around, sit down or lie down on the floor.

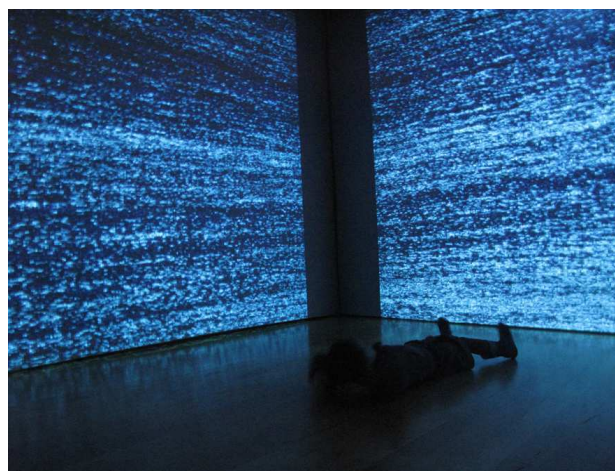


Figure 1. “Geografia Sonora”: the space and the video of the sea.

1.1 The soundscape – An archipelago of sounds

In the soundscape the sound is distributed by 8 loudspeakers one pair per wall (8 channels). Each wall represents one of the four cardinal points in the map and corresponds to a part of the Mediterranean; each country (and its soundmark) has a fixed location and starting point in space. The north wall (N) is the “sound map” of the northern countries, the south wall (S) that of the southern countries, etc.

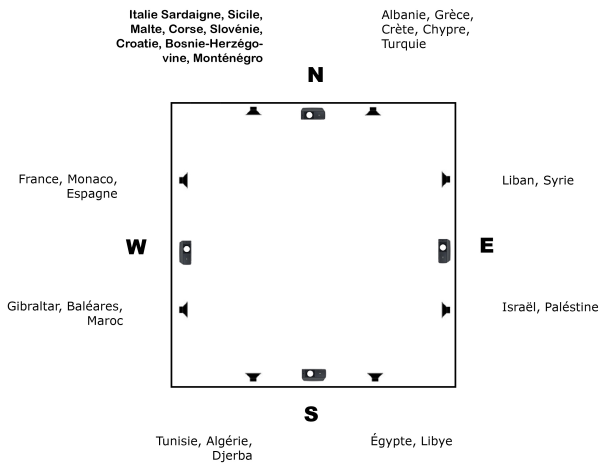


Figure 2. Spatial distribution of the Mediterranean countries and sound diffusion by 8 loudspeakers.

The sound material, concrete and mainly raw, is grouped in “sound islands” and “island clusters” (see Table 1). A “cluster” is a sound family (e.g. Human, Signals) and an “island” is the type of a sound within a sound family (e.g. singing, morse). I will confine myself to describe only a few sounds here. The “Human” and “Ambient” families are related to oral-tradition (songs) or reflect the human activity on sea (fishing, navigating). The Morse code generated by the computer comes from a text fragment of Homer’s “Odyssey” [2]. A very few samples (natural sounds, boats motors) are filtered in order to serve as continuous drones. The sound material is organised in 8 sound families.

	Sound families	Sound types
	C o u n t r i e s	(island clusters)
Human (voice)		singing, speaking, calls, onomatopoeia
Instrumental		related to sea songs
Ambient (with voice)		port, fish market, boat, carnage, celebration
O t h e r	Natural sounds	sea, wind, birds, insects, big fishes, unusual sounds
	Signals	boat horns, whistles, morse signals, sonars, unidentified sea sounds
	Mechanical	boat motors, chains
	Drones	filtered sounds
	Processed	filtered sounds

Table 1. The 8 sound families of the Mediterranean soundmark.

A “sound navigation map” defines paths and interconnections between “sound islands” and/or “island clusters” and generates an “archipelago of sounds”.

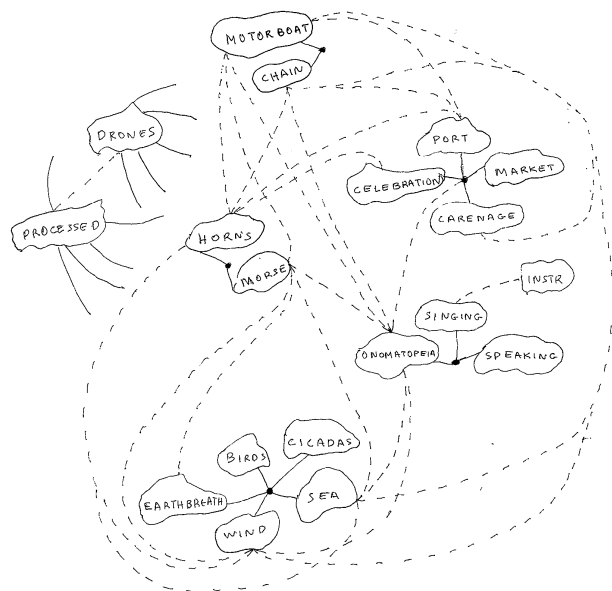


Figure 3. Sound navigation map, “sound islands” & interconnections (manuscript).

1.2 Virtual Score - A sound navigation map

The navigation between the “sound islands” changes ad infinitum in real-time. There is no fixed duration, beginning or end; sounds may be repeated but the listener will never listen to an identical combination of sounds. A “sound navigation map” is generated as a virtual score in the computer by means of Max/MSP and the Spatialisateur software. The navigation map is organised as a complex multi-level matrix constructed with three external tables that interact with each other: 1) a table for the horizontal interconnections between sounds (juxtaposition), 2) a table for vertical connections (superimposition) and 3) a table for the grouping of sounds and for the spatial movement.

island clusters	islands	Voice			Instrumental	Voice ambience		
		singing	onomatopoeia	speaking		market	port	boat
Voice	singing	x	x	x	x	x	x	x
	onomatopoeia	x	x	x	x	x	x	x
	speaking	x	x	x	x	x	x	x
Instrumental	Instrumental	-	-	-	-	-	-	-
	market	x	x	x	-	x	x	x
	port	x	x	x	-	x	x	x
	boat	x	x	x	-	x	x	x
	carenage	-	-	-	-	-	-	-
	celebration	-	-	-	-	-	-	-
Nature	other	x	x	x	-	x	x	x
	birds	x	x	x	x	x	x	x
	fish	-	x	-	-	-	x	x
	cicadas	-	-	-	-	x	x	x
	crickets	-	-	-	-	-	x	-
	sea	x	x	x	x	x	x	x
	wind	x	x	x	x	x	x	x
	breath	-	x	x	-	-	x	x
Signals	horns	-	x	-	-	x	x	x
	morse	-	x	x	-	-	x	x
	sonar	-	-	-	-	-	-	-
	unidentified	-	x	-	-	-	x	-
	motor	x	x	x	-	-	x	x
Mechanical	chain	-	-	-	-	-	-	-
	Drone	x	x	x	x	x	x	x
Processed	Processed	x	x	x	x	x	x	

Figure 4. Sound navigation map: part of the table indicating allowed and non-allowed sound juxtapositions.

The first two tables define a random navigation between sounds types according to rules that determine the

allowed or non-allowed combinations of sounds (e.g. birds to cicadas, birds and cicadas); this choice (yes/no) is either arbitrary or rational according to combinations one may listen in the physical word. The third table determines the spatial movement of sound types and their internal organization in “scenes”. A “scene” regulates a particular behavior of each sound type (e.g. singing, fish) in time and in space:

- polyphony (one/many sounds & loudspeakers)
- spatial movement (static/dynamic within an angle in degrees)
- sample duration and onset (playback position in a sample)
- total duration of a scene (15- 70 sec)

Eight scenes are configured in “Geografia Sonora”.

- Solo (a single sound type): monophonic, static, 1 L/S³
- Multi: polyphonic, static, 2-4 L/S simultaneously
- Respo; polyphonic, static, 2-3 L/S alternatively
- Ubi: polyphonic, static, 8 L/S simultaneously, quiet
- Circular: monophonic, dynamic, 8 L/S, 90°-360°
- Spiral: polyphonic, dynamic, 8 L/S, >360°
- Cross: polyphonic, dynamic, 2 L/S, jump across
- Zig: polyphonic, dynamic, 3 L/S zig-zag

SOUND FAMILY (a cluster of islands)	SOUND TYPE (island)	SPATIAL MOVEMENT (avec scenes)									
		STATIC					DYNAMIC				
		SOLO	MULTI	RESPO	UBI-PIANO	CIRC	DI	SPIRAL	CROSS	TRI/ZIG	
Voice	islands-spot										
	singing	20_30+0_0	15_20+0_0	5_10+0_0	5_10+0_0	20_30+0_0	20_35+0_0	5_10+0_0	5_10+0_0		
Instrumental	speaking	10_15+0_50		10_15+0_50							
	instrumental										
Voice ambience	market	20_40+0_50	20_40+0_50	15_25+0_0	15_40+0_50						
	port	20_40+0_50	20_40+0_50	15_25+0_0	15_40+0_50						
	boat	20_40+0_50	20_40+0_50	15_25+0_0	15_40+0_50						
	carriage										
	celebration										
	other	10_20+0_0									
Nature	birds	10_20+0_50		7_10+0_0	30_60+0_50	7_15+0_50		5_10+0_50	5_12+0_50		
	fish		40_60+0_0	10_15+0_0	30_60+0_50			5_10+0_50	5_12+0_50		
	cicadas	15_30+0_30	30_60+0_50	8_12+0_0	30_60+0_50						
	crickets	15_30+0_30	3_8+0_30	8_12+0_0	30_60+0_50						
	sea	30_60+0_50			30_60+0_50	10_60+0_50		6_15+0_50	8_15+0_50		
	wind	30_60+0_0	30_60+0_0		40_50+0_50	10_60+0_50		6_15+0_50	8_15+0_50		
Signals	breath	30_40+0_30			10_20+0_50						
	horns		8_12+0_0	5_10+0_0	8_12+0_0	8_10+0_0					
	morse	15_20+0_0		2_5+0_0							
	sonar	10_15+0_0		5_8+0_0		3_10+0_0					
	unidentified										
Mechanical	motor	25_45+0_30	15_45+0_30		10_20+0_50	15_45+0_50					
	chain										
Drone	Drone	45_60+0_20	45_60+0_20		20_50+0_20			20_50+0_50	20_50+0_50		
	Processed	45_60+0_20									
Duree scene entiere (sequence)			45-60	45-60	50-70		40-70				

Figure 5. Sound navigation map: “scenes” and sound spatialization.

All three tables are stored in Max/MSP into *coll* objects. The whole sound navigation is a random choice of path by the computer between “scenes” (see Figure 5) and “free” navigations between “sound types” (see Figure 4). A new “scene” appears after 4-8 “free” navigations. As all countries have a fixed spatial point (in a specific loudspeaker and angle) all sounds related to countries (and humans) are localized and start *migrate* in space in the loudspeaker of that country. All other sounds are spatialized according to “scenes”. For example, in the Respo configuration the next sound will start at the opposite spatial point to the first one.

A maximum of three polyphonic voices may be superimposed and read in players (*sfplay~* objects) in the

³ loudspeakers

Max/MSP patch. The number of sound sources, the spatial location and the movement of the sources, are controlled by the Spatialisateur. They are distributed in an 8-channel system with 15 virtual spatial points.

1.3 The video – A “breathing sea”

The video is projected by three projectors on the three walls of the room. The video image is the result of a continuous changing texture of a sparkling sea. When a new sound “scene” appears the sea changes in color, luminosity and density and becomes a constellation of lights.

The video image is a merge of two sources: the video of a shimmering moving sea and a similar photo whose color changes by the computer. From interaction between these sources results a sea-matter in continuous motion, that oscillates ranging from blue to silver blue-violet (and to silver) and whose shimmer is gradually transformed into constellation of lights. This “landscape” could suggest a constellation of stars, signals of lighthouses, boat luminous lines, or the night lights of the islands.

The video treatment is calculated in real time by specific modules on Jitter software: *jitter.op* for matrices operations in order to generate a new synthesized image; *jitter.mxform2d* for image spatial transformation, *jitter.scalebias* for color channels scaling and offset in a 4 plane input matrix (ARGB); *jitter.slide* for temporal envelope following.

2. VOCALSCAPES ON WALT WHITMAN

“Vocalscapes on Walt Whitman” (2014) are electroacoustic interludes extracted from “The Body Electric”⁴ cycle based on Walt Whitman’s “Leaves of Grass”⁵ [3]. It is composed for a speaking-singing female voice, clarinets, trombone, viola, percussion and 6-channel tape. The cycle is a work in progress, which started with four pieces⁶, but more ones will be added in the future. The four pieces are bounded by electroacoustic vocalscapes (interludes). Some instrumental or concrete sounds of the work are directly inspired by the soundscapes in Whitman’s poems (boat horns, wind, whistles, whispers).

“Vocalscapes on Walt Whitman” can be seen as an electroacoustic composition as well as a sound installation. The piece explores both the idea of poetry as sound-space and as “geography” of languages, voices, performances and humans. The sound material derives from the recordings of fifteen talkers, each one having recorded a Whitman’s poem excerpt in her/his mother tongue in a chosen place. Each spoken poem (and voice) is accompanied by the ambient sound of the place where it’s been recorded. The recorded material has been composed and spatialized automatically by Max/MSP and the Spatial-

⁴ The work has been commissioned by the French Ministry of Culture for the Arts Nova ensemble. The title comes from Whitman’s poem of the same title.

⁵ “Leaves of Grass” is a poetry collection of 400 poems by the American poet Walt Whitman (1819–1892). Whitman composed it during his entire life, writing and revising it in five editions until his death.

⁶ “City of Ships”; “A Clear Midnight”; “Yet, Yet, Ye Downcast Hours”; The Rounded Catalogue Divine Complete”.

isateur both driven by Antescofo⁷ software and programming language. This computer environment for real-time composition has been initially conceived for the installation of “Geografia Sonora” and developed further for the “Body Electric”.

2.1 The Vocalscape (Fonotopia)

Most of the fifteen talkers, women and men, have recorded an excerpt of Walt Whitman’s “Song of Myself”. Some of them have recorded excerpts of five different poems⁸. The languages actually recorded are: English, French, German, Greek, Hebrew, Italian and Spanish – more languages will be added in the future. All talkers provided a recording of the ambient sound of the space of reading; many of them have chosen a particular *mise en scène* (staging) of that space with very interesting consequences both for the background sound of the recording and for the work. Dieter Kaufmann recorded on the Pilgram-bridge in the middle of a crowd in Vienna an excerpt⁹ where Whitman expresses his strong conscience of citizenship and involvement in the city (New York); Allen Weiss recorded a quiet snowy soundscape full of birds in Huntington NY; Joel Chadabe chose the West End Avenue sound in front of his studio building and Philippe Leroux the night ambience of Ecole Normale Supérieure street of Ulm.

The recorded poems have been edited and arranged (in folders) by language, gender, type of audio sample (poems, strophes, verses, words, ambience samples) and poem (title and talker); e.g italian/woman/verse/A_Song_of_the_Rolling_Earth_paola.

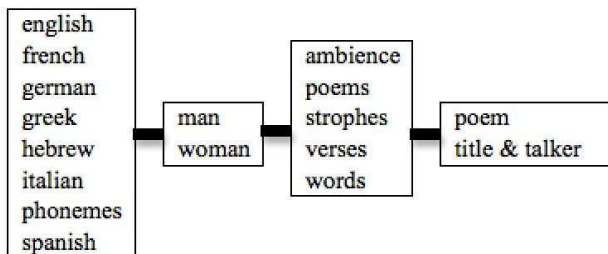


Table 2. Organization of the recorded poems samples by: language – gender – sound type – poem title

2.2 Virtual score – programming in Antescofo

The compositional process and method in “Vocalscapes on Walt Whitman” is an extension of that of “Geografia Sonora”. But “Vocalscapes” by its nature needed a higher compositional control and precision in working on the

⁷ “Antescofo~ is a modular polyphonic Score Following system as well as a Synchronous Programming language for musical composition. The module allows for automatic recognition of music score position and tempo from a realtime audio Stream coming from performer(s), making it possible to synchronize an instrumental performance with computer realized elements. The synchronous language within Antescofo allows flexible writing of time and interaction in computer music”. Arshia Cont, <http://repmus.ircam.fr/antescofo>, 2009.

⁸ “A Song of the Rolling Earth”; “The Dalliance of the Eagles”; “Faces”; “Poem of Salutation”.

⁹ “...A call in the midst of the crowd, My own voice, orotund sweeping and final.../ This is the city and I am one of the citizens...” from the “Song of Myself”.

material. The music material has been generated in real-time on studio, recorded as fixed 6-channel musical sequences and mixed as standard electroacoustic pieces. Each sequence is composed and spatialized as a micro-form similar to Geografia’s “scenes” described above: Solo, Multi, Respo, Ubi, Circ, Spiral, Zig (see Figure 5). The sequences here are generated by the Antescofo software and programming language and generated through Max/MSP and the Spatialisateur.

A new version of the Geografia’s Max/MSP patch has been developed with a 3-player module, with an increased internal polyphony for each player and a maximum of 15-voice superimposition.

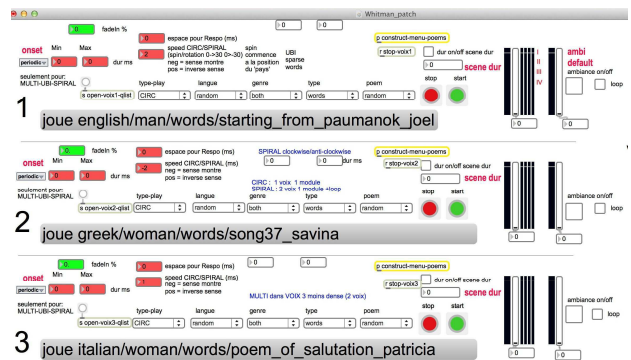


Figure 6. The 3 voices (players) in Max/MSP patch.

When launching the Max/MSP patch all the audio samples are preloaded automatically. The *recursivefolder* object of Alex Harker¹⁰ allows to construct the folders tree for the sound types (poems, strophes, etc.), to access easily to the audio samples and to add more samples without changing the patch. By the *antescofo~* object in the main patch window one can access to the Ascograph graphical score editor.

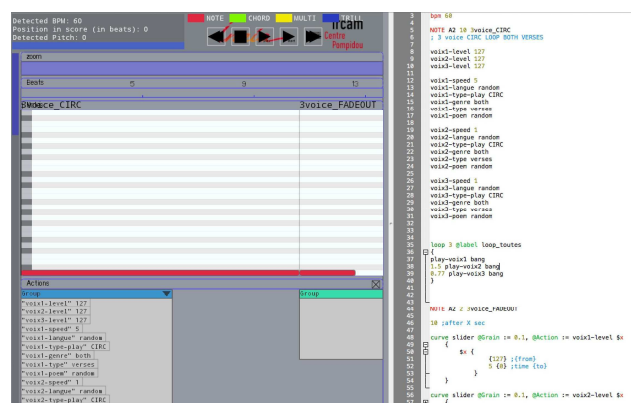


Figure 7. The Antescofo’s Ascograph graphical score editor.

All electroacoustic sequences have been programmed with a high precision in the right part of the editor. It has been possible to compose a large number of appended sequences by controlling numerous parameters:

- a sequence’s global duration
- the sequence’s number of “voices” (3 polyphonic voices)

¹⁰ https://github.com/AlexHarker/AHarker_Externals

- the sound level and the fades
- the choice of an audio sample by language, gender, type of sound, or poem title, also randomly
- the superimposition of a poem with its ambience recording
- the onset (position of the playback in a sample)
- a delay time for the playback
- the speed variation of the playback
- the type of spatialization of a scene, the speed and the sense of rotation (clockwise-anticlockwise)
- the loop of a sequence with a different onset for each voice
- the generation of a sequence of sequences

The following *antescofo*~ virtual score is a simple example of a 1-voice sequence from a randomly chosen poem's verse and language, told by a woman, rotated in a full circle in 5 seconds, looped once and faded out immediately after 10 seconds.

bpm 60

NOTE A2 10 3voice_CIRC
; 3 voice CIRC

voix1-level 127

voix1-speed 5
voix1-langue random
voix1-type-play CIRC
voix1-genre woman
voix1-type verses
voix1-poem random

loop 1 @label loop_toutes
{
play-voix1 bang
}

NOTE A2 2 1voice_FADEOUT

10 ; after X sec

```
curve slider @Grain := 0.1, @Action := voix1-level $x
{
    $x {
        {127} ;{from}
        5 {0} ;time {to}
    }
}
```

The electroacoustic sequences are spatialized by the Spatialisateur in a 6-loudspeaker system with 15 virtual sources offering a fine precision of the sound movement in the hall.

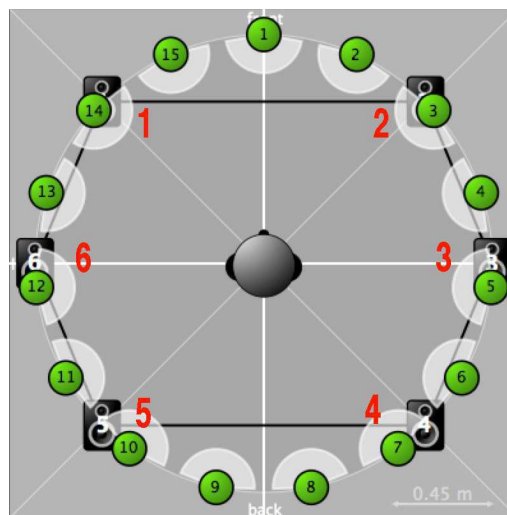


Figure 8. Representation of the 6-channel loudspeaker system with 15 virtual points in the *spat.oper* object of the Spatialisateur

Similar to “Geografia Sonora”, each country and language has a specific location in the sound space. A sound diffusion with a fine control of parameters related to perceptual factors and sound radiation are possible within the Spatialisateur such as the reverb, the source presence and brilliance, the room presence, the distance or proximity of sound events.

3. NOTES ON SPACE, SOUND, VOICE AND POETRY

“Geografia Sonora” and “Vocalscapes on Walt Whitman” are the first two works of the “Ritual Chambers” series of sound environments (soundscapes and vocalscapes).

Physical Space

The notion of the “chamber” as private space and as shared space by a small community comes from personal live and/or sonic experiences in popular rites¹¹. The sonic influence and the compositional approach of the ritual in my work can be found in my earlier pieces “Klama”¹² [4] and “The Bacchæ”¹³ [5]. The “chamber” in rituals is often a small shared place that opens to the spiritual space: “Place is security, space is freedom,” writes the geographer Yi-Fu Tuan, “we are attached to the one and long for the other.” [6]

In “Geografia Sonora” installation, the room can be freely approached by the visitor: she/he may move freely inside, walk around, sit or lie down on the floor, enter or exit, listen, contemplate, or discuss. The space could be a place of listening and meeting like in Roland Barthes’

¹¹ The fire rite of Anastenaria in Northern Greece, the Greek death rituals, ethnographic audio collections from Smithsonian Institution and CNRS-Musé de l’Homme archives.

¹² “Klama” (IRCAM 2006) is a work for mixed choir, live electronics and “audio documents” and have its roots in the death rituals, performed in the region of Mani.

(<http://www.georgiaspiropoulos.com/programnotes/klama.html>)

¹³ “The Bacchæ” (IRCAM 2010) is a solo opera for one performer, tape, live electronics and lights based on Euripides’ ancient Greek tragedy. (http://www.georgiaspiropoulos.com/works/bacchae_excerpts_en.html).

“phantoms of the Opera”: “*Je rêve d'un Opéra aussi libre et aussi populaire qu'une salle de cinéma ou de catch: on y entrerait, on en sortirait selon son humeur...*”¹⁴ [7].

Abstract Space

The notion of space as structural element for the composition and as integral part of the sound is explored in both works. The sound comprises the space, the sound has spatial features and disposition right from the beginning (through compositional decisions) In both works the audio content may change completely but abstract space not. The space is open and can be modulated in terms of temporality, density and internal movement but the structure remains the same. The space is structured by a virtual score that determines the “*scenes*” - sequences organized in terms of material, polyphony, density, duration, spatial position and movement. In “Geografia Sonora” the virtual score generates randomly an open structure, a moving space; in “Vocalscapes on Walt Whitman” the virtual score generates pre-programmed scenes that can be orchestrated in multiple ways.

Liquid Spaces

“Geografia Sonora” also explores the idea of liquidity, the flow of the water (the sea) but also the continuous flow of sonic events from the Mediterranean soundscape. “Vocalscapes on Walt Whitman” explores the flow of the language, of Whitman’s poetic language and of the articulated speaking as recorded by the fifteen talkers¹⁵. Bachelard says: “*Liquidity is... the very desire of language. Language wants to flow. It flows naturally.*” [8] [9]

“Vocalscapes” are geografias and Geografia’s sea changes to a vocalscape too — by songs, onomatopoeias, calls and speakings. In the Homeric sea people speak; and they speak in different languages: “*I navigate the wine-colored sea among people who speak different languages.*”¹⁶ [10]

“Vocalscapes” is a geography of Whitman’s poetry but also a talkers’ portraits. It is a testimony of languages, pronunciations, dialects and idioms similar to Whitman’s introduction of foreign, borrowed words, slang, onomatopoeias and pronunciations inside the chosen tongue: “*Pronunciation is the stamina of language, - it is language.*” [11] The talkers are the voices of the poem and the text-poem joins the “oral” dimension.

“*O what is it in me that makes me tremble so at voices?*”¹⁷ But the talkers becomes also performers, “vocalists”, speakers, readers, and, in a way, directors - many of them have chosen a particular *mise en scène* (staging) of the space/place of reading with significant consequences for the background sound of the recording. The recording keeps the vocal mark of the talker and the soundmark of

the space/place. The talkers are not alone; like Messiaen’s “oiseaux”¹⁸ they are in a changing landscape together with their neighbors singing with them. [12] “Vocalscapes” is a virtual space of characters, of vocal performance and an environment of “oral” poetry. “*The poems in Leaves of Grass ‘are not about the environment, whether natural or social,’... They are environments.*”¹⁹ [13]

Sonic Space

Like “Geografia Sonora”, “Vocalscapes on Walt Whitman”, is a collection and a cartography (of Whitman’s poetry). Whitman collects and classifies images, scenes, voices, humans, objects, words in detailed catalogues: “. . . *Collecting I traverse the garden of the world . . .*”²⁰

If there is a Whitman’s verse that reflects best the idea of “Vocalscapes” it is the following: “*Human bodies are words, myriads of words... / Every part able, active, receptive, without shame or the need of shame.*”²¹ Whitman’s recorded poems are used entire or in fragments: strophes, verses and words. Beckett says: “*I’m in words, made of words, other’s words [...]* I’m all these words, all these strangers, this dust of words, with no ground for their settling, [...].” [14]

Like “Vocalscapes”, “Geografia’s” archipelago is a sound collection and a cartography of the Mediterranean, bringing tonalities, signals and communities soundmarks.

Visual Space

The idea of “Geografia Sonora” installation as an endlessly changing sea has been formed from repeated observation (and contemplation) of the wide open landscape of the Aegean and Ionian seas from different perspectives: the sea as cartography & calm landscape from aerial view (for the sound); the sea as texture when seen from the top of the mountain of an island (for the video).

The video²² of a “breathing sea” is in part inspired by James Turrell’s “Aperture” works²³, Rothko’s “abstract icons”²⁴ [15] or by the “thinking ocean” in Tarkovsky’s “Solaris”²⁵ [16] planet: “an endlessly changing and apparently sentient alien ocean” [17]. But instead of a disquieting heterotopia, Geografia’s sea invites; it’s a space

¹⁸ “*Chaque pièce est écrite en l'honneur d'une province française. Elle porte en titre le nom de l'oiseau-type de la région choisie. Il n'est pas seul : ses voisins d'habitat l'entourent et chantent aussi (...)- son paysage, les heures du jour et de la nuit qui changent ce paysage, sont également présents, avec leurs couleurs, leur températures, la magie de leurs parfums.*” O. Messiaen, Catalogue d'Oiseaux, CD booklet.

¹⁹ A. Fletcher, *A New Theory for American Poetry: Democracy, the Environment, and the Future Of the Imagination*. Cambridge, MA: Harvard University Press, 2004, p.103

²⁰ *Leaves of Grass*, “These I Singing in Spring”

²¹ *Leaves of Grass*, “A Song of the Rolling Earth”

²² <http://www.georgiaspiropoulos.com/programnotes/geografia-video/geografia-sonora-video.html>

²³ “A Turrell Space Division (also called an ‘Aperture’ work) consists of a large, horizontal aperture cut into a wall... The aperture [...] appears to be a flat painting or an LED screen but is a light-emitting opening to a seemingly infinite, light filled room beyond”. <http://jamesturrell.com/artworks/by-type/#type-wedgework>

²⁴ “*Fields of color and light born by Rothko’s experience of the emptiness in the American landscape*” in “L’art au XXe siècle. : Peinture, Sculpture, Nouveaux médias, Photographie” Taschen, 2000

²⁵ Based on Stanislaw Lem’s novel, “Solaris” 1961.. S. Lem, J. Kilmartin, S. Cox, “Solaris”, Mariner Books, 2002

¹⁴ “*I dream of an opera as free and popular as a movie or catch hall: one would get in and come out depending on their mood*”.

¹⁵ “*I have heard what the talkers were talking, the talk of the / beginning and the end, / But I do not talk of the beginning or the end.*” W. Whitman, *Leaves of Grass*, “Song of Myself”.

¹⁶ “*πλέων ἐπὶ οἴνοπα πόντον ἐπ’ ἀλλοθρόους ἀνθρώπωνος*”. Homer, “Odyssey” Homer, *Odyssey A*. 183. Literally “people who make different noises”.

¹⁷ *Leaves of Grass*, “Vocalism”.

of listening, of thinking and maybe of meditating and exchanging.

“... *Sea breathing broad and convulsive breaths...*”
Walt Whitman, “Song of Myself”

“*If one could be shot out of the Earth to fly into space, and if sound could be transmitted so far, or if the ear had the qualities of a super-machine, one would listen to the overall sound, the ‘soundmark’ of the earth. That noise would be made of all the earth sounds : human, animal, mechanical, natural. And if the ear could zoom to an area, it would be able to hear the ‘soundmark’ of this region. And if you could zoom in even further, you could hear families of sounds or individual sounds. This is what ‘Geografia Sonora’ is: a flight, a trip, an imaginary zooming above the Mediterranean, its countries and their sounds.*”²⁶

4. CONCLUSIONS

In this paper I have presented some of my recent research, compositional approach and computing strategies for real-time composition of sound environments. In “Geografia Sonora” sound-video installation, the soundscape, an archipelago of sounds, is generated by a virtual score in Max/MSP and the Spatialisateur. In “Vocalscapes on Walt Whitman” electroacoustic sequences are composed automatically by the same tools and controlled in detail with Antescofo’s virtual score.

The further the environment series grows, the more improved computer environment Max/MSP – Spatialisateur - Antescofo is needed in order 1) to create a generalized control of the whole form and music structure via the virtual score; 2) to provide an automatic editing of audio samples and automatic organization of a database constantly growing; 3) to integrate live sound treatment; 4) to explore different spatial audio rendering techniques such the Ambisonics and the Wave field synthesis.

Acknowledgments

To the talkers in “Vocalscapes” for sharing their Whitman with me: Joel Chadabe, Helga Fanderl, José-Miguel Fernandez, Ayelet Rose Gottlieb, Martin Carlé, Dieter Kaufmann, Elaine Lillios, Philippe Leroux, Paola Livorsi, Anne Montaron, Philippe Nahon, Marina Skiadaresi, Savina Yannatou, Allen Weiss, as well as an anonymous speaker.

To the contributors of samples and of sea songs for “Geografia Sonora”: Antonie Bergmeier, Simon Benacchio, Ayelet Rose Gottlieb-Levavi, Karim Haddad, Kim Jacobsen, Tom Mays, Fotis Moshos, Gianni Pavan, Younsi Ryad, Yioryos Yeoryiou, Antoine Vuilloz, Sharif Waked, Enea Xaferi.

To José Miguel Fernández for his precious contribution and ingenious programming. To all the team of the Muse en Circuit whose studios both projects have been developed in. To the production team and the developers of IRCAM. To Kiki Kokondini and Amalia Atsalaki.

Audio, videos & interviews

- “Geografia Sonora”: <http://www.georgiaspiropoulos.com/programnotes/geografia-sonora.html>
- “The Body Electric”, “Vocalscapes on Walt Whitman”: <http://www.georgiaspiropoulos.com/programnotes/body-electric.html>

5. REFERENCES

- [1] R. Murray Schafer, *The Soundscape: Our Sonic Environment and the Tuning of the World*, Destiny Books 1977/1993, p.9, pp. 214-225.
- [2] Homer, “*Odyseey*”, Daidalos I. Zacharopoulos, 2004
- [3] W. Whitman, “*Leaves of Grass and Other Writings*”, Edited by Michael Moon, W.W. Norton & Compagny, 2002, 1973 (NYU Press 1965).
- [4] G. Spiropoulos, B. Meudic, “KLAMA: The Voice from Oral Tradition in Death Rituals to a Work for Choir & Live Electronics”, in *Proc. Int. Conf. Sound and Music Computing*, Lefkada 2007.
- [5] G. Spiropoulos, A. Georgaki, “Virtual Masks in *The Bacchæ* by Georgia Spiropoulos (Ircam, 2010): Exploring Tragic Vocality in Max/MSP Environment”, in *Proc. Int. Conf. Sound and Music Computing, Copenhagen*, 2012.
- [6] M. J. Killingsworth, “Nature”, *A Companion to Walt Whitman*, ed. D. D. Kummings, Wilwy-Blackwell, 2006-2009, p. 316.
- [7] R. Barthes, *Le grain de la voix*, Seul, 1981, p. 202
- [8] G. Bachelard, *L’eau et les rêves : Essai sur l’imagination de la matière*, José Corti, 1942, p. 251.
- [9] A.S. Weiss, *Varieties of Audio Mimesis*, Errant Bodies Press, 2007, p. 23.
- [10] Homer, “*Odyseey*”, Daidalos I. Zacharopoulos, 2004
- [11] ¹ T. Hoffman, “Language”, *A Companion to Walt Whitman*, ed. D. D. Kummings, Wilwy-Blackwell, 2006-2009, p.373
- [12] O. Messiaen, *Catalogue d’Oiseaux*, CD booklet, Erato ECD 71590, 1970-1973
- [13] M. J. Killingsworth, “Nature”, *A Companion to Walt Whitman*, ed. D. D. Kummings, Wilwy-Blackwell, 2006-2009, p. 314.
- [14] S. Beckett, *The Unnamable* (1959). Calder & Boyars, 1975, p. 141.
- [15] K. Honnef, K. Ruhrberg, M. Schneckenburger, C.Fricke, dir. I. Walther, *L’art au XXe siècle. : Peinture, Sculpture, Nouveaux médias, Photographie*, Taschen, 2000, p. 290.
- [16] A. Tarkovsky, “Solaris” movie, 20 March 1972 (Soviet Union).
- [17] J. Jones, “Out of this world - Whether floating in the air or snuffling across the ground, Andrei Tarkovsky’s films make you see Earth as if for the first time”, in *The Guardian*, 12.02.2005.

²⁶ Notes from “Geografia Sonora” score.