

Audio-visuals in shared space as a metaphor for mindscapes: generative creation in a network performance

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Abstract

This article presents an ongoing research focusing on the development of a platform for generative networked creation. That is, a process of creation in which several collaborators act on different parts during the artistic creation while a computer network integrates communication between these agents and processes generative transformations. Therefore, we established a working methodology with a group of thirteen researchers of the Interdisciplinary Nucleus for Sound Studies (NICS), Ph.D. students, postdoctoral researchers and senior researchers. Our proposal was to distribute the stages of the collaborative process in separate generative modules and develop a network architecture to enable interaction between the elements and, finally, perform a multimodal work as a result of the information flow circulating in the network.

Key words: generative art, audio-visual composition, networked performance, collaborative creation.

1. Introduction

Studies on the possibility of using a network architecture and connectionism as a paradigm for musical creation are already described in [3]. The authors argued that "neural networks cooperate to produce a heuristic value that represents the worth of each of musical fragments". Others developed the NEUROGEN with the idea of using genetic algorithm and cooperating neural networks as architecture for a generative musical composition [6].

Brown [2] explores computers as a vehicle for collaborative music making through improvisation using computers on a network. They also point out that: "*Networked improvisation suggests the 'contemporary musicianship' which embraces the computer as an instrument and the network as an ensemble and cyberspace as a venue*". The authors comment on the last two aspects as follows: 1) The network as an ensemble: "*This allows ensemble activity to occur to separate sites for musicians who share the network and the software, this means they can play together in a collaboration where each can see and hear the result of their gestures have, facilitating real musical communication between them*" (idem, p. 3); 2) The

Cyberspace as a venue: "*With algorithmic musical instruments that do not depend upon continuous gestural input, the user can be both listener and performer, both producer and consumer*" (ibidem, p. 3).

The main concern in our article is the conceptual viewpoint and interactive perspectives that motivate our study. Next section presents a brief retrospect of previous participation on the Generative Art Conferences which follows the conceptual perspective that anchors our approach concerning collaborative practice in contemporary art. After we shortly introduce the implementation of the network, visualization and sonification, and finally, we discuss our understanding of generative performing art as an open platform for collaboration and networking.

2. Retrospective: Generative Art

The study presented here dialogues with other presentations at the Generative Art Conference. We presented a generative networked performance at the 17th Generative Art Conference in Rome, 2014. The work MinDSounDS was a performance involving a dancer, a flutist, BCI performer, and electronic music [10]. Similar to the work presented in this article, MinDSounDS was a performance where a group of musicians and computers in a network produced a continuous exchange of information between them¹. The emerging audio-visuals were shaped by physical actions, movements, music, and improvisation with interfaces and music instruments. Therefore, the performance created meaningful relationships between agents while they explore interactions with the visualization and sonification [10].

We have also studied how generative installations and interactive narratives can be understood as an interdisciplinary research methodology to investigate new paradigms on human cognition mediated by technology in the 18th Conference [11]; we presented how a multimodal opera was created and performed² in the 19th Conference [12]. In the 20th Conference we presented the Selfhood Installation³ [13]. Finally, a multimodal performance entitled as an Ode to Salvador Dalí's Christus Hypercubus⁴ was discussed in the 21st Conference [14].

3. Conceptual Perspective

A tendency toward collaborative, participatory practice is undeniably one of the main characteristics of contemporary art. Admittedly, these attempts are not new; one may contend that this genealogy dates as far back as modern art itself. In the early Romantic era, at the end of the eighteenth and beginning of the nineteenth centuries, poets and artists started to form groups that bemoaned the separation of art from its audience.

¹ minDSounDS – 17th GenArt, Rome, <https://youtu.be/cHJ1fRza9Iq>

² Descobertas – 19th GenArt, Florence, <https://youtu.be/zCRq9zVPLew>

³ Selfhood – 20th GenArt, Ravenna, <https://youtu.be/B2Ryo6Y9Rz0>

⁴ Ode to Christus Hypercubus – 21st GenArt, Verona, <https://youtu.be/Ks3X80TZkMs>

By the middle of the nineteenth century, the strategy Richard Wagner set forth in his seminal essay "The Art-work of the Future" [3] is still central to any discourse in Participatory Art. In order to reach the artwork of the future, the artists should overcome the distinctions between various artistic genres or, as we call today, different artistic media. The synthesis of artistic genres is for Wagner more a means to an end: the unity of artists among themselves and the unity of artists and the people. In this way participatory art can be understood not only as a reduction, since the author forgoes his subjective authorial power by reducing his own creative role, but also as an extension, of authorial power, whereby the viewer forfeits his secure external position, his aesthetics distance from the artwork, and thus becomes not just a participant but also an integral part of the artwork.

During the sixties, artists collectives, as well as happenings, performances, and similar events, were famously reborn on a worldwide scale. Among them, to name but a few examples, were Fluxus, Guy Debord's Situationist International, and Andy Warhol's Factory. In all of these cases, the twofold aim was both the collaboration of different artists and the synthesis of all artistic media. However, central to these activities was the readiness of artists to forego their isolated, elevated, privileged position in relation to the audience [7].

By the same time, in another context, an analysis methodology based on generative theory emerged, focusing mainly on the field of language theory. Noam Chomsky proposed "generative and transformative" models that analysed the different sentence structures. Those were deductive models whose objective was to describe the process of producing abstract chains and to determine a set of "generative" rules that included syntax, interpretive semantics, and phonology.

The works of computer art, in its early beginnings, were based on rules or basic parameters, from which it was established repetitions and variations. The roots of this practice lied in the Neo-constructivist current in the plastic arts. Nevertheless, while Constructivism focused on the application of mathematical and/or geometric models to art, neo-constructivism, as well as Generative or Processual Art, worked with the visualization of algorithms that enlarged their formal field by introducing new processes. The difference is that the "manual" work of most neo-constructivists compelled them, for practical reasons, to restrict themselves to structures of relative simplicity, while computer-generated works allowed the creation of complex structures.

The purpose of several computer art artists to generate the work from the development of a certain process of repertoire selection and statistical distribution certainly retained the proposal of the generative grammar of considering generative mechanisms of construction, related to the specific characteristics of art based on procedural creation. For Nake [15], the essentially new one in Computational Aesthetics is the concept of algorithm. The works based on this generative aesthetic allow the creation of aesthetic situations specified by several different but limited steps. For Georg Nees [16], the computer is a generator of creative processes, whose products are models of work of art. The essence of computer-aided work is,

according to him, the selection and distribution of signals in a given field, which he calls Composition.

Still in the sixties, while the generative approaches emphasize the procedural resolution of the work, other computational approaches look at the role of the observer. Artists of the time analyse both in their work and in their discourse the possibility of reaching a work of "dialog" art, where the point of reference is not the mere circulation of information, but a true "aesthetic communication." Subsequently, comes the telematics, or the art of telecommunication and network art. The art that transits through the telecommunication network is based on a type of open interpersonal communication and, therefore, is an art without a certain public. The fundamental element is communication, art as traffic. Together with the communication process is the idea of participation, which happens to the extent that the artist offers the public a field of action, not a definite and finished work. In this chain, all artistic activity is related to information. In the creative act, the information is generated, when received by the public it is processed, and through the medium is the transmission of information, which is known as communication.

In order to make possible communication between humans and machines, Turing [20] had emphasized the need to generate an intermediary element that would function as a translator of information transmitted in symbolic language to the computer language (binary code). The idea of Turing predates the conception of the interface between people and computational systems since, unlike direct communication between machines, the direct coupling between minds and machines until today is still not completely possible. Man-machine interfaces play a role similar to the means humans need to communicate and enable coupling between different systems.

At first, the information processed by the computer was not visible to the user. This obstacle began to be overcome from 1949 with the development of a first monitor with an interactive, dynamic and visual display under the direction of Jay Forrester at MIT, which allowed manipulating the information directly in the window with the optical pens of the time. And from there we arrive in today's interactive systems, with the immersive technologies, intelligent devices and the increasingly complete discourses from the fields of cognitive sciences and neuroscience on the notions of reality and observer that are placed at the core of the area of interactivity. What, then, of the virtual spaces and interactions that progressively determine and enable cultural practice, particularly in our time?

Perhaps as a remake of the happenings in the sixties, but with the possibilities of the environments available now, this project was conceived and presented to an interdisciplinary group of thirteen researchers, with musicians, artists, developers, physiotherapists, gymnasts among them. The proposal was: Do it! The available environments were presented: Processing, Pure Data, Max MSP and the communication protocol, OSC. Like in Fluxus, the twofold aim was both the collaboration of different artists and the synthesis of all artistic media. However, central to these activities was the readiness of artists to forego their isolated position

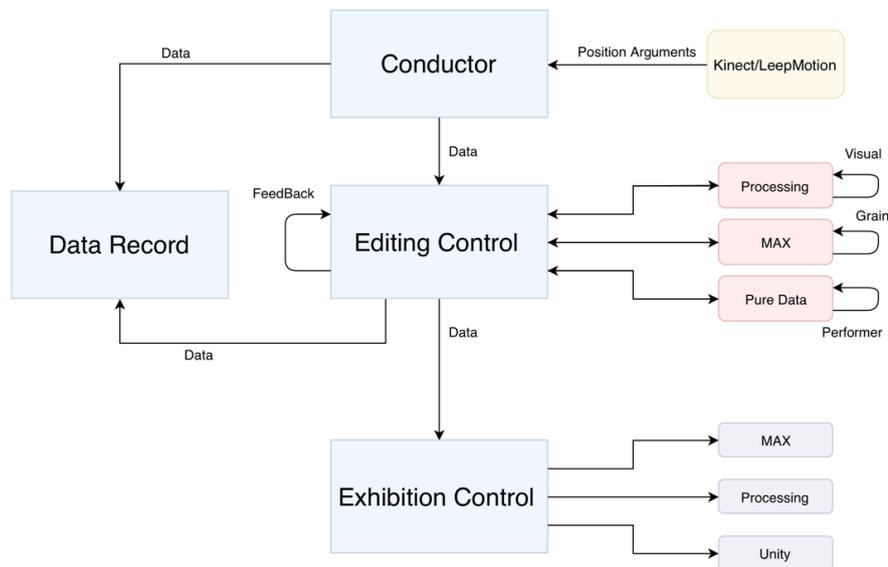
in relation to the creative process towards an engaged, collaborative, participatory approach. Simple as that.

4. Development: Network, Visualization and Sonification

We introduce in this section the three main elements of the study presented here. Firstly, we describe the initial network architecture which is based on a data flow that starts in the gesture captured by two interfaces (Kinect and Leap Motion) and then is sent via OSC protocol to other computers in the network that control the visualization and sonification. The subsection introduces the visualization that was developed in two aspects: 1) geometric transformations and 2) video clips of silent movies. Finally, we describe how the sound generation was developed from granular sounds and sound textures.

4.1 Network

The first network architecture developed for the study is based on the principle that the information flow has its origin in the gesture of a conductor that represents the interpreting action of the whole system (see figure 1). The first tested performance metaphor is that of a networked audio-visual generative instrument. Therefore, each of the elements of the network is represented by computers that perform different tasks and are connected to each other by the OSC protocol, all in the same using an ad hoc network. In addition to the sound and image processing units, each entity of the network has an editing and display controls. Finally, the data flow is stored so that one can make future analyses of the interaction between the different mechanisms of interaction between each agent after performances.



Fig

Figure 1: network architecture

When in operation the network architecture obliges a circular causality, which is generated with data of cinematic quality, derived from a movement interpretation that is tracking from the Kinect or Leap Motion interfaces. Cognitively, acceleration carries

information of intention. An abrupt change of acceleration creates an expectation breach and, in this system, corresponds to the start point. These two aspects of the movement of the conductor are further explored in the sonification.

4.2 Sonification

The sonification developed for this study was based on principles already implemented to compose the multimodal work "Ode to Christus Hypercubus", which was discussed during the 21th Generative Art Conference [14]. The main sound devices explored in the sonification are: 1) long duration low-frequency sound with a dense texture that remains during the whole work as a mechanism of connection between the two distinct visual elements the geometric transformations and the video clips; 2) granular sounds with a variety of grain density and attack mechanisms that depend on the recognition of the gesture captured by the two control interfaces (Kinect and Leap Motion); 3) a set of incidental sounds to signal the insertion of new visual elements, parameter changes, and video clip changes.

As a compositional process aided by the computer that connects sounds and visual the main task was to fulfil the space with many sound alliterations. We already discussed that a multimodal performance can be seen as a way to create a unified experience where sound, image, and audience are merged in space and evolve coherently in time [11]. Therefore, a constant musical drone accentuates resonances in which listeners' memory is expanded. Our approach was to study the relation between granular sounds and sound diffusion by controlling digitally the generated sounds and correlating granular synthesis spatialization with the Ambisonics technique.

4.3 Visualization

Using the Processing environment, the visualization process was based on the construction of two distinct elements: 1) geometric images generated by parametric transformations in real time, 2) silent movies clips in black and white. These two visual contents with their different natures were woven into the work. The objective was to create contact surfaces between two different representations and seek to explore their similarities and differences.

4.3.1 Geometric Transformations

The images, generated by a rather spartan program implemented in Processing (p5.js), reproduce frames of a spiral in perpetual motion (figure 2 and figure 3). More than the adoption of a certain mathematical objectivism, as it could mislead the ellipsis in rotation regulated by trigonometric functions that the code implements, the spiral refers in particular to a visual analogy of obsession, of "idée fixée", as used in cinema. The "Fraser spiral illusion" that the video, confined to dark shades exclusively, aims to accomplish, refers to the spirals that Fritz Lang uses as metaphor for his protagonist's psychopathy in *M – Eine Stadt sucht einen Mörder*

(1931) or those that Alfred Hitchcock and Saul Bass use in *Vertigo* (1958), one of the most renowned cinematographic studies on human obsession.



Figure 2: spiral perpetual



Figure 3: converging frames

4.3.2 Video Clips

Originally, these video clips were cut to fit their related musical themes. These relationships follow a logic of cataloguing the moods used in the silent movies and distributed in dedicated publications called photoplay music, mood music, motion picture music and so on. The most comprehensive of these publications is Erdmann & Becce's huge manual, called *Allgemeines Handbuch der Film-Musik* of 1927. The macro-scheme is based on a taxonomy indexed by the following 2 parameters: '*Incidenz*', or themes for general, incidental music, and '*Inhalt*', or themes specified by dramatic and narrative contents. There are more than three thousand small thematic fragments organized like this on the *Handbuch*. The music suggested by the publications, in particular by Erdmann & Becce [1], were used here as a starting point, but the resultant sonification will be generated by the network interaction. However, the cataloguing of emotions and meanings was a way of producing insights into the generative process.

Video Clip 1: The meeting between Eva (Hedy Kiesler, then Hedy Lamarr), and Adam (Aribert Mog). While Eva was swimming her horse runs away, and is captured - and returned - by young Adam. The mismatch of the escape of the horse generates the encounter between the couple, in causality that triggers the passion and ecstasy that will follow its irrepressible path.



Videoclip 1: Ecstasy, 1933, dir. Gustav Machatý

Video Clip 2: This meeting creates a communication between the two sides of the city Metropolis: the apparent side of wealth, prosperity and unconcern, and the underground side of poverty, the enjoyment of the proletariat, and the insalubrity.



Videoclip 2: Metropolis, 1927, dir. Fritz Lang

5. Discussion

As we understand in the article presented here Generative performing art is an open platform, where the agents can be at the same time the subject, the main character of the poetic lyrics, and the public who enjoys the performance [8][16]. As usually happens, the construction of a creative process is not built by linear actions and interactions, either by the artist who creates a message or by the observer who receives it. This process, in fact, of any art, remains an open work, an open art form

that offers different interpretations, always according to the subjective experience of the viewer.

In the digital age, technological devices could be seen as extensions of the body [9], it is the experience and interaction between the work of art and the human body that determines the subjective understanding of the artistic message, as mentioned by Kozel [7]. In this context, in fact, when we talk about the artistic process, therefore, we are not referring only to the 'at source' process anymore, that of the artist himself. We are, in fact, referring to the same process carried out by the observer, who through his exploration and his Sensorimotor Contingencies can understand, interact and therefore directly modify the entire creative process of the work of art.

For this reason, the work presented by our research group 'NICS' is an open work, an ongoing process to remote and in-person interactions, to demonstrate how the artistic process can be modified non-linearly and can determine a cyclic co-determination (concrete) and a constant (abstract) perturbation, thus increasing the creative potential that emerges from the interaction between the parts.

Therefore, a non-linear communication takes place with the other agents, which transform the information they receive and then return this stream of data so changed to the network. This is possible through the design of various associations, both concrete and abstract, through the technological piece that we propose, and bearing in mind what the paradigm of Embodied Cognition underlines; in particular the Sensorimotor Contingency Theory in which the sensorimotor contingencies governing perceptual exploration in the different modalities [17].

6. Conclusion

The study discussed here focuses on network architecture as a means of providing a framework of collaboration between different researchers so that everyone can contribute to the accomplishment of creative work. In this sense, project members shared the same physical space during the performance or may be in remote locations. During the creation, the network architecture was mainly used to enable prototyping of structures and development of ideas. In a second moment, the actions were integrated and the performance itself is the process of adjustment between the parties of the work.

In a previous article, we have argued that a theory of mind, including one of creativity and aesthetics, will be critically dependent on its realization as a real-world artefact because only in this way can such a theory of an open and interactive system as the mind can be fully validated [21]. In this way we understand that, while we develop a platform that allows creative interaction among researchers, this same methodology is a way of studying creativity using computational models that by extension will reflect models of the mind.

Considering the broad Embodied Cognition paradigm, perception is connected to embodied experience, and within an interactive landscape “this perception is augmented and can be directly tied to our emotional experience” [19]. That means

that through this artistic and experiential process, we can represent the subjective self-perception that the user experience.

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