

NETWORK ART: YOU HAVE TO LET YOURSELF FLOW WITH THE AVALANCHE.

Studies of a Tele-Sonorous Body.

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Abstract

This article analyzes Network Art based on the physicist Per Bak's proposal (1996) to use a model of a pile of grains of sand to discuss complex dynamic systems, which fits what we assume to be the condition for the projects and performances in telematics developed by our research group, o Grupo de Pesquisa Poéticas Tecnológicas: corpoaudiovisual, since these processes have in common a large variability in both environment and elements. In this system, self-organized criticality is part of the process, which remains in constant imbalance, reaching just what may be understood as a punctuated equilibrium. Artistic, technological and aesthetic research propositions on the (tele)sonorous body are considered contingencies that contribute to the complexity impacting the critical stage and the emergences of that system. For this analysis, the works that will be discussed are projects undertaken by *Laboratorium MAPAD2* (2011) and *Embodied in Varios Darmstadt 58* (2013/2014). Our intention is to confirm the aspect of the Net that, like the model of grains of a sand pile, cannot be considered in a reductionist manner. For the effective operation of Network Art you need to understand it in the unstable web of its nodes, in a global dynamic, and enter into the unpredictability of a system with self-organized criticality for the experience and artistic act to occur.

Keywords:

art, sonorous body, network, self-organized criticality, unpredictability, complex systems.

Self-organized criticality is nature's way of making enormous transformations over short time scales (Bak, 1996:61).

Let's start by recalling an image, a trivial experience that everyone must have had: sand grains that fall slowly over a surface, forming a pile. Initially, the grains remain virtually in the same spot where they fell, almost unchanged. A grain may fall on top of other grains making them slide down to a lower level. The addition of a single grain of sand can cause a local disturbance but nothing dramatic happens to the pile. As analyzed by the Danish physicist Per Bak (1996), in this first moment there doesn't seem to be any global response in that assembled pile of sand, only at the spot without major changes in the whole. But if the flow continues, the slope will reach a certain value that can go no higher, because the amount of added sand is, on average, the same amount of the flow of the falling sand. Therefore, such action causes many grains to eventually slide beyond the edges of the pile. Bak calls this a steady state phase, since the average amount of sand and average slope are constants in time. This is a critical condition that is characterized by impreciseness, and when and in what proportion other avalanches might happen is not predictable. There may be other 'landslides' that affect the entire stack, since, as the slope increases, a single grain is more likely to cause the fall of other grains, like a domino effect. The continuous addition of grains of sand transforms the system from a state in which the individual grains follow their own dynamic sites to a critical state where the emerging dynamics are global. This is the self-organized criticality of a complex system (pile of sand) with its own dynamics emerging (unpredictable landslides that reorganize the lot). The emergence of the pile of sand could not be predicted from the properties of individual grains as a complex system should always be considered globally, taking into account their contingencies, i.e., the context, their agents, their histories - in short, the variability of the environment and its elements. "In the critical state, the sand pile is the functional unit, not the single grains of sand. No reductionist approach makes sense" (Bak, 1996: 60).

This model of grains of sand pile was constructed by Bak and his colleagues Chao Tang and Kurt Wiesenfeld at Brookhaven National Laboratory (USA) in 1987 as a simple prototype to explain the existence of self-organized criticality. This model shows how a system can self-organize in a state that tends to balance, always unstable, based on simple and local rules, but not considering these developments as smooth and quiet, but through disturbances. The flat surface, he explains, represents the state of general equilibrium; this state has the lowest energy, since obviously you need to add energy to the pile of sand for it to be reorganized (Bak 1996: 50). Thus, Bak's study did not consider it practical to think that a complex system reaches a state of equilibrium when it reaches the critical state, because equilibrium systems cannot be considered complex and dynamic systems. For Bak, complexity must

be understood as variability (ibidem). In the vein of the paleontologists Stephen Jay Gould and Niels Eldredge, the physicist states:

[...] the apparent equilibrium is only a period of tranquility, or stasis, between intermittent bursts of activity and volatility in which many species become extinct and new ones emerge. [...] This phenomenon is called punctuated equilibrium. The concept of punctuated equilibrium turns out to be at the heart of the dynamics of complex systems. Large intermittent bursts have no place in equilibrium systems, but are ubiquitous in history, biology and economics (Bak 1996: 29).

After a decade researching academically and artistically, that is, feeling, experiencing, analyzing and reflecting on Network Art, I am able to say that the grain of sand model is perfect for the analysis of artistic processes in telematics. There is no way to study, much less create, this artistic configuration with a view only to site, or local. In other words, it is important to stress that one can't do justice to this telematics relationship by focusing in on one city or site (point of presence). It is not a matter of just transmitting remote locations over the Internet, but rather it is the **dynamic and constant relationship** between these locations and the very condition of the network that must be understood as a functional unit, responsible for the art to emerge. It is a complex system in which telematics work must be understood as a pile of sand, and each art space and each node through which flow transits should be seen as grains that are poured to form the hill, that is, each participant creator with his or her team, each active network engineer in the process, each router through which the path of the flow of information crosses, and network traffic itself must be considered as elements belonging to a system. This network of nodes must be seen as global, never by a reductionist view that considers Network Art from the point of view of the local artist's individuality. Such a perspective does not take away from the uniqueness of each Point of Presence (PoP), nor does it inhibit the idiosyncrasy and freedom of each artist. On the contrary, it intensifies each part by emphasizing it when in tune with the whole. The parts gain relevance as they emerge, allowing the execution of a critical system state.

Following this understanding, the form in which I idealize a project from the creative process to the presentation of the work brings into focus the kind of relationship that I intend to develop between the participants and, for this, I begin with some questions, such as: which aspects will be captured at each site?; how will they be processed to reach the remote partner?; how are these codes interrelated?; what is the position of the projection screen at a point of presence and how will it impact the spaces of the partners? and so on. The process, therefore, is not structured on the basis of local interest; rather the proposal goes beyond setting out a theme for each participant to develop, as they want. However, this does not mean creating a hierarchy, as many might misinterpret since the goal is to establish a plot, or web, for this network of ideas. It is a

matter of cooperation that rightly bears the properties of the medium, i.e., contingencies exist, in the sense given by Bak (1996). This factor cannot be neglected.

Given the systemic nature of Network Art, I developed an enlarged storyboard for expressing an overview, plotting the relationship between PoPs throughout the creative process, not just as a timing guide. For example, the directions (Fig.1) can show the camera (C1) of POP1 must have a specific framework, while in Pop2 this image should be projected on the screen 1 (T1) so that the dancer improvise with an “x” proposal to build a composition which complies with the concept of the work and, finally, C2 makes a framework to encompass all layers¹ creating an imagistic composition among all the PoPs, which is normally sent to the Internet public. These indications are not static, they change all the time according to a pre-established script in which the encoders (incoming information: image, sound, data) can be transmitted in any decoder (output information transmission available through projectors, the speakers, etc.) and at any time. In this example, we can see that there are specific indications that function as keyframes, from which the scene moves by the improvisation of each agent involved. Thus, Network Art is understood here as a dynamic and open system, constructed and activated in accordance with the contingency of the overall context. Network Art also possesses local and global factors with different degrees of freedom. An action of a remote partner, or even any event in the network itself, can cause an unpredictable disturbance (the avalanche), thus reorganizing the system entering a state of punctuated equilibrium. In my opinion, this is exactly the point at which art most effectively enters.

Network contingency (high rate of jitter, re-direction of the route, etc.) seems to be overlooked by many, or, for others it is seen as a technical problem that must be worked on to be able to control it, a dubious enterprise given that even if we can achieve a punctuated equilibrium, we can never achieve absolute control of the network. The information highway should not be understood as a river with a stable, steady, calm flow. Disruption is ongoing in this complex system. It is not a matter of a quiet network disturbed only by human activities, but of a complex system, which, in itself, has variability. Several factors contribute to the dynamism and unpredictability of the network: For example, “the number of packets in the buffer of a router or a multiplex, the total number of packets sent for a period, average network usage, variance and covariance of packet flow, time interval between packets received or correlation in delay, which are between switches, routers and network transmission links” (Dias, 2005: 2). All this, without counting on the possibility of fiber damage caused by problems in the logical system or even the physical system; natural disasters, etc.

At the beginning of my research in telematics, projects were developed by my group in partnership with a team of engineers and computer scientists, which enabled greater accuracy with aspects that were being studied and closer direction to achieve the objectives proposed. Since we were responsible for all of the artistic development, there was therefore a lower degree of complexity than projects developed with various partners. The process consisted of local rehearsals, in the same environment, but simulating the two points of presence. The storyboard was built in detail, since we were very clear about the positions of the dancers and cameras, the movement of both, the desired imagery construction on each screen, etc. Thus, the group effectively was very clear as to what it wanted and as to what was defined as appropriate in terms of the keyframes.

Since 2009, when I began to realize creative partnerships with national and international groups in Network Art, there were other commitments and objectives that were defined according to the interests and the possibility of each group, a factor that determined new instabilities. There was constant negotiation between the artistic ideas of each group in order to respect the creative freedom of artist partners, because our goal was to limit advice regarding the conceptual structure proposed by the work. The process was no longer constructed only with members of the GP Poética, a procedure that we considered beneficial to all involved, since this involved new demands and stimuli - both artistic and technological - to be solved creatively. We considered this strategy of dialogue and negotiation with other groups to be a commitment to the development of the field. On the one hand, this GP Poética decision served to process and transfer knowledge, helping to disseminate and offer training in the field, since most of these artists had not previously worked with telematics. On the other hand, the creative process with different groups allowed me to deepen my research through new methodological prisms, aesthetic and research options, analysis of network configuration (from

the artistic and technological point of view) and obviously served to move forward with my main objective: namely, to find new stimuli to investigate corporeity as mediated by new technologies, thus enabling me to expand my studies of human perception. After all, I emphasize that all of my artistic projects, not only those in Network Art, but all my research on technological mediation in dance, from my timid start in the '90s to the present day, has perception as the center of research - not as an end in itself but as a way to discover other corporeal conditions of movement for composition and improvisation in dance.

As the linguist George Lakoff and philosopher Mark Johnson (1999) affirmed, the mechanisms that allow us to perceive and move through the environment are the same that create our conceptual systems and modes of reasoning. Seen in this light, to interact in a telematics environment (or any technological mediation) is not just to create a new aesthetic or another artistic configuration. Rather, this interaction functions as a medium in which we perceive and act on other elements that ignite our perceptions, with other demands to sensorimotor apparatus, aspects distinct from conventional contexts, thus stimulating the perception by other means. All this matters to build cognition.² Technological mediation, not only in the arts but also in our everyday life, allows an extension of our skills to perceive and interact with the world thus altering our basic-level perception, which is responsible for our first ability to acquire knowledge (Lakoff, Johnson, 1999). These are the assumptions underlying my research on dance with technological mediation.

The projects conceived in 2011 brought a new stimulus to the Network Art creative process, one hitherto little explored by us in this field: the relationship of body and sound via telematics. Besides, this is a theme that we can place historically in the close and direct relationship between ballet and music, going through periods where sound and noise formed a kind of texture, or web, that co-existed with dancing until we reach the age of interactivity and of synthetic sounds produced as the subject activates them, just to name a few milestones in the history of dance. My goal is to explore the body for its sonorous nature by virtue of its organic noises, its disposition for language (oral and symbolic) and for its acoustic existence. To accomplish this research, very distinct from my previous research anchored in the image, it was necessary to pursue other artistic and technological configurations that take into account how corporeal sonority is processed and transmitted. In previous works, the image was the center of relational convergences, and now sound would become the reference point for remote partners, thus seeking to break away from an exclusive reliance on the visual in telematics. This proposed new artistic and aesthetic research instigated new demands both for the body as well as for interactivity and network connectivity technologies. Dancers, musicians, videographers, engineers and everyone involved gained new stimuli for the challenge of the (tele)sonorous body proposal.

Research on the dance / music, body / sound relationship began in 2010 in the interactive show *Sonhos e Sons (Dreams and Sounds)*, realized in a

conventional environment, not in telematics, created with musician Cyril Hernandez and the dancer Carolina Baudouin of *Cia LaTruc*. In 2011, it was further developed in the project *Laboratorium de Arte Telemática MAPAD2 (Art Laboratorium Telematics MAPAD2)*, performed among seven research groups from Brazilian institutions, and finally developed during my post doctoral residency at the Sonic Arts Research Centre (Northern Ireland) between the years 2012 and 2013. The results of this process were applied in the project *Embodied in Varios Darmstadt 58 (EVD58)*, performed in 2013 with partners from Spain and Mexico. In 2014, the EVD58 project was created with artists from Portugal and Chile developing the piece *Personare* because we were interested in, and felt the need to, test other network environments, as well as other artistic and technological aspects.³ This article addresses the trajectory between 2011 and 2014, where research focused on the (tele)sonorous body.

As previously stated, this new phase of Network Art research has enabled major discoveries for the field. The methodology developed for the project *Laboratorium de Arte Telemática MAPAD2* (2011) may be cited as a good example. Considering my excellent partnership with engineers and computer scientists from the Laboratório de Vídeo Digital (Digital Video Laboratory /LAVID) of the University of Paraíba, coordinated by the researcher Guido Lemos, and the Rede Nacional de Ensino e Pesquisa - RNP (The Brazilian National Research and Educational Network - RNP), I realized that this association was not only important, but essential for those seeking careers in the field of Network Art. The success of this partnership between the GP Poética, the LAVID and RNP can be illustrated by the development of the *Arthron* computational tool (Fig. 2) used in the creation of the show *e_Pormundos Afeto*,⁴ innovative fruits of the Grupo de Trabalho em Mídias Digitais e Artes (Working Group on Digital Media and Arts / GTMDA), which also featured a collaboration of the Spanish artistic company, Kònic Thtr, through the i2Cat Foundation.

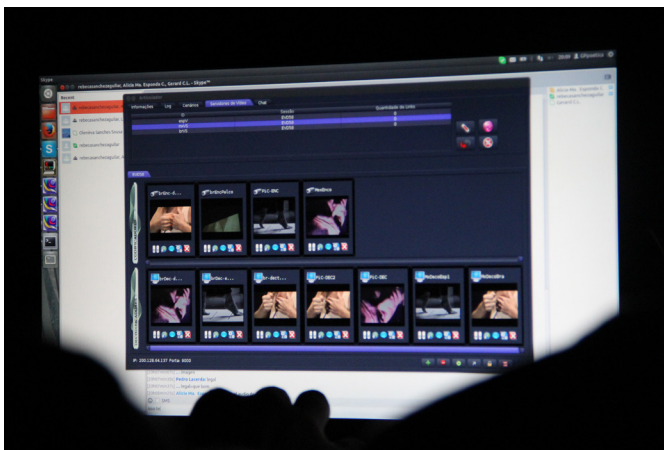
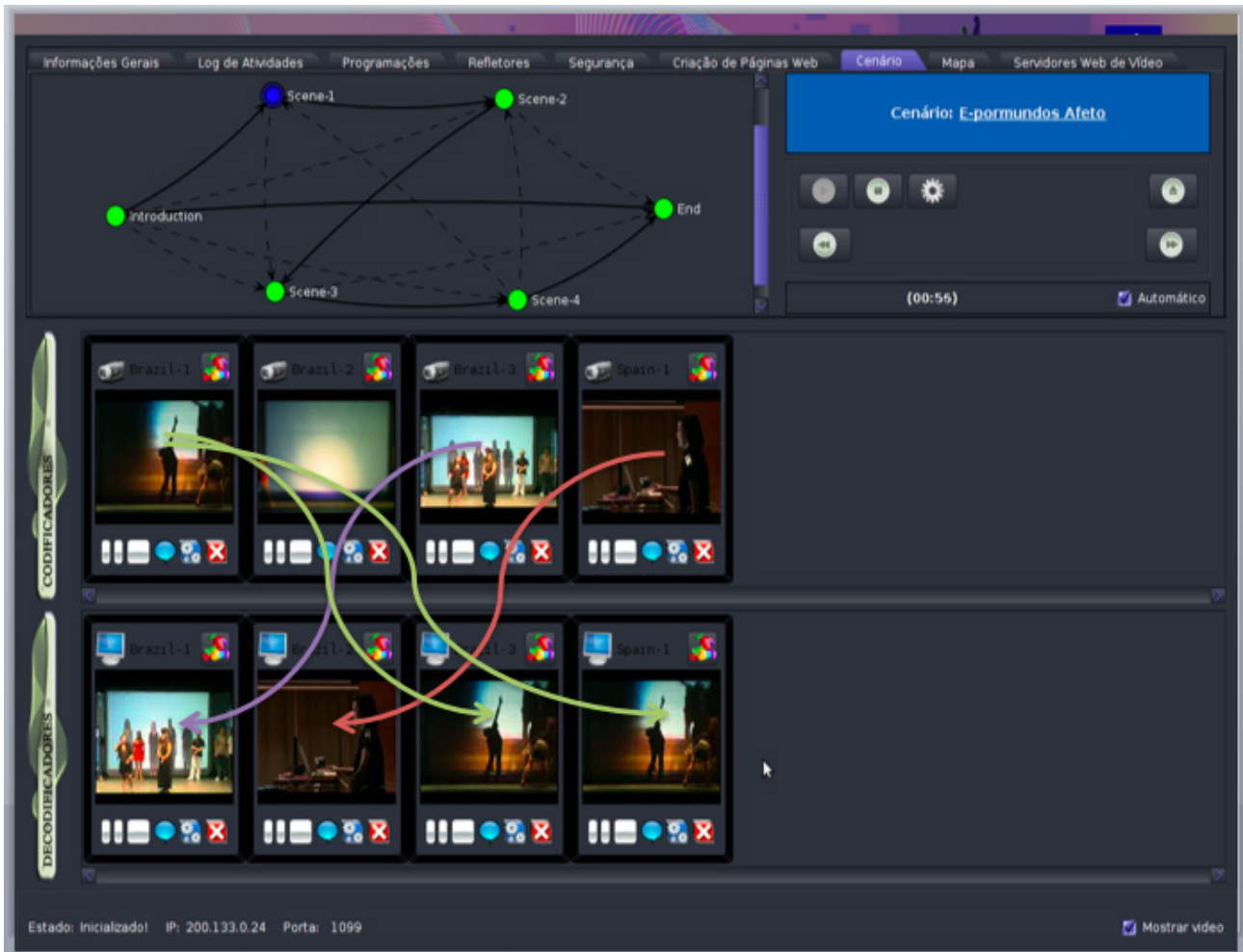


Figure 2. Arthron - computational tool developed by the GTMDA. An image from the tool screen shot during performances of *e_Pormundos Afeto* in 2009, the same work in 2011, and the 2013 version of *EVD58*, respectively.

The *Laboratorium de Arte Telemática MAPAD2* was awarded support from the VIVOLab with the proposal to undertake Network Art research with different artistic languages groups, understanding that each participant could count on the support of a technology group. The LAVID would support capacity building and implementation of *Arthron* for all teams, and the RNP would continue to provide support for the use of the academic network. The collective was then formed with the following groups: Grupo de Pesquisa Poéticas Tecnológicas / GP Poética (Group of Technological Poetics Research / GP Poetics) in partnership with a team led by Professor Celso Saibel of the Department of Computer Science of the Federal University of Bahia; the Laboratório de Poéticas Cênicas e Audiovisuais (Laboratory Performing Poetics and Audiovisual /LPCA) of the Federal University of Ceará, with professionals in the Department of Computer Science from the same institution; and the Núcleo de Arte e Novos Organismos (Nucleus for Art and New Organisms / NANO), of the Federal University of Rio de Janeiro with the collaboration of the Grupo Telemídia (Telemedia Group) from the Catholic University of Rio de Janeiro (PUC). Through these collaborations, the *Laboratorium de Arte Telemática MAPAD2*⁵ was able to train many professionals to work in this field. This meant not only learning to use a tool like *Arthron*, but also learning new ways of using devices already incorporated into the art world such as the video camera, microphones, sensors, etc., since these tools can be manipulated by other operations in telematics, giving rise to other procedures and possibilities. Thus, all stakeholders, artists, engineers, technicians, etc., had an important experience for their own research fields. This methodology enabled each group to develop locally in view of the overall achievement. The growth of groups in each state strengthened the relationship between this network of laboratories.

The goal of working with different artistic languages allowed everyone to gain new experience, since each group triggered stimuli according to their own playing field and this signified innovations to all members of the collective. On the part of the LPCA, Juliana Rangel, who researches the possibilities of voice as language, worked with the actor Héctor Briones and the image researcher Walmeri Ribeiro to establish sound stimuli through texts and varied vocal procedures that would be used by the other teams. A good example is the image of an actress with her head immersed in an aquarium and the sounds produced in the water, a context that was used by the dancer from GP Poética, who employed breathing as support and integration with partners. With a weekly schedule determined for meetings and rehearsals between the groups, the dramaturgy of the work was created always using this relationship between the sounds created in Fortaleza and the movements of bodies in Salvador. Breathing and voice were the first elements used in the work storyboard construction. The NANO team, coordinated by Guto Nóbrega, worked on developing a robot called H.A. that articulated these two characteristics: breath and movement. H.A. had a large balloon that filled and emptied, a kind of belly on which images of the other points of

presence were projected, and a kind of neck that could move according to interaction from the dancer or actor. One particular aspect was detected as the performance progressed: the actual production of the hybrid organism lasted almost all the period of the creative process, leaving little time for the relationship between the automaton, dancers and actors to be effectively constructed. All these biological and non-biological bodies needed a continuous relationship flow for the interaction to become established. Time and continuity were necessary for the system between these bodies and the network to enter into self-organizing criticality and allow other things to emerge.

In addition to the periodic tests, the creative process involved in-person events called Open Lab, two meetings closed to the public: the first, in Salvador, to lead off the project by presenting the teams and their members, the concepts and research proposals, and the GP Poética's history in the field; and the second, held in Fortaleza, in which it was possible, with all present, to hone in on the concepts and the aesthetic and technical proposal, as well as enable further integration between all individuals involved in the project. A third meeting took place in São Paulo, in the SESC Ipiranga, as a work in progress presentation, where the three groups were spatially distributed in a rehearsal warehouse and connected by LAN. The *Laboratorium de Arte Telemática MAPAD2* was completed with the work *Frágil (Fragile)* in 2011 (Fig. 3), presented at the *Desafios de Arte em Rede (Challenges of Network Art)* the Cultural Forum's premiere event, held at the Museum of Modern Art (MAM) of Rio de Janeiro, connected to the University Theatre in Fortaleza. The H.A. and the three interconnected niches of the GP Poética were distributed throughout the MAM space, and all of them were interacting with Fortaleza. As the images of all these points of presence were alternating among the projection screens of all these environments, considering the existing niches in Rio de Janeiro as those created by performative installation established in Ceará, the reference of spatial limits became blurred, so that often the public did not understand who really was in the Northeast and which dancers were in the museum - a breaking up of borders highly desired in the project's design. The profusion of images created a scrambling of presential attendance with the tele-presence of the remote partners, which made a member of the public report that he felt the ground give under him, because he no longer knew where he was. This feeling of disorientation is an example of what can happen as a result of the complexity of this system and the self-organized criticality of this process, in which the audience is also part.



Figure 3. *Frágil* (2011) Museu de Arte Moderna, Rio de Janeiro, connected with the Teatro Universitário, Fortaleza, Ceará. Ballerina: Mab Cardoso. Actress: Nayara Souza. Photography: Aloysio Araripe.

I believe that the methodological proposal to articulate an artistic group and other technology at each point of presence; the structure of meetings with periodic rehearsals both through the network and presential through Open Labs; and also having 10 months to polish the creative process were important factors to show that this procedure is quite satisfactory and useful in creating Network Art. However, to be effectively deployed, everyone involved must be interested in working with interdisciplinary processes and be able to arrange their schedules taking into account the project's overall needs and not just the local objectives. Unfortunately, collaboration between some project groups simply did not happen for lack of openness on the part of technological staff, or because they thought that they could resolve issues coming from the artistic group at the last minute, and did not give due importance to the problems and time necessary to solve them. Art is often considered by some professionals in engineering as a study of little relevance, with a low degree of difficulty, and therefore a subordinate element in the relationship. This attitude led to huge expenditures of energy at the end of the process, when they finally realized what was really involved in these artistic processes. Besides the lack of understanding between the artistic group and the technology group, not all of the institutional sites of the PoPs understood exactly the proposed use of the academic network for the Arts. This required the project coordination to intervene, appealing to higher levels of these universities, or even, requesting that the RNP intermediate so that, for example, security protocols could be overwritten so the project could use some portals for direct connection to the partners. Another important aspect, always, is to understand the need to practice punctuated equilibrium, i.e., during the process everyone must be available to participate in the network relationship, placing their "grains of sand" in the mix, independent of the stage of local development: Construction must be a joint process, it takes continuous action over the network in order to acquire the insight and know-how to act in accordance with the contingency of the telematics system and of the work itself. As in the sand pile model, Network Art has to maintain a continuous flow so that the avalanche occurs, in order to enter into a punctuated equilibrium where self-critical organization can occur. Each PoP, each idea and artistic and technological action should be considered, as a grain of this flow to be poured into the system so that the process can happen.

This aspect will again be illustrated with descriptions of the more recent projects developed by the GP Poética. At this point, it's worth reiterating that, for the avalanches described here in the grain of sand theory, these are not understood as negative disturbances, rather they simply signify unexpected events that occurred. These are moments that arise in this complex system of Network Art that can be considered as an integral part of the experience of producing Network Art. Through the sand pile model (relevant to the creative processes performed by telematics, as we have emphasized), Bak understands that self-organized

criticality occurs in nature as much as biology, economics and history. To launch a system in constant punctuated equilibrium such as Network Art is to open up the system to the unexpected, where one never has absolute control. Therefore, one must change the way in which creativity is perceived, both in work and in the artistic experience. These are not tranquil procedures, without turmoil. On the contrary, they will always be in punctuated equilibrium, in instability, and that's what makes Network Art be "in network."

The Laboratorium de Arte Telematic MAPAD2 was a very important experience for the methodological understanding of such processes, strengthening various findings on strategies already glimpsed in previous projects. These results have been applied in the project Embodied in Varios Darmstadt Various 58, although with two distinct processes in terms of network configuration and aesthetic interest. To follow our sand pile analogy, we began with new piles of telematics grains with different contingencies, experiments that confirmed the importance of testing new aesthetic and investigative choices, in addition to going through other nodes as points of presence.

I wrote several articles⁶ and reviews on these projects; therefore, I will limit myself here to describe the creative process according to the model of the complex system. Thus far, we've addressed the importance of methodological processes and the specific procedures used for Network Art. Now let us consider stimuli created by new aesthetic propositions, in this case the proposal of the sonorous body, or (tele)sonorous when performed in network systems. This research was developed during my post doctoral residency at SARC (Northern Ireland) and consisted of three main studies: a) audio feedback, b) listening to the body, including the use of binaural recording and the amplification of the acoustic body, and c) synthetic corporal sound.

To clarify in more detail: for "a", audio feedback, the aim was to disrupt the acoustics of an environment through the action of a body in that space. To do this, I used audio feedback from microphones attached to a body; an aspect already experienced in the work *Sonhos e Sons* (2010) as already mentioned. I also researched this in the studio of the Cia Latruc in Centquatre (Paris) during the post-doctorate. This research was important to create *Disturbance*, a performance created in partnership with the musician Pedro Rabelo (SARC). In this performance, I used one microphone in each hand and a wireless speaker attached to my lower back. Movements created the sound feedback, which was transmitted to four speakers lined up at the back of the stage behind a white roundabout (Fig. 4). My sensation was able to model the sonorous environment with my own hands while dancing so that sound gained materiality, took shape at the same time that my body became agent of this sound.



Figure 4. *Disturbance* (2013) presented at the Sonorities Festival of Contemporary Music 2013. Beyond soundscape.
Photography: Yi Lin.

b: listening to the body). I made some studio recordings of corporal movement in an anechoic chamber at the University of Porto (Portugal), but did not reach any significant result. Another study was conducted with a binaural audio recorder, which simulates the spatial reference of the human ear, and that path seemed much more interesting to stimulate both the dancer and the public's perception. This procedure allowed the observer to hear the sound created by the dancer's body through a subjective listening point. This investigation was applied in an experiment conducted at the Oeiras Foundation (Portugal), in which I made recordings on an amplified wooden platform, and was also used in the creation of the performance, *Sussurros. Paisagem Sonora para Dança (Whispers. Soundscape for Dance)*, created and displayed in the Graça Brandão gallery, in Lisbon, as part of *InShadow, 4th International Video Festival, Performance and Technologies*. Part of the public listened to sounds recorded in binaural, which I have called the interactor, while the other part, sitting in front of the first group, watched a silent performance, interrupted only by small sounds of the body in space and by the manifestation of the interactors in response to the dramaturgy of the work they listened to. Binaural recording was explored in other works after the post-doctorate, such as in *Memórias no Espaço (Memories in Space)* (Fig. 5), a "soundwalk" in dance created for the Castro Alves Theatre Ballet as part of the *Gretas do Tempo⁷ (Gaps in Time)* project, carried out in the Pelourinho, the historic center of Salvador, Bahia. The public chose one of the five soundscapes (sonorous landscapes, in this case for dance) provided by the project website, and went walking through some of the Pelourinho streets, with headphones, listening to audio narrative created by the body and action of the dancer in that environment. The dancer may or may not be present in each of these passages throughout the soundwalk for dance, thus enhancing the semantic layers of performance. As the narratives intersected, at points the interactors were close together or spaced along the walk, and in the end, all were gathered together to attend the performative installation *Memórias no Tempo (Memories in Time)*, held at the Rio Branco Palace. The foot scraping the concrete floor, the creak of the window opening and closing, footsteps on the floor - all were sounds that the public, as interactors, witnessed by the subjective listening provided by the work. Sounds that were external to the dancer - such as bells ringing in the nearby church, sounds specific to cars, motorcycles, to street vendors who passed by the dancers, or the hollow sounds of enclosed ambiances - all these sounds were utilized to create each dancer's narrative. As in *Sussurros* (2012), those with headphones participated in the work as an interactor since they accompanied the dancers during the soundwalks held in the streets and thus were seen as part of the work. Passersby of those locations became witnesses of that happening, that for them, transpired silently since they did not have headphones and therefore did not have the sound information from the narrative, but only a few sounds from the performance occurring at that specific place and time.

An interactor reported afterwards about how surprised he was when he felt someone pass him saying “Good day!” since the performance took place the night. When he turned to see the supposed person who greeted him, no one was there, just the sensation of listening at that moment mediated by binaural recording. Again, perception provoked to create new sensorimotor responses.

c) Data processing of corporal movements, or the actual body, had already been explored in a number of projects through interface and digital media. However, in order to develop the sonorous-body concept, attention was given to other factors in the process. At SARC, I participated in a collaborative process with the composer Graham Booth and the musician Robin Renwick that led to the interactive programming and network configuration for creating *Ellipses* (2013) (Fig. 5). Both this performance and *Sound Me* (2013) (Fig. 6), created in partnership with the musicians Miguel Ortiz and Franziska Schroeder, were carried out in network with the University of New York team, led by Professor Tom Bayer. At first, our intention was to perform *Disturbance* (2013) through telematics with the United States, but because of a series of technical and artistic factors, we preferred to keep this performance only in the local environment. Anyway, the intention of *Sound Me*, *Ellipses* and even *Disturbance* was to establish a sound relationship between the points of presence. In *Sound Me*, the dancers in New York captured the sounds of 4th Street, which were used by Miguel Ortiz in the composition of the soundtrack, as was my breathing while I danced with Franziska Schroeder who played the saxophone. In *Ellipses*, the movement of the dancer in New York altered the sound mapping in Belfast, while my movements accessed some parameters of sounds created live by the composer Graham Booth. Very different from the structure of my research group, the team at the SARC was much smaller and the production was performed only on the week before the event. The creative process and realization of these performances therefore were very arduous, forcing me to double up on work in various capacities in order to achieve a minimally presentable product, something that greatly hindered much of the research and work results. I don't say this as a lament, but as a confirmation of the need for specialized staff and professionals in specific functions for developing a Network Art project. The energy that I could have spent solely on research itself ended up being dissipated by the accumulated tasks. However, the artistic processes developed in the SARC were greatly relevant to my investigation, and the success achieved is due to the excellence of Pedro Rebelo's contribution; to the care and continuous stimulus provided Franziska Schroeder; and to the competence and commitment of Robin Renwick. My postdoctoral research therefore revealed positive and negative aspects of the project, both of equal importance. Without the challenge of the negative aspects we tend to repeat ourselves, while it is the difficulties that incite us to pay attention in new and different ways, leading to transforming actions. Avalanches are necessary in any systemic and complex process, whether they be positive or negative occurrences.



Figure 5. *Sound Me* (2013). Created by Ivani Santana, Miguel Ortiz and Franziska Schroeder.
Photography: Yi Lin



Figure 6. *Ellipses* (2013). Created by Ivani Santana, Robin Renwick and Graham Booth.
Photography: Yi Lin

The experiences in these creative processes in Europe formed the basis for designing the project *Embodied in Varios Darmstadt 58*. From improvisation in music and dance, our goal was to build a scenic score to interrelate dancers and composers from three locations. The body being the common thread among all, the proposal was to build a sonority through three layers, which I have called: 1) the organic body (breathing, heartbeat, voice, guttural sounds, etc.); 2) the acoustic body (sounds produced by the confrontation of the body with other objects, with the environment and with itself); and, 3) the symbolic body (sounds made through computational synthesis). My intention was to get the entire soundtrack constructed from these layers of sounds from the dancers in each country. This would require very attentive cooperation from the three composers involved, as well as between them and the dancers, so that the sound texture would achieve its goal: to create a unique sonority for the three environments. Although precious moments in this direction have occurred, the concerns of local control always seems to have prevailed, thus dispelling the possibility of achieving an integrated network design.

A difficult moment, but I believe to have achieved the goal, as can be illustrated with the third scene from EVD58 in 2013, which indicates the potential of this fabric created between several hands and bodies in telematics. Synthetic sounds were created from the motion capture through the kinect that provided data to the computer, which in turn were transformed into graphics and sounds. The computer system used by the three countries was programmed by musician Luiz Naveda.⁸ My conception for the relationship body/action-graphics-sound had proposed creating traces of movement occupying space-time, thus seeking a visual and audible representation of this displacement rather than the dancer's static position. The idea was not to represent, for example, if the arm is above (maximum degree in the "y" axis), then sound "n", if located underneath (maximum degree on the axis "- y") sound '- n "'. It was not this direct relationship that mattered to the project, a very common type of interactivity in early Digital Dance. The aim was to represent the "topology" of the movement in a sonorous and graphical form. The scene began with a sequence of solos with a times count of sixteen for each group at a time, and time grew shorter until all the dancers were dancing at the same time (sixteen times, eight times, four times, simultaneity). Thus, one could check the image of the movement trajectory through the graphics on the screen, and hear the sound of each PoP, allowing one to perceive how the relationship between them was construed to form a single fabric of sounds, graphics and bodies. As in the model of the sand pile, the telematics system started with local disturbances until reaching a state of global disturbances, thus allowing emergences that transformed the whole system; then, they entered the state of punctuated equilibrium until unexpected avalanches occurred again. The scene was very difficult to perform, especially because of delay, but this also enabled a good strategy for the dancers to hear and see each other more closely. In the performance *Personare* (2014), the first scene, where the organic layer was explored, was the one that best achieved this state of self-organized criticality. In both examples we can see that success is due to the ongoing process of the dancer going forth into the scene, **but forming the same "sand pile"** which afforded moments of punctuated equilibrium and maintained the dynamic and complex system.



Figure 7. Third scene of the performance *Embodied in Varios Darmstadt 58* between Brazil, Mexico and Spain (2013). The graphics of the “topologies” of each dancer’s movements are projected onto the transparent screen in front of the stage.

The term “Darmstadt 58” in the title refers to Nam June Paik’s famous statement: “My past 14 years [are] nothing but an extension of one memorable evening at Darmstadt ’58” (Rosler 2003: 73), the German city considered the cradle of New Music, where he met the musician John Cage, an important thinker who influenced a generation not only in his own field but for all artistic languages. Cage was largely responsible for discussions and new understandings regarding sound, noise and silence, about listening and seeing, about the relationship between languages, and many other reflections that still reverberate today.

We decided to make the EVD58 in two distinct versions in order to test technological and aesthetic issues. The conceptual framework of the project housing a narrative constructed by the three layers of the (tele) sonorous body was used in both versions. However, in 2014 with the *Personare*⁹ performance, the goal was to explore the question of presence, of being present, of being, of the identity of the subject from its audio existence. The interests and artistic propositions were different between Brazil-Mexico-Spain trio (2013) and Brazil-Chile-Portugal (2014), as well as network conditions to achieve these PoPs. Consequently, new demands and challenges emerged, both aesthetic and technological.

EVD58’s proposal for network connectivity was different from that developed, with two PoPs, in *e_Pormundos Afeto* (2009/2011), and even from *Frágil* (2011) which, despite being composed of three groups, only two groups maintained continuous rehearsals, namely, with the dancers in Salvador and in Fortaleza with the actors. Since it took a longer time to construct the H.A. in Rio de Janeiro so that it could effectively be used to full potential, the frequency of rehearsals with it followed another order. In addition, the final presentation included a connection between only two cities: Fortaleza and Rio de Janeiro. To perform the proposed interaction of three PoPs in an artistically effective way for EVD58, we developed a procedure to account for the triangulation system that consisted in making technical and artistic adjustments, in the first instance with each country. In other words, the GP Poética was responsible for making tests specific to each country. Only then, in the second instance would it test the network and rehearse with the three groups simultaneously. Again, observing the model of the sand pile, this preparation procedure of triangulation would be similar to the passage from the local perturbation stage to the dynamic and global state of the system open to emergences, thus the sand pile develops to achieve self-organized criticality. Each action of each partner is an energy that affects everyone else involved (human and technological), and that power should be sufficiently robust to maintain continuous flow for some time, allowing for the domino effect and emergence in the system. Thus, each group has to be predisposed to enter this unstable process and let the steady state happen, but for that, they have to keep sending information at the same time seeking to interact with whatever the network causes. While the groups are preoccupied with control of the local point of presence, the network relationship will never be completely achieved, or

it will happen in a form distinct from its condition as a complex system.

As I was the creator of these projects, my role to lead and coordinate these processes allowed me an overview of these systems. It takes time for the history of the development of Network Art to exit the local disturbance state and enter the stage of self-organized criticality, but this also requires a change in attitude. While the unpredictable continues to scare those who wish to build through the network, it will be impossible to actually act consistently with this medium. One must let oneself go in this continuous flow of information, breaking away from purely local interest, understanding that the system will always be unpredictable, and realizing that in this unstable condition of existence so many landslides, many emergencies happen. It is these avalanches that make this moment a state of Art!

Harry Pross already stated, in the '70s, that the body is man's first media, the one responsible for "communication that occurs in flirtation, in the articulation and reading of gestures and facial movements, in the movement and shift in the spaces of students, trade unionists, grassroots movements and small producers of agriculture to take to the streets to march, demonstrating with their own bodies their discontent" (Baitello, 1999: 2). This body, primary media that communicates with another body, gains new reverberations and possibilities when brought into a telecommunication system (tertiary media). These biological bodies are also semiotic bodies connected in this unstable and unpredictable weave of a network in its contingencies.

If it is undeniable that the body is the basis of all communication, it is also undeniable that the body as media alters with every change in the culture and society of which it is part. Because to speak of the body is to speak of a complex intersection between biophysical nature, social nature and culture. Therefore, far beyond being a medium, the body is also a text that has registered in itself an enormous amount of information, from the history of life in the universe to the cultural history of man, of *homo faber*, *homo sapiens*, *homo ludens* and *homo demens*. (Baitello 1999: 4)

Network Art is the art of letting yourself flow, like the first media man, into this unpredictable avalanche, in this process that will always be unstable, and that's the big news. We must go forward in this dynamic and complex network of self-organized criticality. This is the moment when the artistic experience in the network can happen!

Notes

- 1 This imagistic relationship, constructed through layers, is discussed in my articles in this edition: “First Telematics Experiences of the Grupo de Pesquisa Poéticas Tecnológicas: Corpoaudiovisual” and “*e_Pormundos Afeto*, an Interdisciplinary Research in Network Art.”
- 2 Cognition in the ample sense of the term, not used here only as a synonym for thought or reason. For Lakoff and Johnson (1999), reason is principally unconscious, largely metaphoric and emotionally engaged.
- 3 Videos and photos of these works, as well as complete descriptions of the projects mentioned in this article can be accessed through: <www.ivanisantana.net> and <www.poeticastecnologicas.com.br>.
- 4 *e_Pormundos Afeto* is a neologism-title, where *e_pormundos* refers to e-culture throughout the world. *Afeto* can refer both to ‘affect’ and also to ‘affection’ in Portuguese.
- 5 This edition of the *Revista Eletrônica MAPA D2* contains articles from partners in the *Laboratorium de Arte Telemática MAPAD2*: Briones, in conjunction with Rangel, focuses on the exploration of the actor’s voice in this project. Ribeiro deals with image relationships, and Nóbrega, collaborating with Maria Luiza Fragoso, analyzes how art is produced in telematics environments.
- 6 Texts written since 2012 are available through this site: <www.ivanisantana.net>
- 7 All of the information about the project *Greats do Tempo*, including videodances and the narratives taped with binaural technology, can be found on the project site <www.gretasdotempo.com.br>, or though the GP Poética site, <www.poeticastecnologicas.com.br>
- 8 Please see the article in this issue by Luiz Naveda for further description.
- 9 The creative process of *Personare* was documented in <<http://personare-evd58.tumblr.com/>>

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Ivani Santana holds a Masters and PhD from the Program of Communication and Semiotics at PUC/SP (São Paulo) and a Post-Doctorate from the Sonic Arts Research Center (United Kingdom, 2012/13) with research done on the sonorous relationship of the body in telematics environments, entitled "Dramaturgias do Corpo Tele-sonoro" (Dramaturgy of the Tele-sonorous Body"). She began her research on dance with technological mediation in the early '90s. Currently, she is a Professor at the Milton Santos Institute of Humanities, Arts and Sciences at the Federal University of Bahia (Artes e Tecnologias Contemporâneas) and in the Graduate Program in Scenic Arts and serves as Coordinator for the Grupo de Pesquisa Poéticas Tecnológicas: corpoaudiovisual. A pioneer in research about telematics dance in advanced telecommunication networks in Brazil, Santana is also author of the books *Corpo Aberto: Cunningham, dança e novas tecnologias* (SP:FAPESP/EDUC, 2002) and *Dança na Cultura Digital* (BA:FAPESB/EDUFBA,2006) and organizer of the collected entries in "Estados da Dança: entrevistas, relatos e ensaios de criadores contemporâneos" (Salvador: GIPE-Cit/PPGAC/UFBA, 2006). She holds a 1D Research Grant in Productivity from the CNPq. <www.poeticastecnologicas.com.br>; <www.ivanisantana.net>