

Music and Architecture: Bonds, Interrelations, Transductions

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Digital technology and knowledge integration between musicians and architects enable us to explore and redefine links between music and architecture. This paper describes the experience and results of the creative processes undertaken by music and architecture students and academics to achieve a hyper-medial composition. The processes embrace the simultaneous construction from music to visual form and vice-versa. This exploration is originated from electro-acoustic music works, written ad-hoc, and based on specific assignments especially designed and framed within two types of situations and links with digital technologies: independent actions and interrelated actions. The intention of this work is to obtain constants and/or variables capable of allowing a certain type of graphic conventionalization that will make possible the mathematic representation previously necessary to create specific software tools.

I. INTRODUCTION

The present work is the report of the activities carried out and the achievements reached in the project "Music and Architecture: the form as a bond, the hypermedia as a tool", within the Course of Action for Research and Development (C.A.R.+D 2005) from the Secretary of Science and Technology of National University of the Litoral Region. This project has been worked out taking into account the results achieved in a preceding project, recognized as its principal precedent: "New discourses and design processes" (C.A.R.+ D 2000), where project strategies were explored that integrated different kinds of knowledge, perceptions and media. [1]

In this research different associations across language, music and architecture have been explored through experimental workshops, and conceptualizations of pedagogic kind have been developed as well as interdisciplinary practices which recognize changes in the relationship between the subject and the object of knowledge when incorporating digital media. In regard of the subjects, the creative processes appear to be related to complex logics based on new types of visualization where the media loses its discursive autonomy and instead depend on the operator's input. In regard of the object of knowledge, biomorphic form design evolves towards complex and dynamic entities and obeys to geometries different from the Euclidian one. It has also been verified that the use of digital media lets us associate other perceptions, of hearing and tactile types, to the traditional way of approaching form construction (i.e. primarily derived from visual perception and qualities).

As a general result, spaces of high level of experience were generated emphasizing the enriching interaction of perceptions and knowledge between the composers of electro-acoustic music while *composing* and the architects *designing* in the digital media: common creative processes have also been detected starting from captures of the real space and its manipulation in the digital space.

As these first results emerged from practices based on a strongly associative and predominantly esthetic imaginary, the unavoidable question was whether there existed common elements between architecture and music

After this observation we needed to find out the different types of knowledge produced within the link between music and architecture. This research work lets us deduce - as it is developed in the following item- that all the attempts to achieve intersections between both disciplines have been approached from two viewpoints: one based on more or less free associations, sensations, metaphors, i.e. assumptions; the other, based on quantification, number and mathematics. Parting from two elements: exact pitches and meter, although present in the music, they do not represent it as a whole.

This prospect left lots of doubts in relation to the bond between the two disciplines since these already mentioned elements are not always

included in traditional music and they remain excluded, to a large extent, in the music of the twentieth century. Besides, there are a few cases where the relationship based on rather subjective interpretations on one or the other side is not established, even using an objective link as it is the number.

The experiences carried out by painters, though based on subjective associations, with a strong emotional and esthetic charge, opened another way.

In fact, the huge formal component that was present in painting, its decisive connection to space, geometry and proportions definitely leads us to think on architecture which uses the same parameters for its spatial and formal structuring. So, the project *Music and Architecture: form as a bond, hypermedia as a tool* focuses on the visual or plastic form; and its main objective is to establish possible constants and/or the degree of variability between the factors that operate in music structuring and in formal construction.

These factors are technical-compositional for they allude to the specific components of the selected element combination, and psychological when referring to organization modes and selective criteria.

In the case of modes of organization the ruling guidelines are, apparently, global. In general, they apply to all human activities; but in the case of selective criteria, the level at which they develop is highly subjective and for this reason its measurement becomes too difficult (it refers not only to the selection of sounding objects or to the visual form but also to their primary interrelationship).

The digital interface currently appears to be a possibility when exploring different kinds of transductions between sound and image within an interactive work involving musicians and architects. The experience has been oriented to the simultaneous construction of hypermedia products from two different approaches: from music to plastic or visual form and vice versa.

Music is the starting point in the presented cases, and the characteristic assignments of the experience are created from music itself to generate multimedia compositions from different music parameters limited to two types of situations and possible bonds:

- Independent actions of the subject-musician and the subject-architect (music composition starting from specific parametric controls independent from design, and design starting from the same controls, independent from music composition).
- Interrelated and joint actions of both subjects.

2. PRECEDENTS

Resuming our work of searching bonds and analogies between music and architecture outlined above we will say that, from a semiotic approach, two types of search supported by connotative meanings can be recognized: a

poetic-expressive search and a technical-rational one, though from the beginning the composing principles of architecture have been connected with mathematic principles and constructive elements characteristic of music. The first search is represented by metaphors or by formal analogies. Goethe and Schopenhauer defined a primary analogy: "Architecture is frozen music". [2] The technical-rational search recognizes correspondences in the Pythagorean thought among music harmony, proportion and composing principles. These links were based on number and mathematics and started a line which has gone through history from Classic Antiquity to our days. [3]

During the twentieth century, though full of continuous and varied esthetic ruptures, these two approaches enabled the visual arts and architecture to explore composing and expressive principles which departed from music as a source of inspiration for the formal abstraction. The first artistic and architectonic avant-gardes, resulting from technological, scientific and philosophical changes deepened the bond as an exploration field towards a new spatial dimension. Futurism and Russian constructivism remarkably contributed to the incorporation of this new dimension not only in art but also in architecture. Kandinsky, Mondrian and Klee noticed the established bond and explored it from plastic art on the plane. Kandinsky, in relation to Schönberg, sets up precedents in two texts: "Point and Line to Plane" [4] and "Sounds" [5]. Le Corbusier, paraphrasing Goethe, appropriates his phrase [6] and with his proximity to Xenakis makes a substantial contribution to the interchange between the two disciplines' composing principles. [7]

In relation to the technical-rational significance, let us note that this bond, though not totally far from assumptions or free associations, does face the problem of the relationship of number and music, or more precisely, of the participating numbers in the proportion and in geometry and its application in music and formal structuring. Xenakis's Stochastic Music is one of the most ostensive examples. In the same way, the use of these principles in the construction of the Philips Pavilion he builds together with Le Corbusier and Varèse at the 1958 Brussels International Fair turns this work into one of the examples of the relationship between Music and Architecture. It also settles the most direct antecedent of sound installations, being almost seventy years ahead of virtual reality. [7]

At the end of the twentieth century, new technological and scientific advances, essentially consisting of computer theories and non-Euclidean descriptions of the physical world, enable to experiment formal products that propose an evolution with regard to the antinomy rational architecture-organic architecture, tending towards a fusion of the two concepts. It is possible, through them, to generate and rationalize organic, complex and anomalous forms that respond to an inexact equation, N.U.R.B.S. (Non Uniforms Rational B-Splines) entities, based on polynomial

approximations.[8] Mathematic theories based on “probability” and “similarity” make possible topological and fractal geometries.

By the mid-1970's John H. Holland inspired by the model of biological evolution -principle of natural selection- founds the “evolutionary programming” starting from the association of living organisms with numerical control [9]. The works by Denis [10] and Alberto Estévez [11] contribute from this guideline to the modeling of surfaces that make possible formal freedom and new Architecture production modes but, besides, these discoveries are decisive for the arising of new architectonic vanguards associated to artistic ones.

These approaches open other possibilities to new searches of common elements between music and architecture. The hypermedia, as a linking information space, appears as the best tool to re-mean the link started by those vanguards, making real the illusion of movement in formal generation processes. These links (and, in general, all those we have spoken about) can now be reformulated from a dynamic representation of the visual form. This is what makes possible to think “form” as a bond between music and architecture and the interactive work between musicians and architects as the first step (and a decisive one) to manage to establish standards emerged from interlacing imaginaries between them that, once formulated and symbolized, would become the formal and conceptual raw material for programming and producing an original software.

At present, there are a few detected lines of investigation trying a possible transposition of the music system to the architectonic one; the data that could be gathered correspond to experiences of groups connected to SIGRADI and ACADIA. Among them, quoted as relevant, though with different aims, are the exploration field started by Julio Bermudez referring to “data architecture” [12] and his later work “Cyber print” [13], Adrian Levy's contributions for the generation of real and virtual spaces from music [14], and Daniel Cardoso's investigations about the bond that music artistic creations establish with computers, which he uses as precedents to explore complex forms with “scripting”. [15]

The current work tries to contribute to art from a primarily experimental construction but, at the same time, a theoretical-critical one, to check the presence of constant common elements at a high (or lesser) degree that take part in music and form structuring. The understanding of those principles, their later selection and symbolization, make possible the visual form transduction.

3. THE PROJECT “MUSIC AND ARCHITECTURE: THE FORM AS A BOND, THE HYPERMEDIA AS A TOOL”.

3.1. Objectives

General objectives

- Explore the heuristic potential of music structures or music compositional modes using hypermedia to test and systematize transference experiences to the field of architectonic formal generation.

Particular objectives

- Update, enlarge and systematize the bonds between music and architecture through a work that contributes to the unity of the creative arts that influence the human habitat.
- Explore and detect the presence of formal or variable new substances other than the existing ones.
- Detect and select common elements and construct from them different types of structures that will enable the interaction between music and architecture.
- Generate software to allow the automatic interface between music and form.

3.2. Research methodology

Bearing in mind the proposal originality and, in consequence, the lack of available precedents and paradigms, it was considered to be a priority to create a new and unpublished methodological guideline -with regard to the project topic- to essentially ensure, from the beginning, an organized and systemic functioning directly oriented towards the pursued aims. In this respect, the assumed direction includes the generation of provisional documents, the validation of assumptions and constant reformulation and/or amplification of categories, and knowledge construction mechanisms.

The research, of strong experimental nature but, at the same time, theoretical-critical, requires a complex and combined methodological approach that is carried out starting from the interlacing of scientific, referential and argumentative discourses and of three types of *interpreters*: musicians, architects and a psychoanalyst.

The scientific discourse develops the theoretical frames that keep the sight from the music, architecture and psychoanalysis point of view. The referential discourse allows the deduction of interpretations from controlled experiences. The argumentative discourse will attempt to construct arguments for bond and symbolization.

Due to research characteristics, work partition was essentially established in three stages, which were not necessarily ordered in a consecutive way:

1. Information compilation.
2. Information processing and analysis.
3. Material media production and reports.

For the same reason and due to the great number of actors needed to perform the tasks oriented to a variety of different purposes it was determined a general methodological organization structured in four working groups for the coordinated and articulated progress of the necessary actions: direction group, control group, gathering group, and experimentation group.

The *direction group*, constituted by the director and co-director, coordinates the whole actions and adopts all kinds of final decisions, for they have created and conceived the project and have been chosen to fulfill it. This implies that they have a comprising and detailed view of all the research instances.

The *control group* is an intermediate instance between the direction group and the gathering and experimentation groups. In addition to the director and co-director, it is constituted by other researchers and advanced degree assistants and the coordinators (who, for the time being, only work in the gathering group) whose functionality level, the experience and disciplines' knowledge enable them to make consultations, deliberations, contributions, checkups, to lead controlled experiences, and any other activity inherent to the process course and its successive lines of action. It is a considerably important help for the direction group.

The *collection group* is in charge of tracking, compiling and collecting information, the revision and verification of the relevance to the project and of making summaries from two variables; one is directly related to the project topic (mathematics, geometry, form) the other maintains an indirect and less verifiable link (i.e. analogies among music, visual arts and architecture).

The *experimentation group*, whose activities are exclusively leaded and outlined by the direction group, explores procedures and transduction variables between music and visual form at two times: production time and critical evaluation time of different interpreters.

The understanding of the music object starts from listening and observation, in different types of interactive situations that bring the subject closer to the raw material and enables the finding of symbolization and linking variables. The theoretical critical instance constructs the material from the obtained data and the object understanding from triangulation strategies among the involved disciplines.

Through the fulfillment of regular experimentations and the validation of transference from music to architecture and vice versa, we tried to produce

a descriptive and explanatory study, a record and classification of the theoretical research data and of the experimentation (using participant observations, anecdotic records, polls, day-to-day classroom reports, personal memories and non-standardized interviews). It is also revealed the lack of a differential semantics, specially oriented to a present conceptualization of both disciplines and their interrelationship.

A following stage will explore mathematic procedures and representations that will make possible the software generation.

It was also essential the elaboration of research strategies suitable for the problematic that is investigated. One of the possible ways was to generate some information and theory that will enable to carry out activities for testing the first assumptions and to generate new assumptions from new data. This will let apply, test, verify and validate those strategies. For a first analysis and interpretation of each controlled experience, following this work line, Seminar-Workshops, approached from an interdisciplinary context and a specific theoretical framework were carried out. Each working group presented their own experience and proposed objectives in order to produce an interactive interpretation.

3.3. Activities

Framing and assumptions

- Setting up of a common corpus.
- Search and selection of information.
- Collective exposition of experiences developed within the framework of the specific disciplines.
- Methodological adjustments.

Analytical treatment of information

- Information and gathered documents analysis.

Regular Experimentations

- Creation of students' interdisciplinary research teams.
- Selection of parameters to use. Confirmations, rectifications.
- Assignments and operative modality selection.
- Music composition and architectonic design.
- Sensitive understanding of the outer form and detection of the evident external structure. Search of significant elements.
- Detection and understanding the inner form. Invisible internal structure. Elements, selection of principles, materials. Interpretation.
- Further elaboration according to each discipline's specific principles and suitable use.
- Translation of elements and parameters common to formal semiotic to relate representations and meanings. [12]

- Formal semiotic translation into the mathematic model.

Final experimentations

- Experimentations of validation and/or refutation of provisory results. Activities and assumption delimitation. New proposals of interfaces and passages. Definition of the elements “code - bridge” between music and architectonic form. Determination of variables. Experimentation with passages in both ways (music-architecture and vice versa).
- Delimitation of frames and assignments. Data gathering. Theoretical framework.
- Common corpus establishment for approaching the interdisciplinary work.
- Software generation.

3.4. Music selection fundamentals

From the beginning of last century, western music looked for new searching paths after leaving behind the strongly structured tonal language, developed to its highest reach during three centuries. These explorations implied new ways of thinking about music and listening to it, which caused a sensitive and, at the same time, necessary amplification and ramification of the components (parameters) of the sound and, consequently, of its detailed treatment. [16]

It is a scenery full of new directions and continuous mobility and change; the antinomies consonance-dissonance, sound-noise, among others, remain behind and there is an attempt to control all sound aspects, especially one of the most difficult to seize, the timbre [17]. Electro-acoustic music appears during these transformations in the middle of the twentieth century, and it is received with especial interest by young composers, especially those belonging to integral serialism and dazzled by the implicit promise of achieving the command of sound parametric control techniques. [18]

From those times until our present days, during almost sixty years, the electro-acoustic music has gone along an individual way, immersed in Western music sharing proceedings, conceptualizations, imaginaries and constructive techniques. Consequently, with following varied considerations, we will fund a first approach to the possible link between music and architecture from electro-acoustic music.

Electro-acoustic music approaches the visual and tactile field from the composer’s interaction with the material in real time, in a sound poetics that could be described as a *sound sculpture*. Besides, there are interesting, practical and immediate reasons as are the intimate and pioneering relationship with the digital media and the feasibility in the field of production (i.e. interactive composition, instantaneous digital playing and

recording, and visualization by means of diverse interfaces, including their format versatility).

It is convenient to remember that, when basing the activities in ad hoc compositions, it is decidedly impossible to think of immediate answers in the case of music for instruments considering the use of media in the process, which adds an important remora to sound concretion of what has already been elaborated (let us consider the necessary delay existing during the composition, the rehearsals and the recording: stages that need their own time and dedication). In addition, it would be inconvenient the use of medium size performing groups, because the bigger the number of performers the bigger the difficulty.

An intermediate option is to dedicate the experiences of *ad hoc composition and analysis to electro-acoustic music, and only analysis of already composed works to music for instruments*, but this generates an unbalance in the treatment between both objects of study which is difficult to bear within the necessary research objectivity.

The most intricate matter in electro-acoustic composition is timbre. Being a very complex and misunderstood parameter in music for traditional instruments it becomes very evasive in the act of composing electro-acoustic music, where sound transformations acquire a prodigious speed and dimension: the form and the material of a sound object change at such a speed that could not even be understood by a potter in his wheel. We have mentioned "speed" -tempo- music essential problem. Traditionally intangible but thinkable in a score for instruments it acquires, due to timbre characteristics, an unusual metamorphosis. Sometimes it comes out as an endless extension and some others, as an intransigent factor, destroying or powering, according to the cases, the composer's projection.

The analogous spelling, or pneumatic or drawn notation [19], is the only one that fits to electro-acoustic music representation although it implies a *regression* with regard to the proportional symbolic music spelling used for traditional music instruments. This *regression* is mainly given in the timbre field and not in the tempo one particularly because this parameter is not properly considered in that music, for it has been reduced to *sound source* concept, according to Schaeffer.

In this type of graphic notation the abscissa is used to indicate tempos and the ordinate to mark registers, parameters that seem to function in a way rather exposed to perception. The forms in which sound objects are represented are arbitrary and refer to the vast characteristics of the object but, due to their multiplicity, the author, in each case, makes explicit music spelling, its name and, eventually, its distinctive characteristics.

The electro-acoustic music does not need the script to be performed. However, for planning and directing the piece, it is essential to guide the possible sound paths and their interrelationship in the macro, mid and microform. From the poetic-expressive bond perspective it is also possible

to think about music spelling as a “frozen” representation, an image of a phenomenon that demands, in itself, movement, a change of state either physical or psychological. [20]

Due to what has been previously said and taking into account technical and practical reasons, we assume that from the electro-acoustic music we can think of a first approach to the possible bond between architecture and music as a first step towards a more complete study later, at a higher research stage: “Get the status of a norm; reveal the principle able to turn into a norm”. [21]

3.5. The interactive experience

The work group, composed by six architects and a composer, interacts with the digital media in different times and with differentiated elements. The resulting product is a hypermedia composition that intends to give form to “what the sounds organize” in music.

The transduction process comes out from an object (a music composition) and obtains a variety of visual samples from the object itself in different interactive and temporal situations:

- First interrelated and joint actions: These actions are carried out during the process of composing music (the object in construction), with the aim to obtain a sample produced in a very close relationship between the composer’s thoughts and operativity during creation process (immanent process).
- Second independent actions: These actions are made up after the process of composition (composed music-close object) with the aim to obtain two types of samples:
 - Without any close relationship between the musician’s music thoughts and music operativity during the process of creating but with a complete knowledge of the raised general premises.
 - Similar to the one obtained before but ignoring everything related to music production. This experimenting case, though almost entirely situated in a purely esthetic level, provides a certain degree of finish, of completeness and wholeness, as if no space was left uncovered.

The composer activity consists of composing an electro-acoustic music piece based on the following music parameters settled in a priority order: chronometric density / polyphonic density (“sound clusters”), register; duration; intensity.

The music composed has three proportional parts with a total temporal extension of approximately 3 minutes. The guidelines for its creation were as in the table 1:

► Table I. First controlled experience. Assignments.

I	II	III
CD/PD = Low	CD/PD = High	CD/PD = Low
Register: Medium.	Register: High.	Register: Long.
Durations = Medium and Long OOSS High index of appearance.	Durations = Impulsive OOSS: High IA Medium and Long OOSS: Medium/Low IA.	Durations = Impulsive OOSS: Medium and Low (not impulsive): High IA Long: Low IA
Intensities = <i>p</i> / <i>mp</i> in any order.	Intensities = Progression <i>mf</i> ----> <i>pp</i> .	Intensities = Progression <i>mp</i> -----> <i>ppp</i> .

The music composition is generated from a sound cluster concept. These sound clusters evolve from a weakly dense and decompressed situation towards a region of high degree of density and compression which culminates poorly dense and decompressed.

In the 1st II Degree Formal Unit the work presents low CD and PD (chronometric density and polyphonic density), it develops in the Medium Register with medium and long duration sounds and the Intensities used range from *p* (soft) to *mp* (medium soft), in any order. In the 2nd II Degree Formal Unit the CD and PD are high, the Register is High, the Durations use impulsive sounds with high IA (Index of appearance) and Medium and Long sounds with a medium/low IA while the Intensities progress from *mf* to *pp* (from medium loud to very soft). Finally, in the 3rd II Degree Formal Unit the CD and the PD are low again; the Register becomes Low, the sounds with more IA are Medium and Short (non compulsive) while the Long ones show a low IA and the Intensities progress now from *mp* to *ppp* (medium soft to “molto pianissimo” i.e. extremely soft).

The architects' task is to look for possible correspondences between the work being produced or already produced and the visual form as first interpreters in the transduction process. Listening to music, finding and selecting joining parameters appear to be the necessary activity to establish analogies between music parameters and visual form.

Samples

From the pointed out guidelines we have obtained a variety of plastic-visual samples from the same music object acting in a variety of ways with the digital media in object interactions (sound-visual), subjects and media in two separate moments: that of composing and that of the piece already composed.

During composition the musician composes his piece based on the music guidelines previously arranged and captures the sound objects manipulated in the digital media. Takes from processed acoustic sources have been exclusively used to do the composition. The gathering includes a variety of sounds (like blows on china and wood objects, gears mechanisms,

aeolic flute and harp sound banks) and the final selection is made according to the sound objects characteristics mentioned in the guidelines.

The used processing types are filters, reverberation and dynamic changes within playing speed. Very different sound objects come out from some takes. Other sound takes are used as micro-sequences within the piece. Finally, the sound objects are taken to the mixing area according to the characteristics of each formal unit. The second unit has experienced some pre-mixtures to achieve the necessary chronometric and polyphonic densities.

The architects observe the composer's procedures and interact from the word. They do the formal composition operating freely within the material and digital media. The formal exploring comes from the *music composition procedure* and is applied to the visual form composition through: sectioning/fragmenting; time/sequences; sound position/space position; sound deformation/form deformation. The result is a video which script is the composition process of the electro-acoustic piece using the collage technique. (See Figure 1).

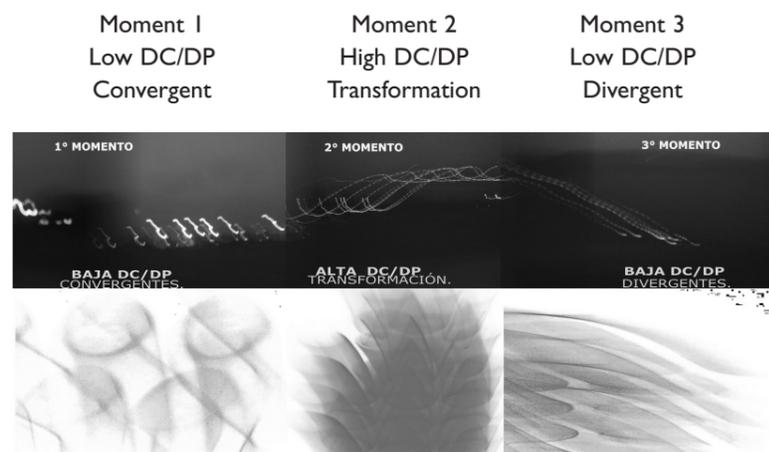


◀ Figure 1. Music composition moment. Interrelated and joint actions.

When the piece is already composed two differentiated interaction situations arise: one with knowledge of music guidelines and the other without it. The formal composition that arises from the former comes out from perceptive sensations that the sound object causes in the subjects listening to the music in interaction with the composer; they detect the sound object parts and recognize three series given from the "chronometric density/polyphonic density", they build an imaginary from a "...time passes, forms become...". The transposition to the visual form is done according to a first series: tension/concentration; a second one: grouping/compression/condensation; a third one: divergence/dilatation. Then

they digitally capture analogous objects and digital images to generate visual registers. The tested formal variations are subject to the study of temporal relationships, considering the correspondence of the visual object transformation in reference to the deformation of the sound objects. The digital captures are made based on two operating modes: still camera (moving object)/moving camera (still object), to finally detect common elements between “sound object form-visual object form” and determine production time and perception variations between subjects and objects. (See Figure 2).

► Figure 2. Composed piece. Independent actions with knowledge of music assignments.



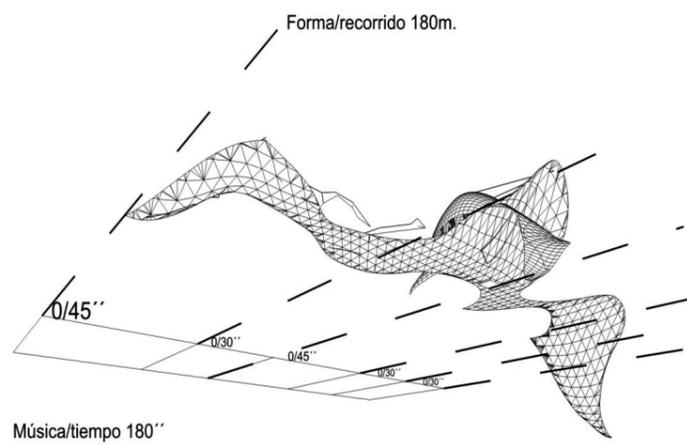
The result is a dynamic formal system which transduces the researched series to the visual form generating, this way, a surface modeling from a rough and wrinkled mesh that deforms itself; it extends, brakes, or gets smooth in correspondence with the raised variations. Besides, this work generates the concept of “textural spaces” and intends to extrapolate form constitutive elements.

The formal composition that comes out from actions that are independent from the musician-subject and architect-subject without knowledge of the music guidelines present two different types of interaction with the media: in the digital space capturing one material object, and successive manipulations with material and digital media.

In the first case, the subjects listen to music and recognize three parts and two transition moments that link different scenes and spatial backgrounds. The parameters used for the transduction to the visual form are music quality, variation and tempo. Sound quality and variation evoke environmental situations and characterize the visual form expression; tempo defines the dimension and the principles that organize its structuring.

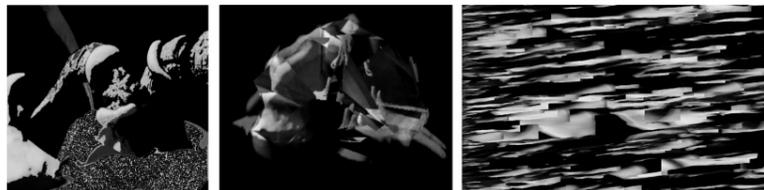
The evoked environmental situations for each part are: the dessert, the cave and the tunnel which generate three different types of spatial

experimentations: barrenness, echo and a feeling of an exit in a close, dark tunnel. An analogy between seconds and meters was used for the space-form structuring. The result is a topological form that translates music scenes into spatial scenes and music tempo into form spatial dimension. (See Figure 3).



◀ Figure 3. Composed piece. Independent actions with no knowledge of music assignments.

In the second case the subjects listen to the music and develop a plaster model which represents the recognized music parts. To generate the visual form they put the digital capturing through different types of filters and stretches that generate new forms which associate sound aspects with the image: movement/transited distance; hierarchy/hierarchy; rough texture/twisted-weft. The results are three dynamic forms that translate the already pointed out aspects. (See Figure 4)



◀ Figure 4. Composed piece. Independent actions with no knowledge of music assignments

In all the cases the interactions between objects, subjects and media have been made through capturing real objects and/or taking them from a completely virtual space. For the formal exploration the following software have been used, 3D Max, Photo-paint, Photoshop, Corel, Morpheus and Sketch-up.

Results

The results arose from the observation, registers and analysis of the varied experimentation made during the two moments and circumstances already established. Transduction procedures into the visual form come, in all the cases, from perceptive sensations caused by the sound object. Some differences in accordance with the already established interaction moments have been detected.

At "the time of composing" a non-previously stipulated work tendency arose; the architects developed their job from the "procedures" used by the musician during composition. This could be the reasons: the detailed knowledge they had of the tools and the processes used by the musician; the impact caused by the observation and analysis of their incidence in sound transformation; and/or the affinity between form design procedures in digital media and electro-acoustic music composition.

During the "already-composed-piece moment" the following constants can be recognized:

- Three parts or moments, transitions and a variety of "procedures" can be perceived.
- The use of register, chronometric density, polyphonic density and hierarchies as connecting variables.
- The transduction of music parts into formal or closed series; from music procedures to form altering, from different sound types to dynamic form types (continuous, curved, cutting, etc).
- Visual representations which turn into topological, textural, dynamic, convergent, divergent and random configurations.

On both moments and in relation to the link subjects-objects-media the following are presented as constants:

- The work with a variety of media and the use of filters particularly as the first imaginaries support related to the material space- the cultural space, the senses, etc.
- Common procedures within creative processes between electro-acoustic musicians and architects through the use of the following software: Cool Edit Pro and Sound Forge for the music and 3D max, Photo-paint, Photo-shop, Corel, Morpheus, Sketch-up, for the visual form.
- Software limitations for the transduction to the visual form.

4. CONCLUSIONS

The results of the first controlled experiences produced data that promoted substantial reflections about their planning and fulfillment. Problems in the assignments conception that produced deviations towards varied points were detected. These problems were especially found in the sensitivity field. This led towards the adoption of a new course of action for

programming the experimentations to follow which presented a strong restriction in temporal limits and control quantity, to achieve a more compact and closer construction.

Undoubtedly, this first experience is assumed as a high degree test of importance for it makes possible to adjust the next work in a more precise way. The current explorations limit the investigation to the “register” variable.

The future directions will be oriented to identify varied music compositions in common visual representations. Mathematicians and information system specialists will record and interpret the produced material to generate, in a later stage, the mathematic representation, code-bridge, between music and visual forms.

These tests’ potential benefit is the possibility to generate a new modeling system produced by the imaginary intertwinement between electro-acoustic musicians and architects. The varied selective criteria will enable the application of different variables from a variety of creative fields and will try to substitute the operating software market limitations for the infinite routines the creator displays during the form modeling process.

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