

Musical objects and digital domains

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Abstract

This paper deals with the production, representation and mutation of musical objects within digital media spaces. The influence of computer science on artistic practices and the modes of production of digital objects are treated. Besides, the ideas of Pierre Schaeffer, György Ligeti, Iannis Xenakis and Gerard Grisey relating to a frame of extra-musical reference are briefly mentioned, since each author, in the construction of the musical object, revealed a different approach. The decoding of structures from one sensorial channel to another is the next issue, devoted to Moles' research on multiple messages, functional analogies and the creation of artificial channels. An overview of how artistic-technological experimentation over the last twenty years has dealt with the conversion of digital objects within multimedial, interactive events follows. To conclude, there is a comment on the views of composers and digital communication scholars regarding the "objective status" of digital objects within the cyberspace.

Introduction

Knowledge and technologies permitting the simulation of the dynamic character of events are today available to multimedia designers through integration of real and virtual spaces. For their part, artists no longer confine themselves to planning contents, but propose complex environments where audiences are free to interact, often managing the transitions from one medial domain to another. In these cases the term intermedia is sometimes used. According to Ian Blom, it implies an interrelationship between different merging media and indicates a third, new form of media characterized by transformative qualities. Intermedia is structurally different from multimedia and mixed media. (Blom, 2001). Different perceptive tasks are involved, and some time has been needed to adapt to this inter-medial technology. According to Jordan Crandall, the intertwining of human and machine capacity and the merging information from multiple sources "generated combinatory fields of perception within distributed fields of shared functions" (Crandall, 2005). In particular, the combining of multiple sensory material, - the essence of interactive multimedial production - implies a mix of long and short-term memory, where the latter prevails. Even navigability of multimedia spaces requires a suitable modulation of attention. According to Jean Trumbo, within navigable spaces of multimedia, whole systems of diverse elements overlap and interact; and the *attention space* "becomes the melting pot in which the multiple sensory inputs are combined and experienced" (Trumbo, 1995). But within interactive medial space, fruition can be influenced by communication relationships, by the presence of unexpected objects or perceptual events that, within attention spaces, may provoke perceptual imbalance. Consequently, both the

integration of sensorial channels and the study of occurrences of cognitive dissonance have become issues shared by technological and esthetical research.

Modes of digital production

The increasing proximity between scientific-technologic thought and creativity may be due to the fact that quite a few metaphors and schemes of information technology are being adopted and re-elaborated in artistic practices. According to D. Fox Harrell, “Hierarchical organisation and categorisation within lists of information are often the underlying means by which media production is forced to structure artistic information”. Digital objects can be produced even through generative algorithms, and we know that they can be re-instantiated several times through variations of the same rule-system: “Abstract data structures are the means by which data spaces are organised. Lists and arrays of information are basic compound data types, but one can combine base data types in any variety of abstract ways to represent current needs” (Fox Harrell, 2003). Besides, the abstract structures can be converted from one domain to another: “Circles become numbers, and programming structures became revolutionary structures when introduced explicitly to media art”. Similarly, structures originally produced for a musical domain can be converted into text or images, and certainly some graphic construction or/and textual messages can become part of musical environment.

However, the capacity to structure information and media in complex patterns and manipulate them algorithmically cannot be separated, according to the same author, from the experience of the artistic outcome. Similar opinion is reported in the magazine “Neural.it” and relates to a work of Atau Tanaka based on Image-to-sound conversion, “a fluid theoretical frontier hard to limit to a simple association by similarities. In the field of sound composition, through the use of image-elaboration software, this practice, effectively implemented by the software MetaSynth, has become the norm. Atau Tanaka uses it to build direct relations, where the image describes a sound and where, by finely tweaking its pixels, the resulting sound can be much improved. In “9m14s Over Vietnam”, the famous picture taken in 1972 by Nick Ut which depicts the human drama of the American attacks, is treated by Tanaka with a double encoding. On one side, the visual data are directly turned into sounds (time domain) and, on the other side, the image is used as an audiogram, that is, a harmonic representation of the spectrum (frequency domain). This manipulation, documented in the 'score', can be downloaded in PDF format” and demonstrates “new power of representation and misrepresentation in mass media” (Tanaka, 1988) .

When data or functionality can change depending upon context, and when structures for manipulating one type of data can manipulate data of another type, Fox Harrell suggests using the term “polymorphism”. According to him, polymorphism describes a type of media fluidity which, unknown in previous media, “is becoming an expected trait of the experience of computational media”. But a problem arises, regarding the objective status of the diverse manifestations of a digital object, given that each of them can show a different sort of reality, while the “underlying” digital structure remains unvaried. In effect digital transformations accustom us to think of the objects as if they were steps in functional processes or the result of inter-medial conversion. This means that the notion of an object -- as something of which it is possible to recognise nature, features and position -- is giving way to the recognition of an idea of objectivity based on the role that transformative processes play in the construction of the objective contents. According to Lev Manovich, “It is possible to think of all representational art as a kind of mapping: taking the wealth of the experiences of an individual and/or a community and reducing it to a single image, a narrative, or another artistic structure. It is also appropriate (and more interesting) to use the term mapping for describing what new media does to old media. Software allows us to re-map old media

objects into new structures – thus turning media into what I call ‘meta-media.’ With software, the data can be mapped into another domain – time into 2D space, 2D image into 3D space, sound into 2D image, and so on. In addition, the media object can be manipulated using all standard interface techniques: search, filter, zoom, multiple view, summarise, etc. More complex and unusual mappings are also possible – and the search for such new mappings that allow us to access old media objects in new ways congruent with information interfaces we use in our everyday life – represents one of the most fruitful research directions in new media art (Manovich, 2003).

Digital culture, through this awareness, has also allowed us to assume new point of view, capable to re-define some critical issues inherited from the recent musical past. One in particular regards the “conversion” of extra-musical to musical meanings, and from there, to the exploration of musical forms. According to R. Packer, the concept of integrated, interactive media has its own long history, an evolution that, starting from Wagner's notion of the Gesamtkunstwerk (Total Artwork) as he applied it to music drama, spans 150 years. In his book Packer showed that during this period the search for correlation, similarity and synergy among different sensorial domains became one of the constituents of musical thought. Besides, the relationship between musical and extra-musical meanings was a subject of discussion among composers particularly in the second half of the Twentieth Century, just when the intertwining of human and machinic capacity became part of the historical development of media itself. At that time, the possibility that musical composition might explain itself through mirroring structures and rules belonging to non-musical domains was emphasised. This give rise to the compositional practices, based on various convictions. One was that visual perception could help in organising musical discourse, and another held that mathematical abstractions might serve as rule-generator engine. Yet, another considered that classification of sonorous objects should relate to the concrete substance of a sound, independently of the musical structure, thus considering the perceptual units more important than musical context.

Musical and extramusical structures.

As E. Pecci pointed out, the musical thought of Iannis Xenakis justified a compositional dimension which adopts extra-musical resources: mathematical operations applied to classes of sound, of intervals and of characters. Xenakis reveals an inclination to mathematical abstraction and to the introduction of non-temporal objects into time, e.g. geometrical contours and architectures which take the form of regular solids. “Time which would seem to be closely bound to musical creation is strongly reframed by architecture which is neither born nor lives in time, but confines itself to entering and using it” (Pecci, 2003). The coercive power of formal relationships confers meaning to musical objects never before “experienced”: in other words, musical meaning is suggested by a set of correlations pre-constituting it and accompanying its eventual changes.

In Gyorgi Ligeti musical form is a sonorous, timeless object; it is enclosed in the instant but shows itself through the time of representation. Ligeti says: “I privilege closed musical forms, built as objects rather than processes: music as frozen time, as a condition, within space evoked by our imagination through the music as such, as a picture, which develops in the flow of time, but remains imaginary, in the contemporaneous presence of all its elements. Immobilising time, neutralising its flow, enclosing it within the present represents my main compositional intent” (Ligeti, 1985). According to Ingrid Pustijanac, Ligeti’s position differs from that of other European avant-garde composers, “particularly due to the number of analogies traced between the concept of space in music and in fine arts, which allow the

composer to state that space is the main dimension by which his music develops, while the dimension of time is considered a means for manifesting music” (Pustijanac, 2001).

In Gerard Grisey, the visual functions play a still more important role. In his thorough analysis, Luigi Manfrin stated that sonographic representation of sound and adequacy between visual and acoustic image suggested a path which invited Grisey to extract and apply visual function to temporal domain. In his writings Grisey uses zoom effect as a metaphor for expressing the idea that musical time can be likened to a lens capable of extending the sonorous object, by selecting connotations and qualities of musical objects from within a micro-phonic dimension and then transferring them into a macro-phonic one. “The sonorous object, from its complexity and dynamism incites us to open, extend, enormously enlarge it, so as to create formal development. In its turn, the sonorous object it is nothing but a contracted process. Two atmospheres, that is two different times correspond to these two organisms. Thus the musical form becomes revelation on a human scale, projection of natural, micro-phonic space on an artificial and imaginary screen; even better, this screen is at one and the same time a deforming, focusing, multiplier, selector, “corrosive” mirror” (Grisey, 2000).

In an article written in 1997 and published on “De Musica”, Cristina Palomba hypothesized that Pierre Schaeffer considered the value not as a fixed quality of musical objects, but, rather, a function which can vary with the context, the system, the compositional rules. According to Palomba the origins of such a conviction would lie in the way of understanding the distinction between *character and value*. Whereas the character constitutes the concrete substance of a sound, independently of the musical structure, the value begins to exist as such in the very moment in which more than one object is present, and the difference between these objects is based on the variation of a common feature. In other words, when we listen to the characters related to a concrete object we know that they can become values, once placed in a context. Thus Schaeffer seems to have recognised that contextual changes may influence the role of values of sonorous objects. According to Palomba, Schaeffer’s belief would derive from having understood the relation object/structure as an endless chain, which characterises all our perceptions: each object is perceived as an object only in a context which includes it within a structure; each structure is conceived as structure of constituent objects; each object of our perception is at the same time an object perceived as a unit within a structure, and it is a structure since it is made up of several objects”.

But Palomba noted also that, when the sound object passes from “sonorous” to “musical”, it is no longer a perceptual unit but becomes functional once again. According to Palomba, though Schaeffer intended to describe the sonorous object without taking into account its function in a musical chain, the very moment it becomes “musical”, the same object can no longer be considered only a perceptual unit, because it is re-invested with meanings deriving from musical sense. As a consequence, two meanings of “sound object” emerge, which seem to express two distinct analytical needs: one refers to the concrete connotations of the sound objects independently of their contextual use; the other refers to the need to re-ascribe a function to them, within a musical context.

Computer and computational media

From what we have seen while considering the previously mentioned authors, starting from the Sixties the search for correlation between musical and non musical meanings by tracing analogies among different sensorial domains was also considered a means for allowing musical meaning to emerge. It is now commonly accepted that musical composition may want to explain itself as mirroring or encompassing something of non-musical, but it was only thanks to Abraham Moles that information theory dealt with these issues in more general

terms, while treating in depth the relations between multiple message intelligibility and aesthetic perception.

Besides describing the complexity of multiple messages, Moles proposed the use of artificial channels of communication to extend the fields of perception beyond the limits of physiological capacity. He clearly explained that the study of relations between messages belonging to different communicative channels should not be confined to the search for isomorphisms, but it should also aim at identification of functional analogies: "The transposition of messages is based on structural analogies that are often emphasized in the course of this activity. Starting from a rule, from an experience or from a result which may relate to a given type of message, there is a systematic attempt to discover an equivalent. This is done by translating each of its elements into another message, to see how that experience or that result could be expressed, and whether or not they could still be valid [...]. For example: given a certain structure existing within a sonorous channel, with given rules of selection of elements, what could correspond to it, within a visual channel of a picture, or a cinematographic sequence ?" (Moles, 1958). Yet in 1980, Moles indicated the difficulties of what - through the new concept of intermedia - was turning out to be a true change of paradigm: "Two directions are open for intermedia art. One is a systematic, but careful, deepening of the difficult contrapunctual relationship between one or the other media. The other is the quest for new media: these media of the senses that have not been explored until now, either for lack of technical mastering, or out of intellectual prejudices." (Moles, 1980).

In the last twenty years Moles' issues have been a constant subject of discussion and inspiration¹, while at the same time they have inspired experiments based on multi-modality, on multiple message control and on artificial sensoriality. Among the many, let us recall the experiments using devices based on systems of small sensors (Waisvisz, 1984), on opto-electronic (Camurri, 1987) and ultra sound technologies (Chabot, 1990; Bauer e Foss, 1992), aimed at controlling sound processes and MIDI devices through the mapping of movements of the body. In the '90s the project of I.M.W (Intelligent Musical Workstation) developed at L.I.M., Milan University, was planning s/w modules built to create functional analogies among literal, graphic and musical objects (AA.VV., 1994). The advent of computational, interactive media encouraged the implementation of multi-modal functions used in composition programs based on virtual objects, like Sound Sculpting (Mulder e Fels, 1998), and also in programs for controlling real time elaboration (Chabot, 1990). Multi-modal interfaces can be considered a decisive step in the development of intersection between natural and artificial sensoriality, for they help navigation within complex environments, allow flexible aggregation of data, and improve communication transparency. It was Internet that made a new process of intermedia integration, based on the ideas of connectivity and non-linearity possible. This not only implied the study of the nature of sonorous objects and the interpretation of their occurrence within different contextual frames, but also required full understanding of the ongoing functions of communications.

Since 1996 Brain Opera, one of the most complex interactive systems for multi media production, has offered a large audience the opportunity to modify sounds by intervening on the sound-image and on sound gesture relations; some different musical stations as well as the on-line interaction were adopted. The creation of cyberspace and on-line communication opened a new scenario which does seem to question the whole system of musical production.

¹ It is known that even Grisey was influenced by reading Moles' information theory: the idea of pre-audibility has been taken up by Grisey with the aim of a double function: firstly, as a dynamic correlation between perception and memory, that is the capacity to imagine a phenomenon starting from its past at its origin; secondly, as a tool for organizing the continuity of timbre change, planning diverse degrees of sound presence, and managing the mutations of temporal perspective.

In this regard, the previously mentioned distinction (deriving from Palomba's analysis) between two meanings of "sound object" linked to different analytical needs, may constitute a useful starting point. Anyone who wants to deal with the issue of recognition of musical objects in the inter-medial spaces of the net, which A. Barbosa classified as shared sonic environments, should take this into account. In particular, according to Barbosa, the site "Cathedral", created by W. Duckworth, should be considered "emblematic for the understanding of the implications of on-line musical production: from questioning the hierarchical or sequential order while accessing musical contents; from ending single producers' isolation to connecting many people in one musical session; from classifying musical contents through multi domain markers to accessing musical contents in non-ordered ways" (Barbosa, 2003).

Unfolding non-linearity

The implications of on-line musical production seem to mark formal and perceptual differences with respect to the past musical experience. In fact W. Duckworth wrote: "Certainly, as a work of art, Cathedral is unlike any previous concert or theatrical model: to mention the most obvious reason why, the form of Cathedral is not expressed linearly in time. In fact it is nonlinear. And time is no longer a factor in a piece of music that is always available, that has no beginning, middle, or end; and that no two people experience in the same order or for the same length of time" (Duckworth, 2003). According to Duckworth the non linearity implied in on-line production no longer allows for musical objects to be identified in an univocal way, due to the uncertainty of musical enunciation and the erratic dimension of listening. Certainly, the ideas of erraticism and non linearity are not new in music: they have been adopted by J. Cage, H. Pousseur, L. Berio, and aesthetically justified through the ideas of *Happening* and *Open Work*. Maybe this is why G. Grisey to imagined the compositional process as evolving through the choices that the composer makes, instead of anchoring it at the beginning of the score. But, as A. Di Scipio noted, in the meanwhile *Open Work* had actually become the architecture of thought and the ideological structure of the existent, cultural condition of the post modern (Di Scipio, 2001).

William Duckworth recently pointed out that "in cyberspace musical experiences appear like series of worlds unfolding in real time. There is obvious order, but not real map, and no "correct" way to go forward, because development is unfolding in all directions at once, creating an interactive matrix of possibilities and causing a plurality of forms to occur, all of which are individual, none of which are, in any sense, alike." It is not by chance that M. Novak used the concept of matrix to suggest the idea of navigable music: "not an organization of sounds in time, but the organization of a matrix of sonic, visual, behavioral possibilities, and others". I interpret such statements as referring to two dimensions: one which refers to endless opening to something new, and one which refers to the endless mutation of digital objects due to their conversion from one domain to another. But It could also recall the schaefferian interpretation of the object/structure chain².

Thus, on the net the musical form, no longer associated with the uniqueness of a musical work, tends to the present and opens towards the exploration of the possible. A composer can only claim to have created "fields of possibility" whose contents will be managed by others. Sounds flowing from different sources can be recognised as a single process, a musical work from which a listener can extract and analyse structures and objects,

² In this regard, see the article 'Acoustic Lexemes for organizing Internet Audio', by Michael Casey, published on *Contemporary Music Review*, Volume 24, Part 6, Routledge 2005. Editor Peter Nelson. Issue Editor Andrew Hugill.

according to the schaefferian definition of sonorous object: “each phenomena or sonorous event perceived as a coherent whole, without regard to its source or meaning”. Music intended as navigable environment even seems to justify the absence of relations between musical project and listening: the idea of freely passing through the musical flows reduces the role of identity of a musical piece, and favours different expressions of musical meaning which, in its turn, is only linked to the listening intention.

While evoking the concept of infinite progression in philosophical, mathematical and musical thought, the idea of enfolding series of words also recurs in the analyses of digital communication theorists: “Reporting on event in time is the most appropriate way to approach digital media in general. It is not simply that these electronic objects and systems are inherently unstable: their very defining quality of unfinish means that different users will encounter very different instantiations of distinct things that go under the same names” (Lunenfeld, 2001). So, even P. Lunenfeld raised the problem of status of “objectivity” of digital objects, whose intrinsic instability requires them to be continuously re-tracked. According to J. Crandall, this tracking-path is filled with signification: “It offers a semiotics that engages with continuity, understanding a moving object not as fixed but in formation -- an “inform” -- on its way to coalescing as a determinate thing, and which exists in a dynamic between passage and construction”. Digital objects end up being a mere hypothesis, which becomes effectual through re-finding, re-reading and re-combining it: all operations which, “while increasing the depth of meaning without ascribing any real specification to it, seem unrelated to the materials used, and imply detachment from the (final) re-combined objects” (Di Scipio, 2001).

Conclusion

The experimentation on metamorphosis of digital objects and transformative functions of intermedia produced a kind of aesthetics where the role of processes seems to assume more importance than their results and their objective connotations. Adopted in the second half of the XX Century by composers who were debating the idea of musical object, the notions of non-linearity and erraticism have increasingly become part of creative processes.

The same concepts have become part of digital creativity, together with ideational paths introduced by computer science and the use of artificial channels of perception. In the meanwhile, the metamorphic qualities of digital objects seem to have been transferred to inter-medial spaces, where the structures can be transformed, converted, and hybridized in the same way. But the mix between the polymorphism of digital objects, the dynamism among inter-medial spaces and the multi point communication gave rise to a duplex result: that digital objects can be modified by human-computer interaction more than ever, and that the formal connotations of a musical work may be re-tracked in an ever-changing way.

We could say that, unlike the concrete sonorous object, the digitally-produced one does not have a definite form. It can acquire different forms, some of which can mutate through functions and interfaces which tend to emphasize inter-medial, dynamic and interactive status of sonorous object. In particular, both inter-medial dynamics and sequence of interactive gestures contribute to elaboration of musical form: the interpretation of sonorous events has to deal with dynamism of inter-medial relationships, with presence of erratic musical events, with partial unpredictability of results, and, sometimes, with a detachment between abstract and concrete qualities of sonorous objects. To the extent that it will be used or emphasized, this detachment will influence the relationships between musical subjectivity and the emotional indexes of sonorous space.

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Links

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