VIVO (Video Interactive VST Orchestra) and the aesthetics of interaction

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Abstract

The research is drawn across the fields of musicology, composition and software development with the aim of achieving a collective intelligence and self-awareness through self-reflection in interactive music.

The present study recognises that for a collective self-awareness to occur through self-reflection in music, specific structures of interrelation have to be adopted, which may enhance the human agent's awareness of the own self as related to the machine. These structures are then implemented in a piece of software. Specific art projects are designed along the investigation to finally test/improve the framework through art practice. The art works spanned the disciplines of music, dance, theatre/performance, film-making, net-art, sport/music interactive public art.

The implementations include: a module for adaptive video tracking that is derived from the feedback loop of action/perception (Vaggione 2001); an adaptive graphic score which is designed upon a previous multi-modal comparative analysis (Impett 2001); a dynamic host for audio software, where the concept of open content is merged within the dynamic orchestration model (Paine 2004).

The piece of software, which provides outcomes that are informed by these structures, is VIVO. This software musical instrument is able to generate an adaptive musical answer to reflect the agents' behaviour by controlling external audio-plug-ins (VST, DirectX, AU).

The paper illustrates its main features, the theories behind the implementations and the partial evidence that was gathered from tests, which are still in progress, within specific art projects.

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Introduction

Aim of the study is to demonstrate that interactive music can be used as tool to allow a process of self-awareness, through self-reflection in music. Research is drawn across the fields of composition, musicology and software development. It is currently in progress at the University of Kent, UK.

The investigation presupposes the basic axioms that: any human agent's recognition of the self in the exterior phenomenological reality constitutes the starting basis for a process of self-awareness and any technology is an extension of our physical bodies (McLuhan 1964).

The present study is particularly important as it recognises that for self-awareness to occur through self-reflection in music, specific structures of interrelation have to be adopted, which may enhance the human agent's awareness of the own self as related to the musical instrument. These structures have been, either identified by the author's previous researches (Paolizzo 2006), or along the current investigation.

In order to achieve the goal, these structures are implemented in a piece of software. Then, the software implementations are tested within musical artworks that are specifically designed for the task. The artworks currently span in conjunction to the disciplines of dance, theatre/performance, film-making, net-art, interactive public art.

The tests allow us to correct the theoretical assumptions and further improve or adjust the framework, according to the issues that may eventually arise during the validation process. Once a structure of interrelation is validated through the artistic practice, it is considered as a bio-logic (Voltan, undated) to be included within the final framework.

Self-awareness

For the scope of the present paper it is enough to describe self-awareness as a form of knowledge. However, few general considerations are still necessary.

First of all, a description is considered to be effective to the extent that it relates to a specific culture or to the individual's experience gathered during the life. Moreover, knowledge is a collective process, which requires, for that to arise, an agreement between the individuals' descriptions (that may also occur across time and space).

A bio-logic: Audio-Visual Feedback Loop of Action/Perception

In electroacoustic music, musical elements, technology and human agents interrelate to each other. The fulcrum of this interrelation is technology, which both includes and exceeds the concept of a traditional musical instrument. Here, human agents have in fact a broader choice of action on technology to shape the musical facts. This chance presents at least a general problem to author and audience. Smalley already addressed what does appear to be the real potential of electroacoustic music. Electroacoustic music, which is confined to the traditional instrumental gesture, does not explore the potential of the medium, while a music which does not take some account of the cultural embedding of gesture will appear to most listeners a very cold, difficult, even sterile music. (Smalley, 1997)

In most electroacoustic music, the source of the sound is not directly perceivable (e.g. it is an algorithm) or it is physically absent (as in acousmatic music). In this context, the musical construct cannot be perceived as a sign produced by a gesture, the source of the sound denotes a high degree of remoteness.

Taking into account the previous considerations about knowledge, as for the remoteness of the source, individuals

will not be able to relate their descriptions to what they already know as music, in an effective way. Also, as a consequence, individuals will find it difficult, or even impossible, to agree their descriptions. Therefore, at best, the knowledge that might arise will be fragmented. It is crucial to understand for the present study, how such a quality can be improved, without compromising the real potential of electroacoustic music.

As pointed out by previous researchers, the meaning of any compositional technique, or any chunk of musical knowledge, arises from its function in support of a specific musical action, which in turn has a strong bearing on the question of how this action is perceived (Vaggione 2001).

This process, named the feedback loop of action/perception, constitutes the pertinent instance of validation of musical processes. Within the contexts described above, the listeners may not be able to read the interconnections between sources and music. In relation to electroacoustic music, the study reinforces the inscription of the musical facts within feedback loops of action/perception to enhance the audienceís comprehension and the accessibility of the musical constructs, which would otherwise denote a high degree of remoteness. In this regard, different directions of investigation are possible. In order to improve the connection between human agent and electroacoustic music, the present study narrows down the feedback loop to an audio-visual domain by focusing specific mappings that relate the visual motion to the evolution of the timbre space of the sound. In relation to electroacoustic music, the study proposes to constrain the musical facts to feedback loops of action/perception in order to enhance the audience's comprehension and accessibility of the musical constructs and, therefore, reinforce the connection between human agent and music.

Of the many directions within this field of investigation, the research focused specific mappings between visual motion and evolution of the timbre space of the sound. As such, the above feedback loop was narrowed down to an audio-visual domain.

An implementation: AVT Module (Adaptive Video Tracking)

In order to integrate audio-visual feedback loops of action/perception, a video tracking component is implemented. The AVT module operates a motion tracking in real-time by using either a live video feed or a pre-recorded video file.

The QoM (Quantity of Motion) of each processed video frame is calculated:

QoM = motion captured at each frame

A bio-logic: Energy Variable

The human-machine interaction can be understood as inscribed within a multi-modal ambient. In a multi-modal ambient, different types of agents interact with each others and each one operates in a different mode than the others. Proposal of the study is to include in the final framework, a multi-modal comparative analysis that occurs at a very low structural level of the agents activity.

Previous research (Impett 2001) already introduced a similar technique in complex adaptive systems for interactive music. In such a context, an energy variable is a single indicator that provides overall historical information about the past activity and current state of each agent. By this technique, the individual energy of each agent changes according to its usage and describes the specific agents chance to act. All the agents are described by this same type of variable and as such, the system can compare the conditions of different categories of agents at a minimal computation cost, as no historical detail is kept. Moreover,

future development is facilitated for integration of both, further categories of agents and new information that can be gathered from different levels of activity of a single agent.

The energy variable is a structure of interrelation that may reinforce the connection between human agents, software agents and other potential media in the ambient of interaction.

An implementation: eScore Module

The eScore (energetic Score) is an adaptive graphic score that modifies the defined sonic scenario according to the agents behaviour and users preferences. Its design is based on the energy variable bio-logic. The interface of the eScore uses interactive automation lines (or curves) to control the energy of each audio plug-in.

A bio-logic: Open Content Dynamic Orchestration

The model of dynamic orchestration (Paine 2004) interrelates the qualitative development of the performative gesture to the evolution of the timbre space. This model applies and extends the ideas of Wishart's dynamic morphology (Wishart 1996) to a dynamically forming orchestration. In such a context, Paine intends an orchestra as a collection of algorithms. Dynamic orchestration is therefore an orchestra of such a kind that can be used when the aesthetic range of expression of the current algorithm is reaching its limits. These algorithms are designed and enclosed in the artworks themselves (as in: MAP2, Gestation, Reeds, Endangered Sounds). (Paine, 1999, 2000, 2001, 2004)

Open Content Dynamic Orchestration, an extension of dynamic orchestration

Proposal of the study is to merge the concept of open content into the dynamic orchestration model.

Open content is any kind of creative work, or content, published under a license that explicitly allows copying and modifying of its information by anyone not exclusively by a closed organisation, firm or individual (Wikipedia 2010).

Rather than leading to monopoly, as occurs for copyrighted content, open content facilitates the democratisation of knowledge. In such a new model, users may define the sonic range of expression for the musical instrument and benefit from the exploration and creative efforts that are produced by other users.

As already highlighted, artworks and pieces of software, which are based on the dynamic orchestration model, include an orchestra composed of proprietary algorithms. Instead, the study proposes to design software implementations and musical works that do not integrate any proprietary algorithm of audio elaboration or synthesis and, in order to compose an orchestra, third-party audio plug-in can be used. In such a way, potentially, a community of users may operate within a flexible open content framework. Users may load the plug-ins with which they are already familiar and discover new sonic possibilities through their usage, within the community. Also, dynamic sonic scenarios may be shared by the users, as long as the relevant third-parties plug-ins are present on the users machine.

An implementation: dRack Module

The dRack (dynamic Rack) is a host for audio plug-ins that is based on the bio-logic of open content dynamic orchestration. It is a special type of rack for audio software, where each plug-in can be configured by the user to reflect a specific sonic answer to be later, dynamically combined. The dRack answers to the requests of the eScore and any single plug-in within the orchestra, is automatically enabled or disabled to create new combinations. Such a dynamic orchestration of the audio source creates perceptive

emergences in the sound domain that reflect the agents behaviour.

Third-parties plug-ins:

GRM tools (INA-GRM 2004) are software audio plug-ins. These are currently used to elaborate the audio signals within the musical works that are part of the research.

In conjunction with dRack, these plug-ins allow to extend the source musical gesture over its duration and to reflect, in dynamic timbre alterations, the agents behaviour.

A bio-logic: Musical Embodiment

The combination of AVT, eScore and dRack helps to create the immersion of the user within an ambient of which is able to determine the asset and that changes in response to its behaviour. This phenomenon is generally defined as embodiment (Ascott in Cilli 1999).

In this context, embodiment takes place, through music. As a consequence of the enhancement that both the audience's involvement in music and its musical expression capacity receive, it is possible to define the phenomenon of musical embodiment as a bio-logic that may reinforce the connection between human agent, music and technology.

Implemented mapping techniques

The AVT, eScore and dRack components adopt two different mapping techniques. In order to maximise control over the automatic elaborations, a direct relation between QoM and sound elaborations is established. Instead, in order to highlight zones of perceptive saliency, a translation of the standard deviation of the QoM to sound dynamics is actuated.

VIVO (Video Interactive VST Orchestra)

VIVO is a piece of software that combines the AVT, eScore and dRack components to provide outcomes that are informed by the identified bio-logics. It is also a benchmark for new algorithms and structures of interrelation that are currently under development or wait to be tested in specific art projects.

VIVO is able to generate an adaptive musical answer to reflect the agents behaviour, by controlling external audio-plug-ins (VST, DirectX, AU). It works in real time as an executable under *Windows* and *OSX.* It has been developed by using Max/MSP/JITTER (Cycling 74 2010). A few externals have been included in minor ways (Pelletier 2008; Pulkki 2006; Jourdan 2009).

VIVO uses video tracking as data source technique to analyse the QoM and its standard deviation. The sensitivity of the AVT module allows to track motion of which the user can be either conscious or unconscious. Therefore, VIVO can be either used as a gesture controlled musical interface or to link the experiences of self-awareness of multiple users. Additionally, it offers the chance to use individual modules separately to interconnect different types of external media.

VIVO has been designed to enhance the user's immersion and expression capacity for musical creation in order to experience self-reflection in music. Along the research, various artworks were designed and used to verify the theories and test the software implementations (Paolizzo 2010).

However, validation process is still in progress and a further test stage will occur within the next musical work, VELODRONE, taking advantage of the experience previously gathered.

VELODRONE will take place the 13th of June 2010 in Rochester, UK. For more information, please visit: http://velodroneconcert.com or http://fabiopaolizzo.com

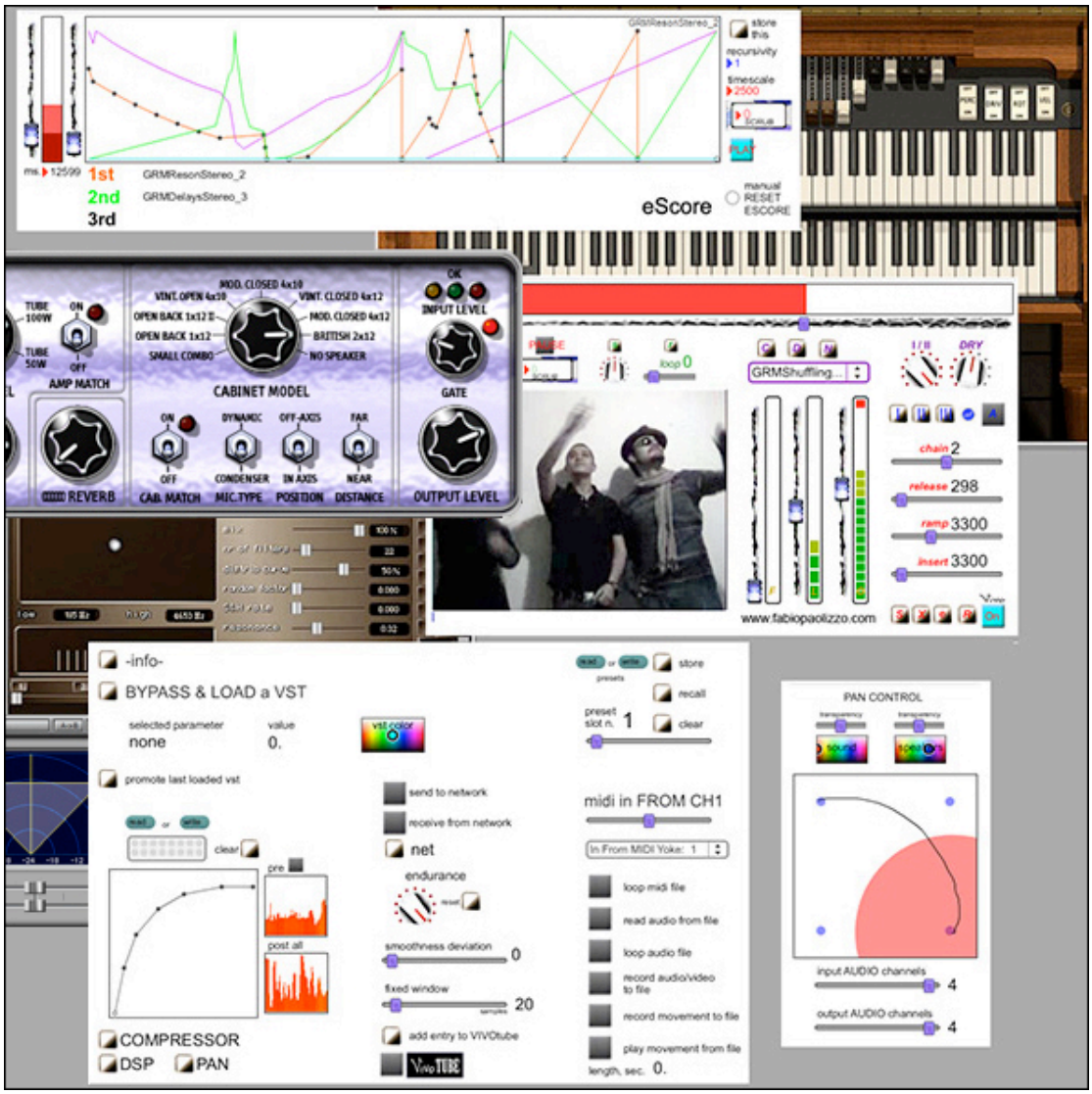

Figure 1. Vivo Windows

Bibliography

CILLI, C. (1999) *La scommessa dell'arte interattiva*. Interview with Roy Ascott. Available from: http://www.mediamente.rai.it/quotidiano/arte/a010418_01.asp [Accessed 26/05/10].

IMPETT, J. (2001) *Interaction, Simulation and Invention: a Model for Interactive Music*.
Available from: http://galileo.cincom.unical.it/esg/Music/workshop/articoli/impett.pdf [Accessed: 26/05/10].

MCLUHAN, M. (1964) *Understanding Media: The Extensions of Man*. New York: McGraw Hill.

PAINE, G. (1999) MAP2 (2000) Gestation (2001) Reeds (2004) Endangered Sounds. Available from: http://www.garthpaine.com/Installation_Works/ [Accessed 26/05/10].

PAINE, G. (2004) Gesture and Musical Interaction: Interactive Engagement through Dynamic Morphology. In: *Proceedings of the 2004 Conference on New Interfaces for Musical Expression (NIME04).* Hamamatsu, Japan.

PAOLIZZO, F. (2010) VIVO (Video Interactive VST Orchestra): An Interactive and Adaptive Musical Instrument for Self-reflection in Music. In: *The international journal of the arts in society*, 4 (6), pp. 149-159.

PAOLIZZO, F. (2006) *Musica e Interazione*. Thesis (MA), University of Rome Tor Vergata.

SMALLEY, D. (1997) Spectromorphology: explaining sound-shapes. In: *Organised Sound* 2 (2), pp. 107-113.

VAGGIONE, H. (2001) Some Ontological Remarks about Music Composition Processes. In: *Computer Music Journal,* 25 (1), pp. 54-61.

VOLTAN, A. (Undated) *Gli strumenti dell'interazione - Incontro fra la bio-logica e la new-techno-logica.*
Available from: http://www.noemalab.org/sections/ideas/ideas_articles/pdf/voltan.pdf [Accessed 26/05/10].

WISHART, T. (1996) *On Sonic Art.* Philadelphia, U.S.A.: Harwood.

WIKIPEDIA (2010) Open content. Available from:
http://en.wikipedia.org/wiki/Open_content [Accessed 26/05/10].

Software

cv.jit. (2008) Pelletier, J.-M. [software] Available from:
http://www.iamas.ac.jp/~jovan02/cv/ [Accessed 26/05/10].Vbap. (2006) Pulkki, V. [software] Available from: http://www.acoustics.hut.fi/~ville/ [Accessed 26/05/10].

ej.function.js (2009) Jourdan, E [software] Available from:
http://www.e--j.com/?page_id=42. [Accessed 26/05/10].

GRM tools (2004) INA-GRM. Available from: http://www.inagrm.com/logiciels [Accessed 26/01/11].

MAX/MSP (2010) Cycling 74. [software] Available from: http://www.ircam.fr/ [Accessed 26/05/10].