Shifting time, space, and consciousness:
The collective mixed reality UVM experience

Ricardo Dal Farra

Understanding Visual Music
Montreal, Canada
ricardo.dalfarra@concordia.ca

Abstract

The artistic interrelation between sound and image has a long and rich history, expanded recently through new multimodal possibilities such as immersive collective experiences. The international project *Understanding Visual Music*, or UVM, mainly focuses on exploring fulldome and immersive environments and has organized symposia, festivals and workshops, and inspiring events in several countries, disseminating and promoting experiences and research-creation projects in the Americas, Asia, and Europe for over a decade. *Understanding Visual Music* has also helped to create a worldwide network of artists and scholars interested in visual music and associated mixed-reality actions. UVM proposes an encounter between art, science and new technologies in collective immersive spaces as a way of weaving networks that connect artists, scientists and technology experts but also open the possibilities of exploring and enjoying visual music, fulldome experiences, and mixed-reality electronic art to everyone.

Keywords

Understanding Visual Music; fulldome; mixed reality; immersive environments; UVM; Visual-Music; computer music; abstract image; electronic image.

Part of History

The interrelation between sound and image has a long and rich history. Many researchers explored it; notably, several of them were musicians. A remarkable example is the work of Alexander Nikolayevich Scriabin (1872-1915) with ultrachromatic microtonal music, synesthesia (considered from an artistic perspective), and so-called "color hearing."

In 1928, Sergei Eisenstein, Vsevolod Pudovkin, and Grigory Alexandrov published a document focused on the future of sound in cinema. They addressed a proposal different from what we often take as the norm: the indissoluble synchronized action-reaction between sounds and images. It is stated in that document that "only a contrapuntal use of sound in relation to visual montage" will allow reaching a new level in the development of montage. This proposal sought to lead to the creation of an orchestral counterpoint between visual and sound images.

Some time later, between 1938 and 1939, Boris Yankovsky and Evgeny Murzin conceptualized the ANS synthesizer (named after the composer Alexander Nikolayevich Scriabin) in Russia. The device was finally built almost two decades later. The ANS is a sound synthesizer with a special graphic score as a controller. The soundtracks in some films by filmmaker Andrei Tarkovsky, such as Solaris and Stalker, were created by composer Edward Artemiev with the ANS.

Similar principles to those proposed for the ANS in the relationship between visual and sound images were used by Fernando von Reichenbach in the 1960s to design and build the Graphic-Analog Converter in Argentina. And for the development of the UPIC, the device conceived by Iannis Xenakis in the 1970s in France and developed by CEMAMu. While Reichenbach's invention used analog electronics, the UPIC was already entering the digital era.

Like Scriabin, and other composers and researchers, Jorge Antunes, in Brazil, also developed a theory about the affinity between sounds and colors, publishing in 1982 a book about his ideas in this regard: A correspondência entre os Sons e as Cores. [1]

Understanding Visual Music - UVM

Decades ago, the interest in the so-called visual music led composer Ricardo Dal Farra to create works that brought together live electroacoustic music with the projection of slides showing paintings by Victor Magariños; and to experiment with interactive digital media that generated music and abstract images in real-time (Interacciones, from 1990, is the first work of this kind created and performed live in Argentina). [2] [3]

Dal Farra's research and growing interest over the years in the relationship between electronic images and sounds was crystallized in an international project known as *Understanding Visual Music*, or simply UVM, as of 2011. That year, the first edition of the international event was held at Concordia University in Montreal, Canada. Under that name, it continues to be developed in various places worldwide.

In 2013, the second Understanding Visual Music symposium and festival was held in Buenos Aires, Argentina; in 2015, it was in Brasilia, Brazil.

The 2013 *Understanding Visual Music* symposium was held at the San Martin Cultural Centre in downtown Buenos Aires and closed with a special event: A visual-music concert at the Buenos Aires City Planetarium. The program included works by Larry Cuba, Matthew Biederman and Alain

Thibault, Bill Alves, and the Jutojo Collective, among other pieces by renowned artists.

A remarkable interest in fulldome works from planetariums around the world has led *Understanding Visual Music* to turn its efforts more and more towards this immersive medium where participants can collectively live an aesthetic experience different from what is traditionally presented in these environments, enjoying an interplay between art, science and diverse technologies that intersect in the planetarium space. A symbiosis between art, science, and technologies that converge in the possibility of offering an audiovisual narrative that does not follow the usual molds but explores the limits of human perception in an attractive "traditional" context (e.g., planetariums and fulldome theatres), with an innovative artistic proposal such as visual-music.

Figure 1. A visual-music concert during UVM 2013, held at Buenos Aires City Planetarium, with about 240 people experiencing a visual-music work by Jutojo Collective.

Since 2013, every year, the *Understanding Visual Music* project offers events for fulldome format that have been held both at the Planetarium of Buenos Aires and in other planetariums around the world, including Bogota, Maloka and Medellin in Colombia, Plymouth in the UK, Santa Maria in Brazil, and Jena in Germany.

The fulldome collective mixed-reality initiative that started in 2013 at the Planetarium of Buenos Aires was frequently organized in conjunction with the annual Electronic November festival organized by the Government of Buenos Aires City and the Center for Experimentation and Research in Electronic Arts (CEIARTE) of the National University of Tres de Febrero (UNTREF).

Every show organized by UVM attracted crowds that usually do not have the possibility of accessing electronic art events of these characteristics.

From visual-music with images projected in rectangular formats, or interactive concerts using multiple parallel screens of different materials that make possible the simulation of depth beyond the regular perception of a physical 3D space, to projection in fulldome format or other immersive environments such as those proposed by virtual reality through individual helmets, there is a long journey with

fascinating experiences, both from the visual and from the sound. And although the projection in domes with multiple high-definition projectors usually takes much of the attention, the immersive sound also plays a key role in the final production. Some planetariums have 32 audio channels distributed through 64 speakers that surround the audience, but it is not the most common. Certainly, this opens the possibility of designing soundscapes and creating music and moving paths of sound signals in a physical or virtual space that allow the construction of alternative realities, in conjunction with visual projections. Thinking on pioneers like Norman McLaren and Eisenstein, the richness of exploring synchronization appears, and also the counterpoint between worlds that may coincide but need not always do so. The audiovisual narrative expands and becomes richer when the abstract creation of images meets experimental music, such as electroacoustic works, and this exploits the three-dimensional space of a dome, being able to include all aspects, even the very mysticism of planetariums that are often a bridge between the universe and our world.

Electronic Art in Immersive Environments

An exceptional experience carried out within the framework of the *Understanding Visual Music* project, once again in conjunction with the Planetarium of Buenos Aires and CEIARTE-UNTREF, was the realization of the Fulldome Workshop UVM 2015/2016 - Visual-Music: Experimentation, Research and Creation. Starting from an open call to learn, experiment, create and show original productions of visual-music for fulldome, this was a one-year workshop held in Argentina between November 2015 and November 2016. The objectives of the Workshop included: (a) To analyze the challenges and general possibilities presented by the production and creation of works for the fulldome format; (b) To acquire knowledge about the technical possibilities necessary for the creation of audiovisual pieces intended for presentation in domes; (c) To experiment with different levels of complexity in the creation of immersive works for fulldome; (d) To explain visual perception phenomena involved in the projection on domes; (e) To identify links between the composition of images -2D and 3D- and the fulldome format; (f) To develop specific aesthetic criteria for their application in the creation of audiovisual artistic pieces conceived for fulldome; (g) To integrate sound work and musical composition in the production for fulldome. [4]

Nearly 50 multidisciplinary teams applied, and 15 were selected. In this way, and free of charge for the participants, the regional capacity for artistic and technical fulldome production was supported and developed, allowing a significant number of artistic works to be created and presented.

It is worth noting that one of the characteristics that *Understanding Visual Music* seeks in each action and event is to bring the audience into a situation of collective mixed-reality that enables everyone to live the experience on an edge that oscillates between total immersion and the feeling of shared space. The proposal is that each person lives these concerts as a multi-sensorial artistic experience beyond an

audiovisual presentation on a screen with unusual geometry. The aim is for each person to experience the concert as a mixed and expanded reality, between the collective illusion and the physical closeness of other attendees.
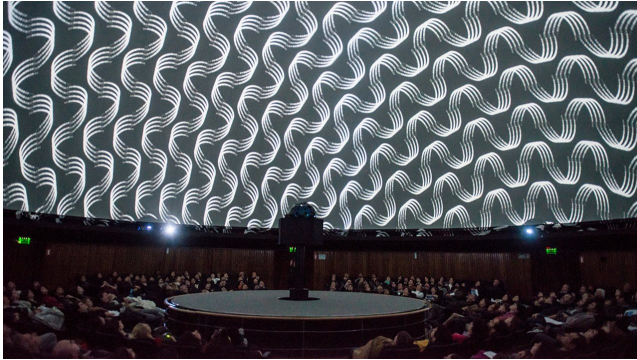

Figure 2. A UVM visual-music concert with the audience experiencing the fulldome version of Two Space (original from 1979) by Larry Cuba.

The relationship between visual and sound images can be constructed in different ways in visual-music. While sometimes it works as "visualized music," where the visual is a consequence of the amplitude, spectrum, pitch, rhythm or other characteristics of sound/music, often in the form of computer-generated animations or light shows, in other cases, it can refer to the "sonification of images," where the audio is derived from some analysis of the image. A remarkable possibility of visual-music is the elaboration of a non-hierarchical correlation between sound and image, where both are generated from the same algorithmic process. Likewise, there are also examples where the works are conceived from a superposition without hierarchy or correlation. In all instances, both sound and image can be presented as pre-recorded elements, live, or even as part of an interactive electronic art installation.
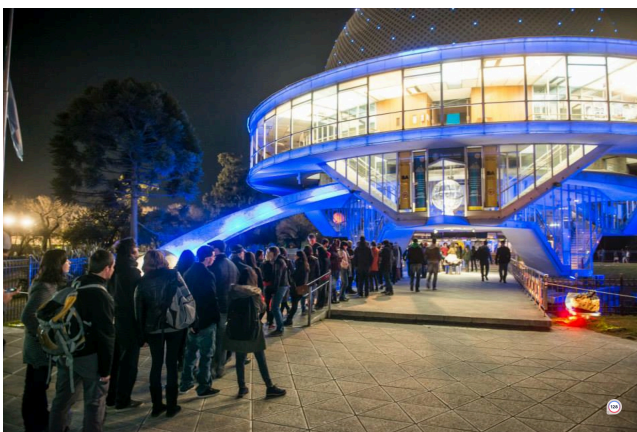

Figure 3. People attending the first fulldome *Understanding Visual Music* concert in Buenos Aires, 2013.

Although production and rendering technologies have come a long way in the last decade, part of the challenge of creating visual-music works for fulldome is the limited resources available to meet the quality (e.g., image resolution) many of these pieces demand. And once the works have been created, making the adaptations and generating the files in the necessary formats for the different planetariums and fulldome environments can take longer than planned, despite high-speed computers or even computer farms. Although standards are being developed to facilitate the circulation of materials, it is still difficult to achieve broad dissemination of the works. In relation to these standards, IMERSA and AFDI have published specifications on the geometry of the visual template (Dome Master) and design considerations regarding the visual part. They also detail file formats (e.g., sequentially numbered lossless files), the number of frames per second (frame rates), and audio formats.

Conclusions

Understanding Visual Music has been helping to create an international network of artists and scholars interested in visual-music, and has also inspired several creation and dissemination projects, including concerts, symposia and festivals in several Latin American countries and beyond. It has facilitated the interchange of information and the transfer of knowledge, and has allowed the presentation of a significant number of works in different cities. This network has been built in such a way that today allows an exchange between curators and cultural managers who see in visual-music presented in planetariums the way to reach audiences of all social classes, ages and conditions, with an experience that otherwise would be restricted to minority groups of artists or technology experts. *Understanding Visual Music* thus proposes an encounter between art, science and technologies in collective immersive spaces as a way of weaving networks that not only connect artists or scientists but also open the possibilities of exploring and enjoying mixed-reality electronic art to everyone. Today, UVM is also a way to educate and propose perspectives that encourage critical thinking. [5]

Acknowledgements

References

[1] Jorge Antunes (1982) A correspondência entre os Sons e as Cores. Sistrum Ediçôes Musicais. Brazil.
[2] Ricardo Dal Farra (1987) "Para Todos Ellos" for MIDI,guitar, digital synthesizer, and real-time electroacoustic processing. With slides from paintings by the Argentinean artist.Víctor Magariños.

http://www.fondation-langlois.org/html/e/oeu.php?NumEn-
regOeu=o00002067

[3] Ricardo Dal Farra (1990) "Interacciones" for real-time com-
puter-generated moving images and sounds. https://www.face-
book.com/UVMvisualmusic/videos/759667198725803

[4] Taller Fulldome - UVM 2015/2016. http://ceiar-
teuntref.edu.ar/2016/11/concierto-del-taller-fulldome-uvm-2015-
2016/

[5] Understanding Visual Music - UVM. Facebook.
https://www.facebook.com/UVMvisualmusic

Author Biography

Dr. Ricardo Dal Farra is a new media/sound artist, educator, com-
poser, curator, and historian. He is a music and media arts professor
at Concordia University, Canada, and director of the CEIARTE-
UNTREF Electronic Arts Research Centre, Argentina. His creative
work has been presented in about 40 countries. He is the founder
of the *Balance-Unbalance* and *Understanding Visual Music* con-
ference series and has been a researcher and consultant for
UNESCO in France, De Montfort University in the UK, Amauta
in Peru, and the National Ministry of Education in Argentina. Dal
Farra was the coordinator of DOCAM, the Documentation and
Conservation of the Media Arts Heritage international research al-
liance. He created the Latin American Electroacoustic Music Col-
lection. Dal Farra is a member of the Board of ISEA International.
http://www.concordia.ca/faculty/ricardo-dal-farra.html