Poetic dimension for the fulldome cinema in 
Demarcar, Resistir!
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Abstract
This article deals with questions about the poetics and relationships between technology and ancestry involved in the research and creative process of the “Demarcar, Resistir!” (2017) film for fulldome, awarded with the “Best Narrative” and the “Planetary of Brasília Award” at the Immersphere Fulldome Festival in November 2017. The film addresses the issue of the indigenous lands demarcation in Brazil, in a political context where the authorities, to promote agribusiness and indiscriminate exploitation of the environment, have massacred this right. The essence of this work is to merge the traditional aspects (graphics and visual elements of indigenous cultures) with 360º visual creation technologies, and the sound composition for such environment with songs and sounds of the forest remodeled by the processes of electroacoustic.

Keywords
Creative process; Fulldome Cinema; Indigenous Ancestry; Demarcation of Indigenous Lands; Indigenous Graphic Designs

Introduction
The current research, about poetic and conceptual creation related to cinema fulldome, points out directions for understanding the relations between art, technology and their possible interconnections with ancestral cultures. For this the creative starting point was to picture how to represent through the visual creation of 3D animation in 360º and the surround sound spatialization (5.1) the existing political and social issues that the indigenous peoples face in Brazil.

The process of the short film for fulldome cinema Demarcar, Resistir! (Brasilia, 6’, 2017), produced by Aníbal Diniz and Victor Valentim, starts from the poetic-artistic territory aiming to bring to light the matter of indigenous lands demarcation in the Brazilian territory, which is configured as a social demand for the remaining traditional populations. This right to land is essential for safeguarding these people’s cultures and traditions, and for the preservation of the environment and biodiversity, objecting to the agribusiness expansion interests – such as priority in territory disputes, landowning concentration and unfettered extractivism – that have gained strength in the post-coup context in Brazil (2016 - 2018). This claim, along with the hordes of judicial and legislative powers in Brazil, has historically been shaped as a slow and bureaucratic process that, due to the recent political domestic events, has sharply been set back given the increasing casualization of the social policies promoted by the current governmental conjuncture.

Besides the spotlight on social and political matters, the creative process for this film approached sound and visual elements present in indigenous people’s traditional ways of living. From the reconstruction and remodeling of these elements through computational and technological resources, to gathering and organizing these elements on a non-linear narrative by processing those elements into transi-
tions and combinations and then intersecting them in the timeline. The proposal intrigues us to discuss the role of art and technology and the poetic-creative process for fulldome cinema beyond the scientific and educational main functions mostly applied to this medium. With a view to enlarge the gathering of a well-informed audience about the large ranges of sensible learning possibilities that this immersive support can provide (YU, 2005).

**Fulldome Cinema – Dialogue between science and artistic poetic-creative process**

When we take a first look inside a planetarium dome what we see is a perfect half-sphere that has its azimuth\(^3\) of 360° and its inclination of 90° that provides us to immediately project an imagined sky, our first door to the universe with all its complexity and deepness. Seen it this way we shall think the planetarium dome as a lens to the universe, therefore when in a Scientific-educational screening of what would be the “sky” in a dome we are given to observe an accurate representation of the celestial chart, with constellations, planets, equatorial axis, all the way to the profound universe. The darkness of the projection room immerse us all into the fulldome cinema, creating the feeling that we are travelling at the speed of light, indeed a challenging and highly sensorial experience (SCHNALL; HEDGE; WEAVER, 2012). The sound spatialization holds our attention as well everything in this moments seems to be substantially wide and deep. The projected planetarium’s zenith\(^4\) is proportionally greatly bigger than the real half-sphere revealed by the projection of the Z axis through extrusion\(^5\). But in the face of such a sensorial and attractive experience, who’d in a first contact consider so many technical issues?

When having such questioning in mind since the beginning the artist may deliberately affect the creative process for a fulldome piece in order to amplify the ranges of building possibilities to a greater plurality of universes. That way each piece may be a new sky with precisely calculated elements in all 3 dimensions, generating multiple depths and sizes when considering the dome thought as a lens (YU; NEAFUS; WYATT, 2016). Thus, a piece’s possible “universe” environment scene is at responsibility of the artist’s poetic aspiration, in which he is also free to have no desire for immersing himself into the subtleties of the scenery, nor to wish to look at the whole picture. But when the artist is able to imagine that the projection environment is a viewpoint, he assume that there are infinite possibilities of views, much larger in terms of poetics than in terms of technologies when the task is to create for fulldome cinema (RIENOW, 2013).

Recently, the technological advance of digital projectors upgrading to new standards the resolution and lightning potentials, aligned to the possibility of concatenation of those projections for mapping creation to dome, promote an exponential growth to the interests in creation of pieces for planetariums. That generates a demand for specific software development for all stages of creative processes (MELENBRINK; KING, 2015), and consequently is notable a rising wave of festivals and exhibition opportunities that in their turn generate an instigated audience in the same time that allows planetariums all around the world to be more visited and acquire new functions not limited to merely “universe displays”. Such a wide creative territory for fulldome pieces composition instigate artists to amplify their knowledge in science, technology and astronomy, fields in first sight essentials to understanding the context in which visual and sound elements are organized inside the dome and the space. It goes up to the point where artists can also suggest new ways for creation for planetariums away from the traditional scientific protocols in such
environment that all around the world find themselves not yet opened to artistic-poetic experiments. The collaboration between physicians, astronomers, scientists, designers, filmmakers, producers, musicians, visual artists and software engineers becomes more and more significant. Such a production chain for fulldome points out to the development of a scene where all this professionals may dialogue and think of new solutions that will help bring education, science and art to a larger public through the fulldome cinema (YU, 2005).

Poetic Dimensions in Demarcar, Resistir!

The combination between sound and image surrounds my work since my admission to the Music Bachelors Program (Composition) at University of Brasilia (UnB) in 2007, when I met my great friend and partner Aníbal Diniz, who studied Visual Arts at the same institution. The methodological kinship that we have developed together for over 10 years of research and productions collaboration results in one of our boldest and most important works: the short film for fulldome Demarcar, Resistir! (2017). We have created this work remotely, I’ve produced the sound in Recôncavo da Bahia and finalized it in Geneva – Switzerland while Aníbal produced the images in Brasília/DF, following our will to put an effort in giving voice to the subject we chose to work with and considering the opportunity to screen the film at the first international fulldome festival organized in Brazil, the Immesphere Fulldome Festival, at the Brasilia Planetarium in November of 2017.

Our first artistic shaping experiences with academic research took place in the outreach program REDE – Rede de IES para povos indígenas (Higher Education Institutions Net for the Indigenous Peoples) of UnB in 2008, coordinated by the professor Maria Luiza Fragoso (UFRJ), where we have conducted our first computer art interactive installation named “Um Atikum” (2008), to pay homage to our colleague Josinaldo da Silva, the first indigenous doctor graduate who had joined the university through the differentiated entrance exam for indigenous student at UnB. That same year he invited us to make the short film “A saúde que se faz na aldeia” (Healthcare how is done at the village) (2008), in partnership with our friend Jackson Marinho Vieira, who was also a member of the research and outreach REDE team at that time. This film was an opportunity for us to get to know the Atikum and Pankará peoples from the Serra do Umã, at the Sertão de Pernambuco (FRAGOSO et al., 2009). The collected material at that occasion was useful to Josinaldo’s endeavor to speak about the traditional wisdom in healthcare from his culture and has inspired us in the subsequent piece developed on the relation between the *maracá* and the *toré* dance within the arts and technologies environment. For that piece we used interactive sound synthesis and image synthesis, by then performed in real time using the open source visual programming language for multimedia Pure Data (PD). After that experience Aníbal and I have cultivated the will to perform a new piece with the subject of indigenous ancestry within the technological means. The opportunity came in 2017, 10 years after our first contact to that idea.
The original proposal to approach the indigenous lands demarcation in Brazil has instigated us to deepen our research on the possibilities of dialogue between sound and image to cinema fulldome. What we had in mind was the creation of a piece not only documental or merely political, but an artistic composition that took on board traditions and their immersive potentials merged with the digital arts technologies: a briefer dialogue between the indigenous ancestry and the new media resources without taking the essence neither allowing technology to overlap the cultural elements of the indigenous peoples. Aníbal has taken charge of the research over the indigenous graphics and visual elements for digital rearranging and remodeling (Image 1), 360\(^\circ\) virtual camera techniques and 3D virtual environment visual compositions for planetariums. I have followed the sonority of traditional peoples from the Alto Xingu region, the singing and flutes from the Bororo indigenous (MT) (VICTÓRIO, 2016) and also the Caiapós singings (PA), forest sounds and the relations between those sonorities with timbres developed by computational sound synthesis processes produced by multimedia programming and ambisonic\(^8\) sound spatialization for 5 channels and subwoofer speaker surround setup (5.1).

Our first idea was to project the planetarium dome as an indigenous oca\(^6\) given the layout resemblance, and to project the zenith as the crowning point from where the images transformations start in a circular movement. The first thought was of an engine that would generate and develop the narrative, following that path I worked concepts of ambisonic spatialization such as 3D sound circular motion spread in allusion to toré dance, which we had seen in Atikum in 2008. Aníbal found reference in the short VR (Virtual Reality) film entitled “Fogo na Floresta” (jungle in fire), directed by Tadeu Jungle, about the deforestation, the environmental problem and the constant territory dispute suffered by many indigenous peoples in Brazil (JUNGLE, 2017), from then on we’ve imagined each visual element been mixed in a way that the subtle image transitions in the planetarium dome would awake to the audience other sensorial dimensions.
The *oca* (image 2) is built in the projection in a fluid way within subtle transitions among the other narrative elements, as the headdresses and the 3D *muiraquitãs* array, the body paintings and the visual representations of the different ethnical groups all the way to the forest’s end dismantling in fire and the text demanding the urgent territory demarcation, all this elements are in counterpoint with the sounds created by a virtual percussion instrument with accentuated attacks and irregular rhythmic and timbre with sweep frequencies in large dynamic and wide spectrum range from under low to the extremely high, along the jungle sounds and bird whispers remodeled by electroacoustic methods and the granular synthesis processing from the *Bororo* funeral chants and traditional flutes with Phase Vocoder effect in Pure Data (PD). The will to portray the *Bororo* sonority came from listening the vinyl “Bororo Vive” (*Bororo Alive*) (BORORO, 1990), released in 1990 by ethnomusicologists from Federal University of Mato Grosso (UFMT), and also the contemporary music piece entitled “Trilogia Bororo” (*Bororo Trilogy*) (2002) composed by Roberto Victório (VICTÓRIO, 2016).

One other bold visual element that draws the audiences attraction is the great 3D *muiraquitãs* array (Image 3) done by Aníbal in 3D modelling, a visual effect reception made possible by the fulldome cinema. The shapes extrusion generates the sensation of jumping “out the screen” it is made possible due to the optical illusion provided by alternating the regular positions of the images’ 2 dimensions by distorting them into the semi-spherical lenses. This sensation is well appreciated and elaborated in the works of artists for this nature of projection. The overlapping elements and the 3D illusion in the fulldome cinema image are some of the great poetic differentials presents in this media (YU; NEAFUS; WYATT, 2016) that when elaborated with poetic intension beyond the merely technical computational manipulation allow way for sensorial openness amplifying the specta-
tor’s introspection inside the small “universe” pro-
posed by the artist.

The burning forest (image 4) in the end of the film intends to lead back the attention to the dome’s zenith, turning it into the point of intersection between the beginning and the end of the narrative. The sound is also synched to the image been centralized in the same point while fading-out. All these transitions were thought with the purpose of developing a non-linear narrative for the film, as it can be commonly found in other experimental works for fulldome cinema.

Demarcar, Resistir (2017) was released at the competitive section of the Immesphere Fulldome Festival in Brasilia/DF in the first week of November, 2017. This festival was idealized and organized by Francisco de Paula Barretto (UFBA) and has counted with the curatorship of Ricardo Dal Farra (Concordia University, Canadá / CEIArtE-UNTREF, Argentina) and Marilia Pasculli (Verve Cultural, Brasil). The festival’s relevance for the Brasilia Planetarium was the visibility achieved during the festival when it had all sessions crowded by the city’s population and after the festival with an increase of visitors frequency. This place that had been closed for 16 years and re-opened in 2013 without much visibility received then films of fulldome filmmakers from Brazil and many other countries. It was an event of high relevance for the fulldome production scene in Latin America that has put Brazil in the map of the fulldome international festivals already popular in other parts of the world such as the United States (Macon Fulldome Festival), Canada (SAT Montreal), Germany (Jena Fulldome Festival), Czech Republic (Fulldome Festival Brno), Japan (IFSV Domefest) among other well-known festivals around the world.

During the final text animation (Image 5) the room is filled with an intentional silence, the words
run around the dome’s walls what put the spectator in an uneasy movement in the attempt to follow the projected message. It is an appeal to the indigenous cause for the lands demarcation in Brazil, precisely in this awkward political moment that our nation now faces since the last 2 years. The main concern present in the fight for land demarcation for remaining peoples whether they’re quilombolas or indigenous is to secure the biodiversity protection and these people’s cultural traditions. The cruelty inherent to the agribusiness and environmental exploitation is beyond repair for our peoples, through art we find ways of expression to bring awareness to those urgent issues on social political demands. And our fight doesn’t end here!

**Conclusion**

To think the planetary as a place destined to artistic and scientific experiences is to instigate the productive chain debate regarding the development of new languages for fulldome cinema. This medium of expression offers a quite wide range of possibilities that inspire me into deepen even more into the possible “universes” that may fit inside the semi-spherical dome. In Brazil we still have a long way to travel on researches and possible achievements of pieces and festivals focused on this language. The places (planetariums) equipped with the most up-to-date projection equipment and high definition sound systems are already present in a considerable number of cities and institutions compromised with the dissemination of scientific knowledge around the country. What we lack is the engagement to increase the visibility and the integration between fulldome producers and the planetariums administrations. We have a quite fertile soil to integrate creativity, experimentation and science to produce educational and poetic highly qualified contents for these rooms.

**References**


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Notes
1 Universidade Federal do Recôncavo da Bahia – (UFRB)

2 Surround is a sonorization technique created to enhance the quality of the sound reproduction to the listeners, through an audio source in independent channels and additional speakers. The technique recreates a more realistic audio environment, present in screening rooms, movie theaters and home theaters audio systems, among others.

3 Azimuth is the angle measured between the north vector and the vector of a determined point on the horizontal plane (ex the intersection between the brightness of a star reflected on the ocean’s surface and the sea horizon line in spherical coordinates). The concept is originally used in navigation to define guidance due to the angular split between an origin point and the astronomic North.

4 Zenith in astronomy is the technical terminology (also used in trigonometry) that designates a point intercepted by an imaginary vertical axis drawn from directly above an observer’s head (located on the surface of the planet Earth) until the imaginary celestial sphere.

5 Extrusion in 3D modeling means the perpendicular volume added to a 2D drawing namely is the process of transforming a 2 dimensional vector image in 3D by expanding it on its third axis.

6 Maracá is an idiophone shaking instrument, consisting of a paper, plastic or calabash sphere containing dry seeds, grains, rice or coarse sand.

7 Toré is a traditional dance present in indigenous peoples cultures from northeastern region of Brazil.

8 Ambisonic is a full-sphere surround sound format: in addition to the horizontal plane, it covers sound sources above and below the listener.

9 Oca is the name given to the typical Brazilian indigenous housing. The term comes from the Tupi-Guarani language family.

10 Muiraquitãs or muyrakytãs (from the Tupi language family) are carved gem artefacts, usually jade, representing animals (more specifically toads, but also turtles and serpents). They would’ve been used by the Tapajós e Konduri peoples that used to inhabit the lower Amazonas before the arrival of the European colonization, as amulets, signs of power and yet as exchange values. There are many legends and myths about them always related to the extinct and legendary Icamibas, indigenous female warriors.

11 Phase Vocoder is a type of vocoder which can scale both the frequency and time domains of audio signals by using phase information. The computer algorithm allows frequency-domain modifications to a digital sound file (typically time expansion/compression and pitch shifting).