



# Immersive Dramaturgy. Aesthetic Dance Experiences Embodied Through Virtual Reality

Ivani Santana<sup>(✉)</sup> 

Federal University of Rio de Janeiro, Rio de Janeiro, Brazil  
ivanisantana@eefd.ufrj.br

**Abstract.** This study aims to explore the potential connections between dance and extended realities. This interdisciplinary approach is based on the concept of dance mediated by technological intervention. In other words, technology isn't merely used for illustration; it serves as a pivotal catalyst for physicality and aesthetic outcomes. Within this research, we're considering both virtual and augmented reality, in addition to the metaverse and imagery generated through 360-degree cameras. Understanding how these systems and tools can enhance technological mediation in dance creation is intriguing. Technological mediation can introduce novel bodily triggers and extraordinary perceptions for both dancers and the audience, aligning with the objectives of the artistic proposal. The experiences with video conferencing during the pandemic played a critical role in shaping what I've termed "immersion dramaturgy." Employing expanded realities has been essential in delving deeper into this form of narrative. The text highlights and deliberates upon the following artistic endeavors: "Itaara" (Hub, Mozilla), "ECOS" (Virtual Reality), and "Em\_Corpa" (360-degree video, Augmented Reality).

**Keywords:** Expanded Realities · Virtual Reality · Immersion Dramaturgy · Dance through Technological Mediation

## 1 Introduction: The Dance Mediated by Digital Technologies

The subject of this article revolves around a dance performance conducted within the realm of virtual reality, while also encompassing an exploration of other forms of expanded reality, including augmented reality. Furthermore, the article delves into investigations involving the metaverse and 360-degree video studies.

However, it's essential to clarify that our interest doesn't lie in the functional aspect of digital devices, but rather in what we refer to as "technological mediation" [17–20]. The research and creative process pursue aesthetic objectives rooted in bodily and perceptual discoveries that emerge through this mediation between the agents of action (dancers and/or the audience) and digital technologies. In this introduction, I will present the concept of "technological mediation in dance" [20] to provide a lens for understanding the studies and work discussed in this text.

In Sect. 2, I delve into dance projects that I consider to be situated within the spectrum of expanded realities. This encompasses a journey from telematic dance [9], through

experiences in virtual realms like Second Life, culminating in current projects called expanded realities: augmented, virtual and mixed reality. Within this reflection, I also incorporate the metaverse and the realm of 360-degree video.

In Sect. 3, I will showcase three works that I've created to explore the immersive dimensions of dance: 1) Itaara was conceived on the Hub platform (Mozilla); 2) ECOS (ECHOES), a project seamlessly intertwining dance improvisation and virtual reality; 3) "Em\_Corpa" is a project that aims to develop a specific language for images generated by a 360-degree camera, considering it distinct from the pre-existing audiovisual language coming from the two-dimensional flat camera (conventional 2D camera). This provides a technical foundation for the development of 360-degree video dramaturgy itself. Through an exploration of this three-dimensional visual language, we've brought to life the interactive video and audio installation known as Em\_Corpa. This project is currently in the developmental stage, presenting itself as a performative installation that incorporates images crafted through 360-degree video and augmented reality.

### 1.1 Dance Improvisation and Digital Technologies

From my standpoint, the utmost significance for dance in incorporating digital technology lies in the potential to unearth fresh corporeal stimuli. My focus extends beyond mere scenography or visual aspects [19]. The goal is to establish a dialogic realm where technology and the body engage in an exchange of information, facilitating the emergence of aesthetics and dramaturgy within the composition [1, 15].

Hence, within this perspective, the dance crafted through what I regard as technological mediation strives and validate this dialogic connection; and illustrate that this integration reshapes the dancer's perception, and possibly even that of the audience. Consequently, actions ensue as a result of the stimulus furnished by technological mediation. As I wrote in my book *Dança na Cultura Digital* [20]:

The body of dance and technology travels in this complex melting pot of culture in permanent imbalance and transformation. Thus, dance with technological mediation should not be considered a stylistic innovation of a dance that uses new media in an indiscriminate and naive way, in the form of facilitating or decorative tools. Technologically mediated dance is an artistic manifestation that emerged from an "irremediably random" world such as that described by Ilya Prigogine, which allows us to understand the environment-individual relationship as a relationship of mutual implications. This implication consolidates the presence of the computer in everyday life and, therefore, changes the body that deals with it throughout this interaction. Therefore, the connective specificity implicit in it must not be lost, at the risk of trivializing what distinguishes it [20, p.33].

Given this conceptualization of a "live" system as one characterized by reactivity and dialogical engagement, dance improvisation appears to be better suited for this dynamic than a predetermined choreography. To sustain an ongoing dialogue, both technology and the dancers necessitate consistent interaction. This article will not discuss or reflect on dance improvisation itself. The interest here is to highlight that all the dance works presented as case studies in this text were created through dance improvisation. Reflections on improvisation will be presented in the sections of each artistic work: Itaara, ECOS and Em\_Corpa.

Hence, these projects are oriented towards technological mediation in dance, and it is from this conceptual framework that I elaborate upon the projects I introduce in the following sections.

## 2 Expanded Realities in the Dance

Certain scholars perceive virtual reality as an illusion [6], while others contend that it delivers an experience akin to those encountered outside the virtual environment [21]. A third perspective posits that this binary categorization is, in fact, [10, 12]. I align with the latter stance, in which scholars argue that “(...) VREs can be analogous to non-virtual experiences in an important sense. Therefore, they are not illusory—yet, they fail to have the same *meaning* as (non-virtual) cognitive states” [16].

It is within this conceptual framework that we aim to contemplate dance within expanded reality contexts, primarily focusing on virtual reality, which we deem the most immersive platform. This choice stems from our intention to avoid immersing users in an illusory state where they lose awareness of their present physical embodiment and become confined to a primarily cognitive state. Similarly, we reject the notion of an identical corporeal comprehension between the virtual experience and that within the physical environment. We posit the existence of various states of presence, each implying distinct experiential dimensions [15].

In the realm of dance, this stance holds immense significance, as we aspire for this domain to serve as a realm of corporeal revelations rather than merely facilitating contemplative, metaphorical, or cerebral encounters. The veracity of this assertion will become more apparent through the forthcoming examples.

Let us adopt the metaphor of immersion, as articulated by Oliver Grau [6], yet with a keen focus on perceiving virtual reality. The expanded realities, especially virtual reality, constitute an “as if” experience, as stated by Rolla et al. [16], and it is more appropriate to use the term “allusion”, therefore, distinct from understanding as an illusion.

The creative processes I have been engrossed in, facilitated by technological mediation, have consistently pursued a distinct level of immersion. Whether in stage productions or even in the realm of telematic dance, extending to contemporary endeavors within virtual reality, the overarching goal has been to reexamine, introspect, and delve into corporeality with regard to its weight, gravitational pull, dimensionality, tactile perception, olfactory stimuli, and more. This endeavor thereby evokes novel or unorthodox sensations and perceptions.

Consequently, when confronted with these alternative perspectives on the dance experience and the very act of dancing, I gradually discerned the emergence of what I term “immersion dramaturgy.” I introduced this concept during the pandemic, a period marked by our profound engagement with remote interactions. Although not the primary emphasis of this article, it remains imperative to assert that these novel dance formats necessitate a departure from conventional narrative creation. The ensuing examples will elucidate several pathways in this direction.

During the pandemic, we explored the different possibilities for using videoconferencing rooms to hold artistic presentations. The public was isolated in their homes and, in general, watched the presentation alone, choosing how to participate in that meeting.

We started studying ways to encourage audience participation, whether through the camera image or through the sounds you could send through the microphone. In addition to creating a dramaturgy that encouraged the public to participate in the work's own narrative, I realized the power of using several meeting rooms simultaneously. In this sense, one of my proposals was important for the creation of the work "[In]Submersas" (2021), which featured several sensory rooms, each created by an artist from the *Mulheres da Improvisação* (Women of Improvisation) collective. The audience was divided into groups, which were sent to another room every 10 minutes. The objective was to promote a network of different sensations, as each artist promoted a different immersive environment, for example: one emphasized the sound issue, another was visual, another was more performative, and so on. One of the artists went through each room proposing a dance improvisation with the elements that were there. The term immersion was then used to demonstrate that dramaturgy is constructed by sensory layers in virtual environments, in which the audience is immersed. Following the metaphor of surfing the internet, we believe that diving is a verb that defines the action we propose to the public.

In another project, called *Casa Parangolé*, the public was encouraged to participate from the beginning, first with simple things, encouraging, but not forcing, everyone to say their name. This stimulus came with the phrase "Marielle, present!" a reference to a councilor murdered in Brazil that gained great repercussion. The audience then started saying her name followed by "present". After that, other stimuli were given, and, at a certain point, the public was thrown into rooms with different performances. When placed back in the main room, they were invited to report what they had seen in their rooms. This resulted in a dialogue between everyone present, who shared what they had witnessed during this immersion in another environment. At the end, everyone was invited to join in a dance using their "parangolés", a reference to the famous wearable work by Brazilian artist Helio Oiticica.

These experiences deepened my studies for more than 10 years in the telematics area. My current investigation into expanded realities is interested in developing "immersive dramaturgy", enabling the subject to immerse themselves in the paths that the artwork can offer them.

## 2.1 Telematic Dance

In a dedicated edition of the *MAPA D2 Journal*, *Map and Arts Program in Dance (and Performance) Digital*, 2015, volume 2, ([www.mapad2.ufba.br](http://www.mapad2.ufba.br)) [17], I curated a compilation of articles that delved into the realm of telematic dance projects, representing over a decade of dedicated involvement. This issue includes contributions from both myself and the collaborators with whom I've engaged in this extensive journey within the domain of telematic dance.

My introduction to telematic dance occurred during a phase of my doctoral studies at Ohio State University under the guidance of Johannes Birringer, spanning from 2001 to 2002. During my time in the United States, I was involved in sessions that entailed interactions among five universities. This platform was leveraged to showcase the respective endeavors of each institution through internet-based presentations. Within these virtual gatherings, each group shared their choreographic creations with their remote colleagues.

Upon returning to Brazil, the opportunity to stage a telematic dance production only materialized in 2005, when we inaugurated the Brazilian academic high-speed internet network called Rede Ipê, an infrastructure comparable to an Internet2 connection. It was during this juncture that I received an invitation to conceive a performance, which I subsequently named “VERSUS” (2005).

In my inaugural telematic venture, VERSUS (Fig. 1), the central emphasis lay on establishing connections among geographically distant dancers. My intention went beyond mere passive observation. The platform for my presentations underwent a transformation, becoming akin to what could be referred to as a “hole in space” (and time), a concept that shares affinities with the title coined by Sherry Rabinowits and Kit Galloway for their 1980 creation facilitated by satellite.



**Fig. 1.** VERSUS (2005). Telematic Dance between 3 Brazilian cities: Salvador, Brazilia and João Pessoa.

Over the course of more than a decade engrossed in telematic dance creation, numerous concepts were explored to evoke a sense of connection and immerse dancers within that expansive and remote realm of space and time. Projects were undertaken to accentuate image manipulation; we devised an approach to layer live and pre-recorded footage, enabling the expansion of the stage’s dimensions; we incorporated intentional data delays as an aesthetic facet to accentuate and delve into temporal considerations; novel “bodies” emerged through the amalgamation of images featuring dancers in distant dialogue; and so forth. In retrospect, I discern that during that period, immersion dramaturgy was already in the process of inception, as innovative methodological strategies were being devised to facilitate the evolution of these endeavors. As I explained in my article “Moist art as telematic dance: connecting wet and dry bodies “[The telematic dance] This new art configuration promotes different sensory-motor experiences compared with a stage-based dance environment. The networked field of telematic dance is one way in which to render reality fluid in a moist context.” [19, p.187].

## 2.2 Second Life

Launched as a platform for virtual reality by Linden Labs in the year 2003, Second Life currently has more than one million active users who frequently interact with the simulated worlds that were developed within it.

It is a virtual and three-dimensional environment that simulates, in some aspects, the real and social life of human beings. Depending on the type of use, it can be seen as a game, a mere simulator, virtual commerce or a social network. Second Life ([www.secondlife.com](http://www.secondlife.com)) allows the environment to be developed by its “residents”, who adopt an avatar to inhabit this world, using it as a platform for communication, social life, and creative activities. Residents of this “second life”, through their avatars, can chat with each other online, socialize, visit exhibition, and perform a multitude of “real life” rituals. The platform also allows the construction of all types of 3D objects, programming necessary tools, and so on, and all productions are listed in an inventory, a section of the interface where all the belongings are listed. The modeling of objects and avatars is based on polygons covered in textures, allowing the images to become more real.

Dance practitioners have also explored the potential of the platform as well as the metaverse today. I found it essential to incorporate this information in the text; however, this article does not aim to explore Second Life but to bring into discussion the possibilities of the metaverse in dance.

## 2.3 Expanded Realities Examples in Dance: My First Experiences

My inaugural encounter with augmented reality materialized through the artistic endeavor “Gretas do Tempo” (Cracks of Time) (2014) which I specifically crafted for Balé Teatro Castro Alves, the official company of the city of Salvador ([www.gretasdotempo.com.br](http://www.gretasdotempo.com.br)). This project encompasses three distinct artistic creations: a collection of screendance pieces titled “Memories of a memory”, an interactive installation - “Memories in time” -, and a soundwalk for the dance - “Memories in space”.

To access the installation situated within the historic edifice known as Palácio Rio Branco, the audience traversed a chamber where the screendances were projected onto a cube. Within this initial space, stands adorned with mirrors showcased augmented reality markers. Attendees could employ a tablet to engage with these markers, subsequently activating additional screendance components. The mirrors fostered the conception of layers, echoing the stratum we had previously explored in telematics. Furthermore, they served as a means to engross the audience within the visual poetics of the environment.

Here again, I realize that this may be a feature of what I currently consider immersive dramaturgy. The three works by Gretas do Tempo allowed the public to appreciate the artistic theme through different sensory experiences. In the case of augmented reality in Gretas do Tempo, the public accessed the image through markers fixed to a mirror. With this, the public watched the video accessed at the same time that their own image was also reflected in the mirror, which also reflected the screendances that were behind them at the entrance of the installation through which they crossed to enter the Palace Rio Branco.

In these examples, technological mediation was important for the creation of each part of the work. The process of recording the videos required the dancers to dialogue with the camera and, in addition, to be aware that these videos would be used in this



**Fig. 2.** Gretas do Tempo - “Memories of a memory” (2014). Augmented Reality installation.

entrance portal or in images that would be reflected in the mirror. In this way, the process is completely involved with the technological devices used. The aesthetics of the work, the movement of the dancers, and the recording of images need to take into account this proposed articulation between the media (see Fig. 2).

In 2022, I explored augmented reality in my production titled *As Histórias de @evamariageni* (The Stories of @evamariageni) (<http://evamariageni.nicepage.io/>). Upon entering the theater, the audience was met with three dancers positioned within the foyer. Attendees were invited to interact with images associated with markers and QR codes adorning the dancers’ arms, hands, and bodies. These dancers, blindfolded and positioned atop an 80-cm diameter circular balance platform, sustained a continuous oscillation. The visuals and avatars that materialized through the spectators’ tablets and smartphones stood in sharp contrast to the (almost) immobile stance of the dancers’ bodies. This juxtaposition conveyed the notion that augmented reality held the potential to unveil each individual’s memories and contemplations. These are other ways of understanding immersive dramaturgy that I am proposing based on this artistic research.

### 3 Three Experiences for an Immersive Dance

The artistic trajectory delineated above, coupled with the comprehension of the concept of technological mediation in dance, has been pivotal in furnishing a foundation for our contemporary proposition within the realm of expanded realities. This encompasses our exploration of the Hub platform (Mozilla) and 360-degree videos as well. These creation processes are important for the development of immersion dramaturgy based on technological mediation in dance. It is worth mentioning that the relationship with the camera (whether virtual reality or 360-degree video) was created from a dance

improvisation, which, in this case, had a three-dimensional and immersive image as a partner. This specific configuration carries aspects that demand other sensorimotor contributions and stimulate other aesthetic possibilities. The following pieces will be presented: Itaara made on the Mozilla Hubs metaverse platform; ECOS, a virtual reality project created with Unity; and Em\_Corpa, a performance installation that integrates 360-degree videos and interactive sound.

### **3.1 Itaara. A Dance Experience on Mozilla's Hubs Platform**

Itaara played a fundamental role in shaping our considerations surrounding an immersive, three-dimensional, and interactive environment akin to virtual reality, despite its conception within a web platform. This endeavor unfolded concurrently with the evolution of the virtual reality venture ECOS, a topic we will delve into in the ensuing section. Given that the level of intricacy on the Hub platform is comparatively more approachable than the development of a virtual reality project constructed through Unity, this experience assumed a significant role within the project. It enabled us to contemplate the prospects for audience engagement with the work, in addition to devising the most effective means of integrating dance within that contextual framework.

The conceptualization and development of Itaara were undertaken by the team at Technological Poetic Research Group: corpoaudiovisual throughout the period from 2019 to 2021. Derived from the Tupi-Guarani language, Itaara translates to “high stone” or “stone altar.” The selection of this title was influenced by my time spent during the pandemic at Itacimirim Beach in Bahia, Brazil. Situated amidst stone formations that naturally shape pools, this coastal haven conferred a sense of privilege, despite the ongoing weight of isolation and the separation from family members. Additionally, this locale served as an evocative backdrop for filming, utilizing both conventional flat camera (2D) and immersive 360-degree (3D) video captures, which were extensively employed in the creation of various environments designed for the Hubs platform.

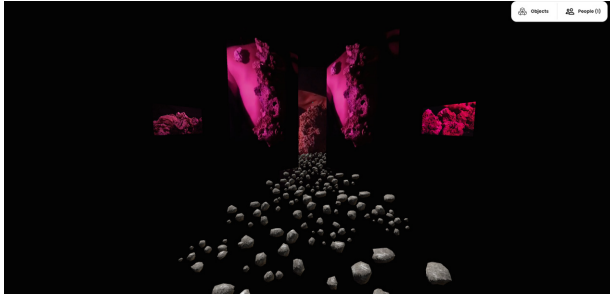
The project was guided by myself, Ivani Santana, and had Renan Felipe Bolcont de Menezes and Letícia Mayne in the development of the virtual environments, while Camila Soares was responsible for the screendances with me.

Our initial inquiry revolved around a fundamental question: How could dance be perceived and not merely observed within this environment? Our intention diverged from creating a conventional gallery of framed images. Instead, we pondered how to engender sensory experiences for users by leveraging the potential afforded by the Hubs platform, even while navigating its inherent limitations. Given the ubiquitous influence of the mediation concept across all project phases, a paramount consideration was to embark on an exploration of the system, intertwined with the established knowledge pool in the realm of media art. Furthermore, this exploration intersected with the realm of dance enriched by technological mediation.

For our team, the paramount attribute under scrutiny centered on the exploration of a three-dimensional environment, heightened by the sophisticated integration of spatialized sound. This foundation prompted our pursuit of crafting distinct experiential trajectories for users throughout their engagement. Within the inaugural chamber, users were presented with detailed directives pertaining to the navigation of portals that grant entry into subsequent chambers, coupled with comprehensive instructions elucidating

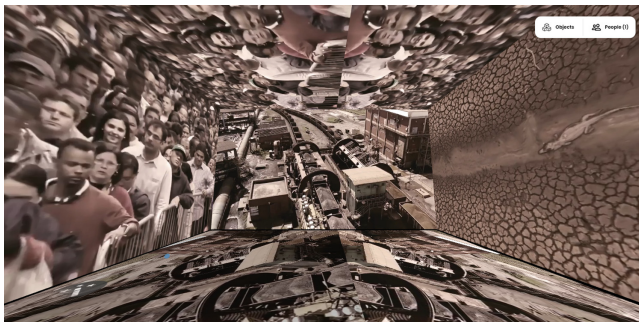
how to navigate the environment through the utilization of either the mouse or keyboard arrow inputs.

This initial room (Fig. 3), for instance, comprised an endless expanse of black space, offering users a stone pathway along which they traverse images of the “sphinx woman” – a figure that forewarns about the realm of Itaara and beckons them to embrace the experience of embodying an Itaara being themselves.



**Fig. 3.** Itaara (2021). Hubs, Mozilla. The entrance. Technological Poetics research group: corpoaudiovisual. <https://hubs.mozilla.com/ArbFzkU/slight-natural-plane>.

Amidst the vast expanse of the initial space, users experienced a sense of liberation and acquired the ability to navigate amongst the evocative depictions of the sphinx woman. Spatialized auditory cues further facilitated an enhanced grasp of the three-dimensional environment. As users approached the auditory objects, the sound intensified, diminishing in volume as they distanced themselves from the source.



**Fig. 4.** Itaara (2021). Hubs, Mozilla. The Chaos room. Technological Poetics research group: corpoaudiovisual. <https://hubs.mozilla.com/mkw436M/caos>.

Conversely, the second room (Fig. 4) incarcerates the user within a tumultuous milieu characterized by boisterous and forceful auditory stimuli. The swift and vigorous alternation of vivid images projected from all facets of this cubical space intensifies the

immersive experience. The portal serves as an egress for the user, guiding them towards another sensory realm.



**Fig. 5.** Itaara (2021). Hubs, Mozilla. The contemplation room. 360-degree image. Technological Poetics research group: corpoaudiovisual. <https://hubs.mozilla.com/apfDPxM/mundo>.

The entrance of this hallucinatory expanse guides the way to access a new environment (Fig. 5), now dedicated to a moment of serene contemplation. Within this setting, a 360-degree photograph invites users to engage in unhurried contemplation, encouraging them to leisurely survey the entire encompassing space. This perspective assists users in identifying subsequent portals that will lead them into further sensory realms.

In this manner, users are incited to navigate the spatial domains, thereby revealing an assortment of distinct sensorial landscapes. Within one such environment, suspended stones come into view, and upon crossing them, they unveil auditory messages. In an alternate locale, users are invited to explore a labyrinthine configuration of stones adorned with 2D depictions of the performer (Fig. 6). A quintessential characteristic of labyrinths, specifically the sensation of aimless wandering intertwined with the pursuit of an exit, is unmistakably established. Furthermore, an environment boasting a 360-degree video format is presented, summoning active contemplation akin to its photographic counterpart. Users are enjoined not solely to search for the portal, but also to manipulate the image's proportions, thus transmuting it into a spherical representation (Fig. 5). Lastly, an enclave is designated wherein users can activate both their camera and microphone (Fig. 7), evoking a culminating conversational circle. In facilitating the presence of other users, this space engenders opportunities for interpersonal exchange and discourse, mediated through the technological device.

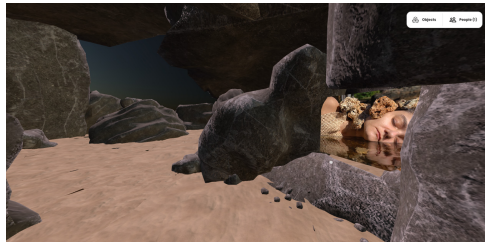
These dynamics were integral to the dramaturgy of Itaara, designed to provide users with stimuli connected to movement, distinct spatial sensations (such as vastness, confinement, and labyrinthine structures), and diverse temporal experiences (including contemplating photographs or videos, and navigating intricate paths). Itaara stands as an example of what I refer to as “immersion dramaturgy,” a concept that invites and encourages the audience to engage with a range of sensations by immersing themselves in various virtual environments. In this regard, the primary aim of Itaara within the Hubs platform—a virtual web environment—was to bring the essence of dance into the user’s encounter with the platform.

In Itaara, the audience's experience embodies an 'as if' sensation, rooted in the illusion of vastness, entrapment, or labyrinthine exploration, contingent upon the specific room they occupy. When viewed on a computer via the web, the sense of immersion tends to be more subdued compared to physically inhabiting a space with these attributes, or even within a virtual reality environment that elicits heightened engagement of the entire sensory apparatus. Regardless of the medium, it remains an allusion, as posited within this text.

Contemplating a narrative rooted in sensations, poetic resonance, and embodied connections, rather than adhering to a framework centered on gaming and competition, emerged as a propitious trajectory for the development of the virtual reality endeavor known as ECOS.



**Fig. 6.** Itaara (2021). Hubs, Mozilla. The Maze Room. Technological Poetics research group: corpoaudiovisual. <https://hubs.mozilla.com/V9i54r8/caminhante>.



**Fig. 7.** Itaara (2021). Hubs, Mozilla. The confessional room. Technological Poetics research group: corpoaudiovisual. <https://hubs.mozilla.com/HHgKPPi/eu-sou-pedra-oceano>.

In the case of Itaara, we can say that the characteristics of a dance improvisation process were released to the public. At each moment, in each room, the audience is involved with the environment and, in this interrelationship, they decide which paths to take and how to move their avatar to dialogue with that environment and its elements. What matters in the improvisation process is precisely the choices we must make when faced with a stimulus. This aspect was chosen to be explored in Itaara, and it was based on this factor that we created rooms with different sensory provocations to offer the public.

This artistic research then seeks to apply knowledge from the field of dance to deepen the notions of technological mediation, immersion dramaturgy, and even improvisation itself.

### 3.2 ECOS. Dance and/in Virtual Reality

ECOS represents another path through which I have strived to delve into the immersive dramaturgy I have been cultivating. This project presents an alternative approach to harnessing virtual reality, transcending the domain of games and educational applications. The integration of virtual reality into the realm of contemporary dance remains relatively new, particularly at the intersection of these two domains, with only a handful of researchers and artists currently exploring this convergence. ECOS introduces a dance improvisation meeting anchored in uncomplicated gestures that arise from the interactivity evoked by the constituents of the virtual realm.

ECOS was conceptualized as an interactive realm, fostering engagement among the user, the avatar, and the virtual environment. The user's actions manifest within the environment, inducing alterations encompassing chromatic shifts, physical transformations, auditory variations, and even the avatar's embodiment. This virtual ecology engages in a symbiotic interplay with the rapport forged between the user and virtual reality, reliant upon the participant's motions for its unfolding. Our objective resides in furnishing visitors with an encounter that heightens their awareness of their own corporeal dimensions contingent upon their engagements within this digital realm. A poetic proposition that delineates how our conduct can reverberate across the environment we inhabit.

User engagement necessitates active involvement, wherein participation, perception, and interaction harmoniously intertwine with the environment. Their gestures evoke responses within the spatial dimensions, impacting facets such as color, saturation, and clarity, among others, while simultaneously influencing the avatars within the system, fostering a seamless connection with the participants. The caliber of interaction—comprising elements like intensity, duration, and scope of action—serves as the determinant of the degree of interconnectedness linking the user, the avatar, and the system. A heightened level of contact, encompassing both visual and gestural aspects, amplifies the vigor of their actions—be it through movement, locomotion, or gestures—culminating in heightened engagement and perception.

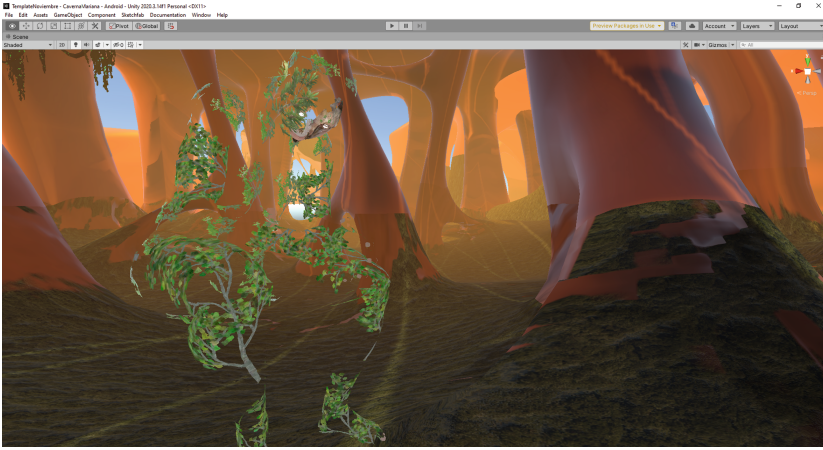
The inception of the project was grounded in an exploration of improvisational procedures within the domain of dance, viewed through the analytical frameworks of Enactivist Theory [23] and Linguistic Bodies [2]. Within this theoretical framework, we conceive the actions inherent in improvisation as outcomes engendered by the phenomenon of “participatory sense-making” [2]. Hence, improvisation transcends individualistic decisions and unfolds as a convergence of individual agency interwoven with the actions of fellow participants and the contextual fabric, collectively shaping the landscape of decision-making. This interplay of actions resonates within the system, prompting a reciprocal cascade of effects across the process and the realm of corporeality. Anchored in this theoretical backdrop, the project embarked on an investigative trajectory, seeking to dissect the intricate web of interrelations among the constituents of a given system. In the context of ECOS, these constituents encompass an array of entities, including

the user, the avatar, diverse elements, entities, and the very spatial environment—each contributing to the complex network of interactions.

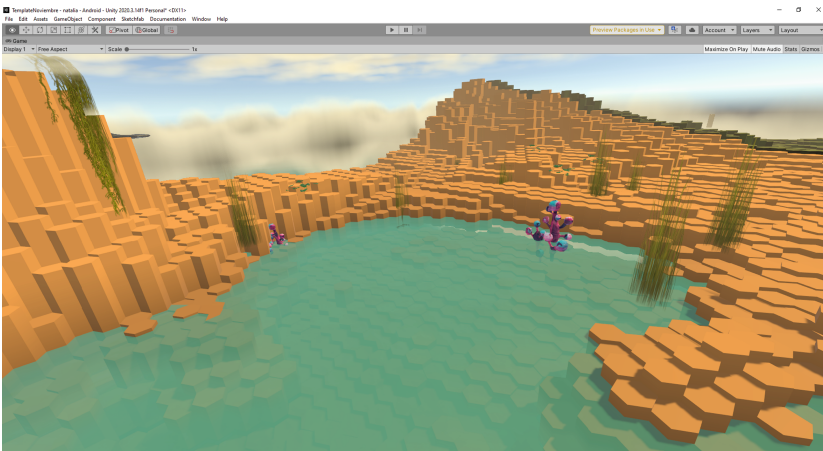
The project presented several challenges for its development in Virtual Reality. The first was to create a library of actions and reactions between the avatar's movements and the user's movements. The head-mounted display sensors impose a certain limitation on capturing a full body expression, so the system needs to infer the user's gestures from these three parameters (glasses and 2 hand controls) added to their movement in the action area. The displacement is considered, in principle, within the avatar's area of influence. In turn, adequate programming had to be generated to capture these movements and gestures and generate a dynamic response in our virtual interlocutor. In addition, it was sought that this interaction also influence the environment, from shapes, materials (shaders), and various parameters that affect the appearance of the environment and its elements. This interplay further extends to induce emotive responses within users, cultivating a holistic experience that encompasses affective dimensions.

ECOS comprises two discrete environments – a cave (Fig. 8) and a lake (Fig. 9) – embellished with mountains and a bridge, serving as the point of entry for users upon their ingress. Echoing the conceptual underpinning of Itaara, the fundamental idea was to propose a dyadic topography: one encapsulated and the other expansive. Distinctive responses from both the environment and avatars demarcate these realms. However, a unifying thread interlaces them: the imperative for users to engage in corporeal movements, particularly those involving their hands and head, in order to render all elements discernible. Within the cave precinct, for instance, an initial veneer of whiteness is punctuated by subtle contours and shadows. The user's movements engender escalated saturation, progressively unveiling all constituents and enhancing environmental perceptibility. Conversely, upon venturing into the lake expanse, the user is greeted by the bridge, mountains, sea, and sky. As the user navigates, mountains flourish with verdant foliage, and the realm is graced with fanciful entities like whales and airborne fish – all catalyzed by the user's movements. Across both domains, the avatar assumes a humanoid form adorned with leaves and plants in the lake, or imbued with brushstrokes akin to cave paintings in the cave – a manifestation that harmonizes the tangible and the ethereal.

Although we still wish to develop ECOS, placing other rooms and other movements for the avatars, it is important to state that even at this current stage, the bases of dance improvisation, technological mediation, and immersion dramaturgy are effectively applied in this project. The notions of participatory meaning can be perceived in the dialogue established between the user and the head-mounted display, and the avatars, and the ECOS environment itself. To reach this stage, it was necessary to physically verify on the dancer's body which movements would be interesting to bring the avatar to life, which is why we consider the importance of understanding technological mediation. In the same sense, it was through improvisation processes with the avatar that we discovered the best ways to implement the avatar's computational programming in its relationship and reaction with the public. Once again, the dramaturgy of immersion is installed from the moment the audience is able to immerse themselves in the work. In the case of ECOS, this is a literal condition, as the environment, avatars and virtual beings will only appear if the user with the head-mounted display moves around the



**Fig. 8.** ECOS (2021). Dance and Virtual Reality. The cave and the avatar as a “nature man”. By Ivani Santana and Daniel Argente.



**Fig. 9.** ECOS (2021). Dance and Virtual Reality. The mountains. By Ivani Santana and Daniel Argente.

space and interacts with the surroundings. If there is no action, or movement from the public, nothing will happen.

Dancing with the avatar is not the same as dancing with a person in the physical world, but, following the arguments of Rolla et al. [16], it is an “as if”, an allusion to improvisation. We also know that the user can move their body in a very simple way, performing movements to access the virtual world as needed by the system. However, these are not functional movements, with an end in themselves (picking up an object, firing a weapon, to give common examples in games), but moving freely through space. This is the characteristic of the improvisation that we apply in ECOS, whose objective

is not specific and codified movements of any dance, but the simple possibility of acting in the space by interacting with it.

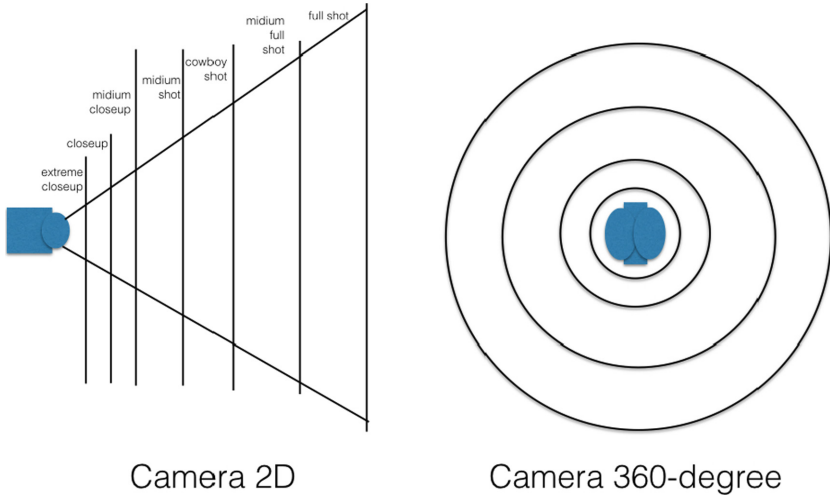
### 3.3 Em\_Corpo: Dance on Video 360-degree

The integration of 360-degree video into our creative process commenced during the inception of the Itaara project. However, it was only in 2022 that the Technological Poetic Research Group: corpaudiovisual embarked on a systematic exploration into the refinement of the audiovisual language inherent to 360-degree video. Although we introduced 360-degree video in the context of Itaara's creative development, the comprehensive investigation into the maturation of the audiovisual idiom associated exclusively with 360-degree video was formally carried out by the Em\_Corpa creative process, which began in 2022 and will debut in November 2023 at the ArtsIT Congress, UNICAMP, Brazil.

In the realm of traditional flat camera methodologies, encompassing aspects like framing, composition, camera kinetics, and the like, a multitude of established norms exists. Paradoxically, our inquiry revealed a paucity of substantive guidance directing us towards the articulation of an audiovisual vernacular that effectively accommodates the unique attributes inherent to the 360-degree camera. In contradistinction to the prevailing inclination among certain authors and artists [1, 10, 15], who seem to endeavor to harness the viewer's perspective through the prism of established audiovisual norms, our approach takes an antithetical trajectory. We posit that the most efficacious approach ought to diverge from the endeavor of curtailing the viewer's gaze and instead, should be predicated on engendering a multitude of divergent trajectories.

In contrast to the conventional frontal engagement associated with the 2D camera, which progresses from a confined spatial frame (extreme close-up) to a broader panorama (full shot), the 360-degree camera introduces a fundamentally different structural paradigm. This configuration entails a circular interrelation, with camera perspectives revolving around the viewer's field of vision. As elucidated through the schematic representation (Fig. 10), the conventional vertical planes depicted by the 2D camera yield an alternative organizational principle. In lieu of these distinct planes, a succession of circumferential rings takes precedence, orbiting in alignment with the panoramic image captured by the 360-degree camera. As a consequence, this reconfiguration engenders a novel methodology for narrative composition, characterized by the evolving spatial dynamics inherent to the 360-degree dancing

Founded upon this comprehension, we conceived the Em\_Corpa installation, wherein attendees are furnished with virtual reality headsets encapsulating 360-degree recorded imagery of the four dancers. Concurrently, the dancers themselves, each equipped with mobile devices and Bluetooth speakers, partake in the performance milieu, generating an auditory landscape interwoven with their bodily movements. The 360-degree visuals are further projected onto peripheral screens, meticulously preserving the original dual-globe configuration captured by the camera. It is imperative to note that this endeavor remains a work in progress, hence the omission of accompanying visual assets at this juncture. The installation will also incorporate augmented reality in a manner akin to what was employed in the production "As histórias de @evamariageni", utilizing markers on the dancers' bodies.



**Fig. 10.** Camera 2D language, and 360-degree video language.

This work is still in progress, but we already have a promising path achieved through research guided by practice. Mediation with the 360-degree camera has demonstrated aspects that are of great importance for the dramaturgy of immersion, such as opening the audience up to choose their narrative and delve into possibilities found at the moment of enjoyment. Once again, improvisation was an important process to discover this dance involved with a global image that exposes 360 degrees of vision. Likewise, the public is offered to dance in this installation, sometimes immersed in the head-mounted display, sometimes participating in the environment and interacting with the dancers. The narrative was created thinking about the transition from virtual to real space, integrating the public in these two environments.

#### 4 Conclusion

While ECOS offers an immersive experience that encourages user movement and improvisation, it's essential to recognize the fundamental differences between the real-world experience and the virtual one. Although ECOS aligns itself with dance improvisation, primarily from a first-person perspective, there remains a noticeable distinction in the experiences provided by these two separate realms. In this complex context, we introduce the concept of 'allusion' as a compelling idea that captures certain aspects of the physical experience within a parallel virtual environment. This framework enables individuals, including those less inclined to dance, to embrace the opportunity to engage in choreographic interactions alongside digital avatars. Built upon the foundation of 'as-if,' this proposition fosters an environment where people can navigate the world of dance with increased confidence and freedom. We argue that this experience is valid due to its evocative 'as-if' nature, thereby transforming the virtual space into an empowering sanctuary for those who might otherwise avoid medium in the physical world.

The term “allusion” [16] represents a powerful idea that serves as a bridge between two distinct realms: the physical and the virtual. In this context, “kinetic encounters” refer to experiences involving movement and physical engagement, such as dance. The core idea is that “allusion” acts as a conduit, allowing people to share and participate in these kinetic experiences despite the barriers posed by the tangible (real-world) and the virtual (digital) environments.

This concept becomes particularly valuable because it offers an opportunity for a wide range of individuals to overcome their reservations or hesitations and become part of the captivating world of dance. In other words, it empowers people who might not feel confident or comfortable dancing in the physical world to engage with the art form within the virtual realm.

By using the term “allusion,” this concept acknowledges that the experience in the virtual space is not a perfect replication of physical dance but rather an immersive and evocative representation that allows individuals to feel as if they are participating in the dance world. This can be incredibly liberating and inclusive, as it encourages people to explore and enjoy dance in a virtual environment, breaking down barriers and making the art form accessible to a broader audience.

The increasing diversity of experiences emerging from various corners of the world, blending the realms of dance, virtual reality, augmented reality, the metaverse, and 360-degree video, is akin to a rising wave pushing dance forward through the channel of technological mediation. Within this intricate convergence, virtual reality emerges as a prominent driving force behind this transformative journey. Our eager anticipation lies in the hope that these interconnected endeavors, spanning academia and artistic creation, will produce substantial insights, enhancing the multifaceted aspects of exploration and involvement nested within this dynamic intersection.

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