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Inter Faces: creation processes for artistic performance enhanced by augmented reality

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ABSTRACT – ***Inter Faces*: creation processes for artistic performance enhanced by augmented reality –** In view of the poetic use of augmented reality, this article presents links between performance and augmented reality technology with self-referenced digital content, supported by the activist artistic proposal *Inter Faces*. For a reflection on creative processes, the artistic works *body* and *Parade to Hope* are compared. With this analysis we intend to present the challenges and solutions found during the creation process of *Inter Faces*, seeking to contribute to the debate on the expansion, popularization and poetization of augmented reality in performance.
Keywords: **Creation Processes. Augmented Reality. Performance. Self-portrait. Hybrid Territories.**

RÉSUMÉ – ***Inter Faces*: processus de création pour la performance avec la Réalité Augmentée –** Ayant l'utilisation poétique de la réalité augmentée comme *locus*, cet article présente des articulations entre la performance et la technologie de la réalité augmentée avec un contenu numérique auto-référencé soutenu par la proposition artistique activiste *Inter Faces*. Pour une réflexion sur les processus créatifs, on fait la confrontation avec les oeuvres artistiques *body* et *Parade to Hope*. On prévu, avec cette analyse, de présenter les défis et les solutions trouvés au cours du processus de création de la recherche *Inter Faces*, afin de contribuer au débat sur l'expansion, la vulgarisation et la poétisation de la réalité augmentée en performance.
Mots-clés: **Processus de Création. Réalité Augmentée. Performance. Autoportrait. Territoires Hybrides.**

RESUMO – *Inter Faces*: processos de criação para performance com Realidade Aumentada – Tendo como *locus* o uso poético da Realidade Aumentada, neste artigo são apresentadas articulações entre a performance e a tecnologia da Realidade Aumentada com conteúdos digitais autorreferenciais coadunados na proposta artística ativista *Inter Faces*. Para a reflexão em torno dos processos de criação, é feita a confrontação com os trabalhos artísticos *body* e *Parade to Hope*. Pretende-se, com esta análise, apresentar os desafios e as soluções encontradas durante o processo de criação de *Inter Faces*, de modo a contribuir para o debate sobre a expansão, popularização e poetização da Realidade Aumentada na performance.
Palavras-chave: **Processos de Criação. Realidade Aumentada. Performance. Autorretrato. Territórios Híbridos.**

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Introduction

The technological innovations of the last two decades have made it possible for contemporary society to use mobile devices (smartphones and tablets) for several different purposes, such as accessing the internet and experimenting with augmented reality (AR) technology. AR is now a widely accessible tool and its use has grown exponentially. The sectors of manufacturing, retail and entertainment and the field of art have been exploring the possibilities of this technology, motivated both by its popularization and contemporary society's relationship of dependence with mobile devices.

Regardless of the field where it is applied, AR technology requires the mediation of some kind of technological resource to visualize digital content, most often mobile device screens. In the field of art, besides smartphones and tablets, multimedia projectors are used in experiments that incorporate AR into creative processes, giving the audience access to digital information overlaid on artistic works. Experiments using AR in artistic creation processes have thus favored traditional art mediums and spaces, which may pose a challenge for contemporary poetics marked by hybridization, ephemerality and deterritorialization, such as performance. Therefore, a performance art project that proposes to exploit AR technology on mobile devices will have to address both technical and conceptual questions. How to provide interaction between AR technology-based digital content on mobile devices and the performance space and body, guaranteeing a symbiosis that highlights and enhances the self-referential, conceptual and activist dimensions of performance?

With such questions in mind, this article aims to investigate the creation processes – understood here as the set of procedures, steps and activities performed at cognitive and behavioral levels to obtain a visual product or work (Santos, 2004) – involved in the practice-based research (Candy; Edmonds, 2018) being developed by the authors. Entitled *Inter Faces between Self-portrait and Performativity in the Continuum of Reality*, the research links AR, self-portrait and performance art focused on the process of poetizing technology. Drawing on qualitative methodologies, this process includes the analysis of two artistic experiments that exploited AR

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to overlay digital content on body and space: the performance *body*, by Camila Hamdan (2008), and the AR activism work *Parade to Hope*, by Mark Skwarek (2011). The goal of this analysis is to identify the expressive, symbolic and aesthetic potentialities of using AR technology as an artistic resource in performance and urban intervention works. It also aims to identify new poetic possibilities offered by both the subversion of the tool and feedback from interaction with the audience, for "[...] art made with interactive technologies is based on the principles of mutability, connectivity, non-linearity, ephemerality and collaboration" (Domingues, 1997, p. 19).

The article starts out by defining the concepts of virtual reality (VR), augmented reality (AR) and mixed reality (MR) to them insert them in the field that investigates the relationship between artistic practice and digital technologies. These first steps are necessary to pave the way to understanding the underlying contexts of the AR-based works *body* (2008) and *Parade to Hope* (2011), whose creation processes are analyzed to identify the procedures, conceptual approaches and tools used in each project. The mapping and comparison of the creation processes of *body* (2008) and *Parade to Hope* (2011) are used as reference points to analyze the creation process of the performance artworks produced in the context of the *Inter Faces* investigation and recorded through photographs, videographics, descriptive reports and website[1]. This comparative analysis aims to identify similarities and differences between creative processes sharing the same technology, especially focusing on the challenges inherent in the poetization of AR in dialogue with performance art. A further goal is to make the documentation of the *Inter Faces* creation process available to be consulted by those looking for creative possibilities in AR.

The Tangible and the Pixel: possible dialogues

The history of technical images is marked by transformations. However, it was in the 19th, 20th and early 21st century that innovations emerged to enhance the process of creating and broadcasting images, such as photography, cinema and video and the replacement of analog by digital media, resulting in new paradigms and new behavior patterns. Media digitization led to the growing need for screens to mediate the visual

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experience and, by extension, the process of enjoying images, since "[...] it therefore seems indisputable that today, as never before, we lived immersed in screens, requiring or being required by them at all times" (Almeida, 2012, p. 15).

Besides the use of devices for viewing purposes, images started being integrated into new realities developed for the creation and enjoyment of visual content in virtual environments, namely VR and AR, both part of the field covered by MR. The conceptualization of VR included two terms whose definitions may have a contradictory relationship:

> The term virtual reality (VR) is commonly used by the popular media to describe imaginary worlds that only exist in computers and our minds. However, let us more precisely define the term. Sherman and Craig [2003] point out in their book *Understanding Virtual Reality* that *Webster's New Universal Unabridged Dictionary* [1989] defines virtual as 'being in essence or effect, but not in fact' and reality as 'the state or quality of being real. Something that exists independently of ideas concerning it. Something that constitutes a real or actual thing as distinguished from something that is merely apparent'. Thus, virtual reality is a term that contradicts itself — an oxymoron! (Jerald, 2016, p. 9).

Despite the oxymoron created by the use of the words reality and virtual, the term resulting from this combination (VR) is used to designate "[...] a computer-generated digital environment that can be experienced and interacted with as if that environment were real" (Jerald, 2016, p. 9). Therefore, the observer is literally transported to the world of image, with the illusory perception of three-dimensionality and movement, besides being submitted to other stimuli, such as tactile and audible.

Although the words that constitute the term AR may not bear a contradictory conceptual relationship, as occurs with the term VR, the association of the words augmented and reality may lead to the inclusion of examples prior to the very development of this technology. Examples of humanity's interference in the physical world have accumulated over time, from cave paintings to graffiti in urban centers. Both cases involve the inclusion of symbolic images and content in the real world, bringing them closer or even including them within the sphere of the concept of AR. However, the borders that define the content covered by AR technology limit its sphere to digital content, since:

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> [...] AR allows the overlay of digital information on the physical world. That is, there is a digital computer or processor involved. The digital information can be purely synthetic, such as from a computer simulation, or can be copies of real-world information represented digitally. There is no restriction on what sense the information pertains to, that is, it can be visual information, auditory information, or information related to smell, taste or touch. The information can be static, such as a digital photograph or 3D digital graphic model or a digital recording of a sound, or it can be based dynamically on a time evolving computer simulation, from real-time sensor data, or other dynamic sources of information (Craig, 2013, p. 16).

In MR (Figure 1), the real environment, VR and AR intermingle in a spectrum whose ends delimit a virtuality continuum (Milgram; Kishino, 1994).

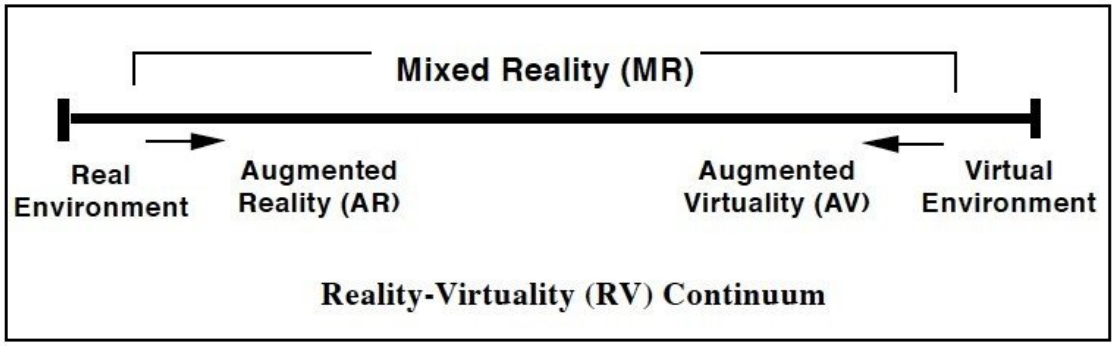

Figure 1 – Virtuality Continuum. Source: Milgram e Kishino (1994).

The growing interest of production and artistic sectors in AR is mainly due to the paradigmatic change driven by new digital technologies, the possibility of interaction with the image. Today, the image is manipulated, animated and adapted to virtual environments through computational technology resources. As a simulacrum it is enhanced by allowing the observer not only to manipulate or interact with the image space, but also to inhabit and explore it. The expression *to enter the painting*, used in the past to describe an aesthetic experience in which the work involved the observer and his or her imagination, today has a literal meaning thanks to VR. The observer can enter the image, inhabiting and experiencing it.[2] Interaction occurs both with the image space and its entire illusory depth and with the visual elements that are part of this same image. On *entering the image* the observer embarks on the immersion experience, an effect exploited by the different platforms that use VR technology. According to Grau (2007, p. 30):

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> The majority of virtual realities that are experienced almost wholly visually seal off the observer hermetically from external visual impressions, appeal to him or her with plastic objects, expand perspective of real space into illusion space, observe scale and color correspondence, and, like the panorama, use indirect light effects to make the image appear as the source of the real. The intention is to install an artificial world that renders the image space a totality or at least fills the observer's entire field of vision.

The Head-Mounted Display (HMD), popularly known as VR headset or goggles, adapted to the screen of smartphones or connected to a computer, allows the observer to cross the dividing line between reality and the umbratic world of the image. By being isolated in a simulacrum and simultaneously being cut off from the visual stimuli of the tangible and surrounding world, observers are able to immerse themselves in the image. Immersion in a new fictional visual field enables not only a new way of enjoying images, but also experiences capable of stimulating other senses, such as hearing and touch, enhancing sensations and feelings such as fear or vertigo.

Unlike the immersive experience made possible by VR, AR uses visual displays as lenses that allow the observer to merge two seemingly distinct worlds, the tangible and the digital. This fusion occurs in a projection space where the real image is but a reflection of the landscape observed through the lens of cell phones or webcams, that is, a fictional image. In AR in mobile devices, the image that is considered real corresponds to a projection of pixels on the screen, ordered from the data captured by the lens and processed by electronic sensors. Therefore, the image that is considered real, which in essence is fiction, dialogues with and comes closer to that deemed as virtual. Despite the fictional nature of the reality captured and framed by smartphone lenses, contemporary society seems to peacefully accept, and even show certain enthusiasm for, having its visual perception intermediated by mobile devices screens. Such a phenomenon could lead to accepting the image obtained by smartphones in real time as actual reality, with the perception of nature outside the visual display causing more strangeness than the image framed and projected on its reflective and fictional surface. If we accept the images projected from smartphone lenses as fragments of reality, the digital content overlaid on these fragments

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would generate images marked by hybridization between the tangible and the digital, as claim Domingues and Venturelli (2007, p. 109):

> The hybrid adds properties of the cyber and becomes cybrid. The potential of the digital, taken to extremes, fuses virtual with virtual in the physical space, confirming fictional desires to live in parallel worlds. Objects, scenes, synthetic visualization, mixed geographies are cybrid spaces and places for existence. Augmented reality and its versions divert the focus from the virtual as an evasion of the real and, dialectically, enhance the potential of the virtual by expanding reality.

In VR and AR, as in any tool used for creation processes, the poetic possibilities may go beyond the original functionalities of such technological resources, as with the film societies founded in the early decades of the 20th century by representatives of the European avant-garde, such as Dadaism and Surrealism, pioneers in experimental film.

Just as Dada artists exploited film resources like stop motion[3], transposing elements of pictorial language to film and appropriating resources of film language to reassess pictorial practice, many artists today appropriate AR resources to reassess or expand the creative process. The possibility of merging in the same visual field the images that surround the observer and a wide range of digital content, linking data, images and audiovisual files, allows this technology to dialogue with the most different interests, from poetic to commercial, from playful to critical. However, it is important to note that the use of a specific kind of technology in artistic processes involves certain risks. The more the artistic proposal subverts the tool's functionalities, expanding them in the interest of the poetical element, the greater the work's ability to survive the tool's obsolescence; if the relationship between the artistic proposal and the tool is one of dependency, limited to the latter's functionalities, the work may not survive when such technology becomes obsolete.

Creation Processes between Art and AR

Numerous creation processes in history have woven together the spheres of art and science. The 20th century was especially fruitful in production stemming from the interaction of these two fields of knowledge. Stelarc[4] and Eduardo Kac[5] are just two examples of pioneering artists who

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blurred the boundaries between science and art by linking engineering, genetics and anatomy, addressing both conceptual and aesthetic issues and creating working methods focused on the specificities of the dialogue between technology and art. The development and popularization of digital media have enabled the world of art to incorporate in creation processes certain technologies like VR and AR. Consequently, the last three decades have witnessed an increase in the number of artworks that allow the immersion of audiences in images (VR) or the insertion of digital content in a space or a tangible image (AR).

Art experiments that incorporate AR into the creation process may have different approaches, overlaying digital content on various kinds of spaces and mediums. The art performance *body* (2008), by Camila Hamdan, used the performing body as a medium to approach digital content through AR. The performance proposes to creatively use computing through the unconventional application of AR technology (Hamdan, 2015), thus making it possible to view digital content to obtain a hybrid body, consisting of flesh and pixel:

> The artistic performance consisted in drawing AR markers, using pens and stamps, on the skin of the audience. The bodies were submitted to demarcation processes similar to tattooing. In this work the bodies were edited by symbolic imaging patterns typical of AR systems and which related at the time to the transformation of subjects into mobile art products, under the dialectical effect of the construction of the body image enlarged by technology, in a venue of exhibition and artistic enjoyment (Hamdan, 2015, p. 277).

The act of drawing AR markers[6] on the spectators' bodies reveals how the artist incorporated into the performance a technical component of the AR visualization system, placing it in the poetic space of the symbolic reconstruction of the body. The *body* (2008) performance made use of ARtoolKit[7], an open-source library for the development of AR interfaces. This tool uses computer vision to recognize markers, making it possible to overlay digital content on such markers. The creation process of *body* (2008) was not restricted to the creative use of technology. The need to use markers for the interaction of digital content with the body allowed the performance, through tattooing, to use the copyleft symbol[8] with a twofold function: as a marker for the viewing system of the AR interface and as a conceptual framework of the performance, since, by acting on the real

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body, the copyleft design transformed it into a technological body subject to the rules of intellectual property protection.

> By proposing to mark the bodies present at the installation with the copyleft symbol, *body* (2008) introduced the current dialogue of modifying the body by means of an editing process similar to tattooing, and assigned to it a new meaning of symbolic existence of technological, political and aesthetic informational content. The poetic license to use this image differently in the art performance invites reflection on the freedom to modify the human body and protect other versions derived from such modification (Hamdan, 2015, p. 281).

The AR interface developed for *body* (2008) used a hardware and software structure, including a webcam and a projector to view the digital content. The technology resources were installed in an exhibition venue and occupied two areas, one for interference on the audience's body with the copyleft symbol, where the webcam was set up, and another to project the body image with the AR digital wings (Figure 2). The interface required setting up the equipment in a fixed spot, since the systems for visual recognition of the marker and visualization of the digital content were not integrated in the same hardware structure, but connected by peripherals. The design of the technology structure used in the creation process of *body* (2008) caused the audience to simultaneously observe the environments occupied by the real body and the body hybridized by the overlay of AR digital content.

Figure 2 – *body*, Camila Hamdan (2008). Image: Creative Commons license.
Source: <https://flic.kr/p/5vHYFb>.

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The use of AR in artistic experiments was not limited to the exhibition space and the use of complex technology structures. The expansion of hardware resources of smartphones and tablets, alongside the development of mobile operating systems, such as iOS and Android[9], has made it possible for AR technology to be incorporated into mobile devices as well. This process has been enhanced with the availability of software development kits (SDK) with support for AR. With the incorporation of AR in mobile devices, new possibilities have emerged for using this technology in artistic creation processes, such as Mark Skwarek's work *Parade to Hope* (2011).

On April 8, 2011, at the intersection of Lorimar and Maujer streets in Brooklyn, New York, a series of events preceded and announced a *grand and endless* parade in search of hope. Initially, an explosion echoed at the intersection of the streets, followed by the formation of a hole from which billowed a large volume of smoke. This hole soon turned into a volcano. Following the volcanic activity, a canyon was formed and, finally, from the depths of the canyon emerged the members of the parade. The events described above, of a fantastic nature that beggars belief, are part of Mark Skwarek's experiment of AR urban activism for mobile devices *Parade to Hope* (2011). In this project, AR technology for mobile devices was incorporated into the creation process, allowing virtual intervention in the urban space with the insertion of layers of digital content. All the events described above were viewed as animated digital content on a smartphone screen through an AR application (Figure 3).

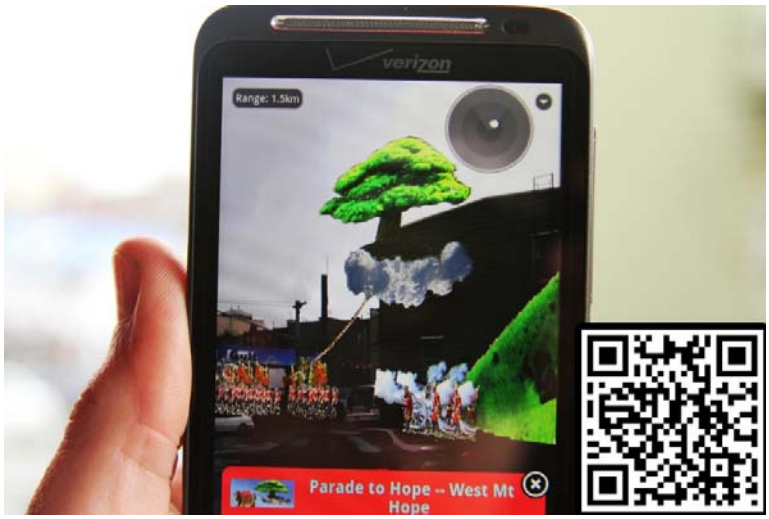

Figure 3 – *Parade to Hope*, Mark Skwarek (2011). Source: <http://paradetohope.wordpress.com/>.

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By inserting layers of digital content in the urban space, *Parade to Hope* (2011) appropriated mobile AR for poetic and activist purposes. The immateriality of the AR-based intervention process exempts the artist from obtaining any necessary permits to assemble and display his work in the public space, enabling the activist intervention:

> AR allows ideas and messages to be overlaid onto the real world digitally with the purpose of achieving activist goals. Activists can create work with AR software such as Layar and Junaio to make their own inexpensive AR protests using their personal smartphones. Having access to low-cost tools allows more freedom to create and distribute activist messages rooted to the physical world. The goal is generally for the message to reach and mobilize the largest audience possible. AR can turn the global community into an audience while at the same time giving them a voice (Skwarek, 2014, p. 7).

Body (2008) and *Parade to Hope* (2011) share the incorporation of AR in their creation processes. However, the technological tools and visualization systems used in each work are different. Such differences can be justified both by the conceptual dimension of each proposal and the technological resources available at the time each work was produced. The relationship with tattooing and performance enhanced the use of the marker recognition system in *body* (2008), while *Parade to Hope* (2011) used geographic data for georeferencing digital content. The digital images present in both works drew on animation, especially because they are associated with action, such as the dynamics of wing movement or the march of a parade. Therefore, besides the creative use of programming language to develop AR interfaces, both projects required knowledge in image editing and digital video, in addition to modeling and three-dimensional animation. In both cases the interdisciplinary relationship between the different technological tools employed was guided by the conceptual and aesthetic guidelines common to each creation process.

The analysis of two artworks that resorted to AR, with a focus on the poetization of this technological tool, contributes to map the strategies adopted in planning new conceptual and aesthetic possibilities for the artistic use of AR. These works provide material to help answer the question posed in the introduction of this article, since the issue addressed makes it possible to correlate both in a single creation process which uses AR in mobile devices to insert self-referential digital content in the urban space,

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building hybrid territories for performance. The combination of a heterogeneous set of components in the creation process, such as the AR tool, urban intervention, self-referential digital content and performance art requires the participation of an agglutinating agent. *Parade to Hope* (2011) draws on a narrative for the genesis of the parade, consisting of a succession of events. By using a similar strategy it is possible to gather the components listed above around a character and its story. Hence the emergence in the context of the *Inter Faces* performance of the pilgrim figure and its journey, based on the relationship between performance and AR for the development of dialogues between simultaneously present/absent spaces and the performer's body. To this end, the tangible (the performing body) and the digital (self-references) interact in a fluid space in continuous transformation, the real space and its expansion through digital content, combining tangible and virtual interfaces in a hybrid territory.

Inter Faces between the Performing Body and AR

The process of creating the *Inter Faces* performances comprised five distinct stages: comparative analysis of AR artworks, technical study of software tools for the development of AR applications compatible with mobile operating systems, creation of the conceptual frameworks of the performances, digital modeling of self-referential content and exhibition of the performances. Among the artistic works characterized by the use of AR technology, *body* (2008) and *Parade to Hope* (2011) were selected for the comparative analysis for addressing in their creation processes similar issues to those at the genesis of the investigation.

The development of the AR application for mobile operating systems required technical knowledge of Unity software[10], acquired through self-learning provided by tutorial videos available online. The software enables the use of SDK for AR. The SDK chosen for the first experiments was Vuforia[11], which uses the computer visualization system to track markers and does not require prior knowledge of programming language, thus enabling a greater number of people to use AR resources. The AR camera in the Vuforia SDK allows the recognition of different types of markers, two-dimensional and three-dimensional, monochrome and polychrome. Although the Vuforia SDK can be used in various platforms and operating

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systems, the Android operating system was chosen to test the first application developed.

Approximately a decade separates the two analyzed works from the initial phase of the creation process of the *Inter Faces* AR performances. Advances in the field of AR during those years enabled both its popularization and easy access to development tools, whether by programmers or the lay public. These factors made it possible to engage in the initial experiments of the *Inter Faces* project without the need of programming knowledge.

The digital content developed for the first explorations with AR and, consequently, the first version of the application were created from self-portraits of the artist (first author of this article) with self-referential images, by appropriating the performer's face and elements from his imaginary world (Figure 4).

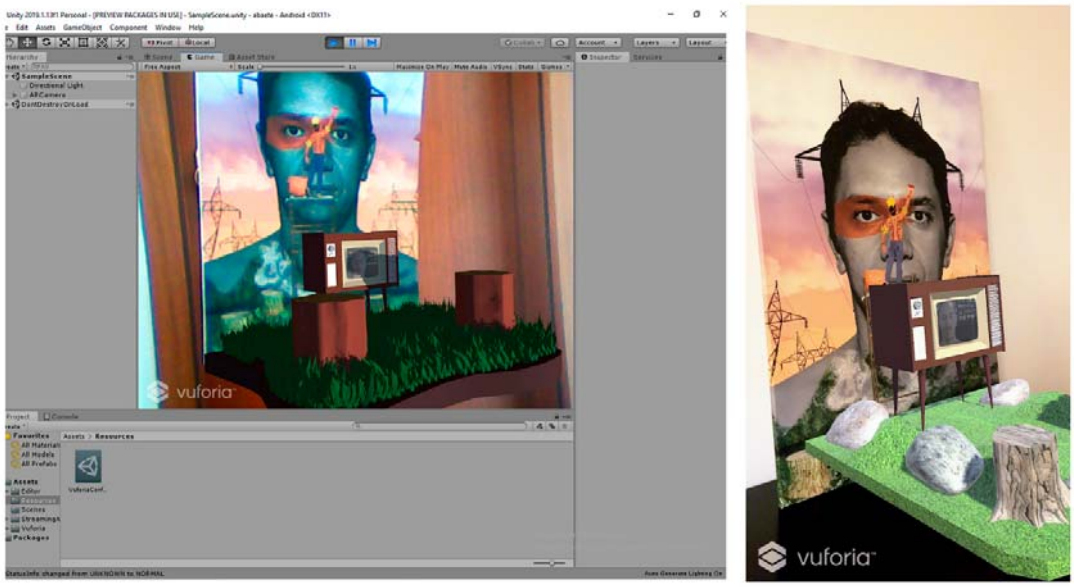

Figure 4 – Image of the artist's self-portrait and first AR experiments using the webcam and later a smartphone. Source: Author's files (2018).

This same self-referential universe influenced the creation of markers for overlaying digital content on the performing body.

The first public exhibition and practical experiment with performance was at the *Timelessness*[12] collective exhibition (Figure 5) as part of the *Campus Exhibition* of the 40th *Ars Electronica Festival*, in Linz, Austria. At that event, the *Inter Faces* installation was on display over the course of five

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days with performances (three daily sessions), two self-portraits in digital painting and a tablet to explore the respective contents in AR.

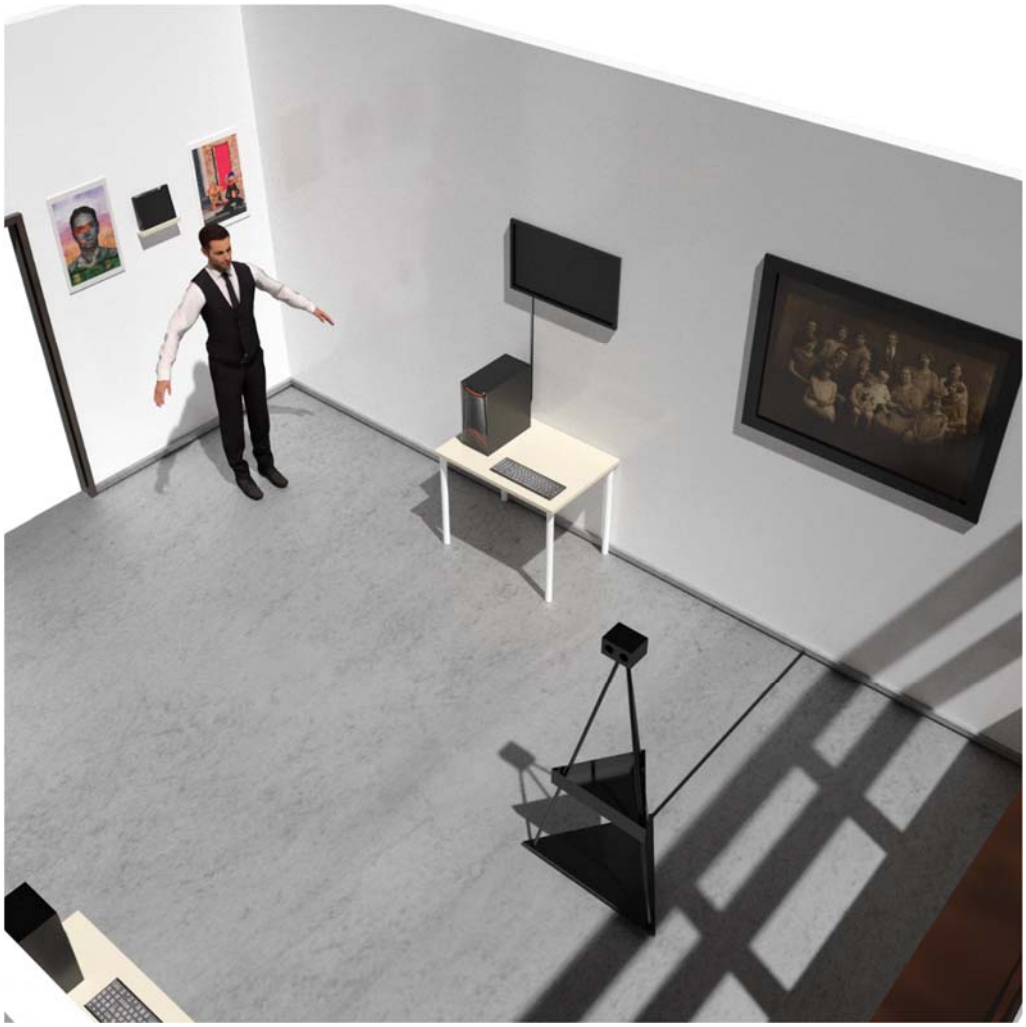

Figure 5 – Three-dimensional model designed for the *Timelessness* collective exhibition, *Campus Exhibition*. 40th *Ars Electronica Festival*, Linz, Austria (2019). Source: Author's files (2019).

For the performances at the event, printed markers were shown successively on different parts of the performer's body, enabling the overlay of digital content with the AR application developed specifically for this event and installed on the tablet provided at the exhibition. Six markers were created, each presenting specific digital content, as shown in Figure 6. The design of this first experiment was based on the project's initial proposal of using autobiographical digital content manipulated by the performer through markers arranged on his body.

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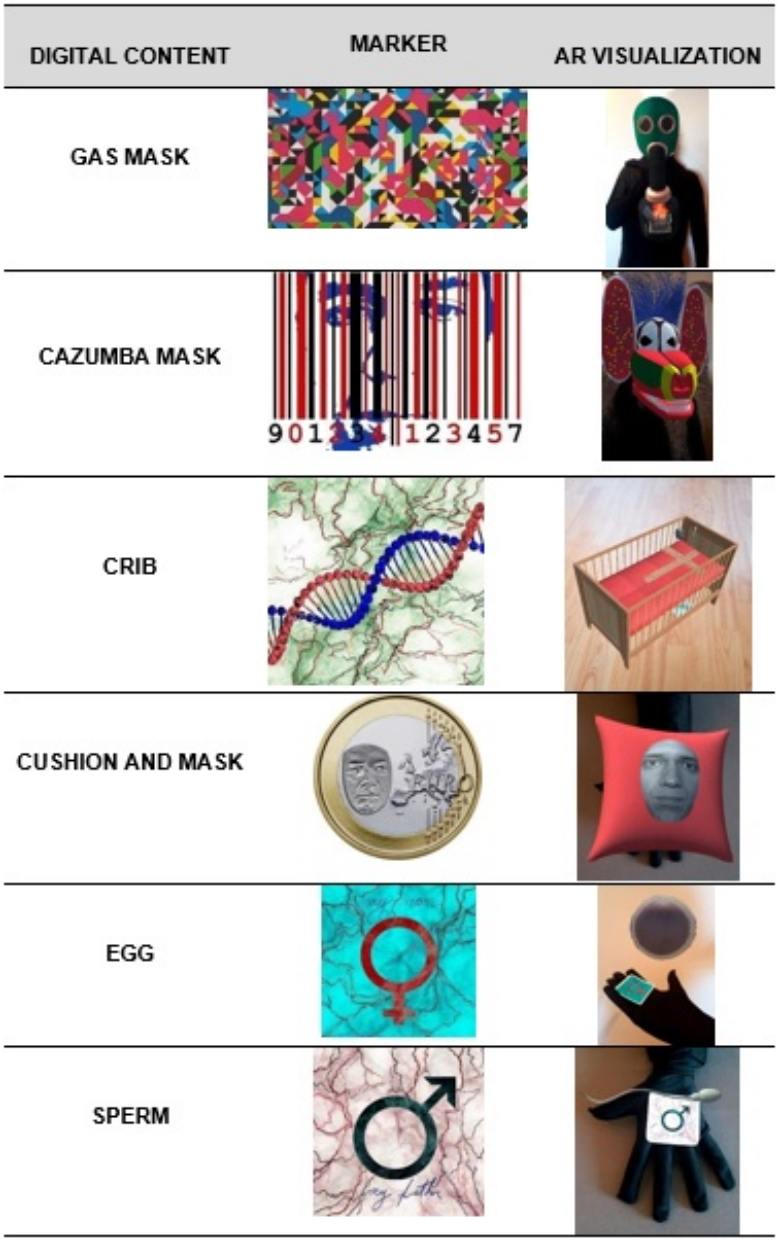

Figure 6 – AR targets and content of the *Inter Faces* installation and performance displayed at the *Timelessness* exhibition, 40th *Ars Electronica Festival*, Linz, Austria (2019). Source: Author's files (2019).

For the demonstration of digital content on the body, a second black skin was used to annul the performer's identity, highlighting the markers manipulated during the demonstration and the visualization of digital objects. Two digital masks visualized through AR were used (Figure 7). With the investigation based on three main pillars – performance, self-portrait and AR – the self-referential element present in the digital content created for this first contact with the audience was developed in two ways:

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the static exhibition of two self-portraits with AR digital content and the performance, which used the performer's image in two markers and three digital contents. Digital AR objects alluding to the performer's history were also used, from the biological conception of the body with sperm and egg to the process of cultural identity formation, symbolized by the *cazumba* mask[13].

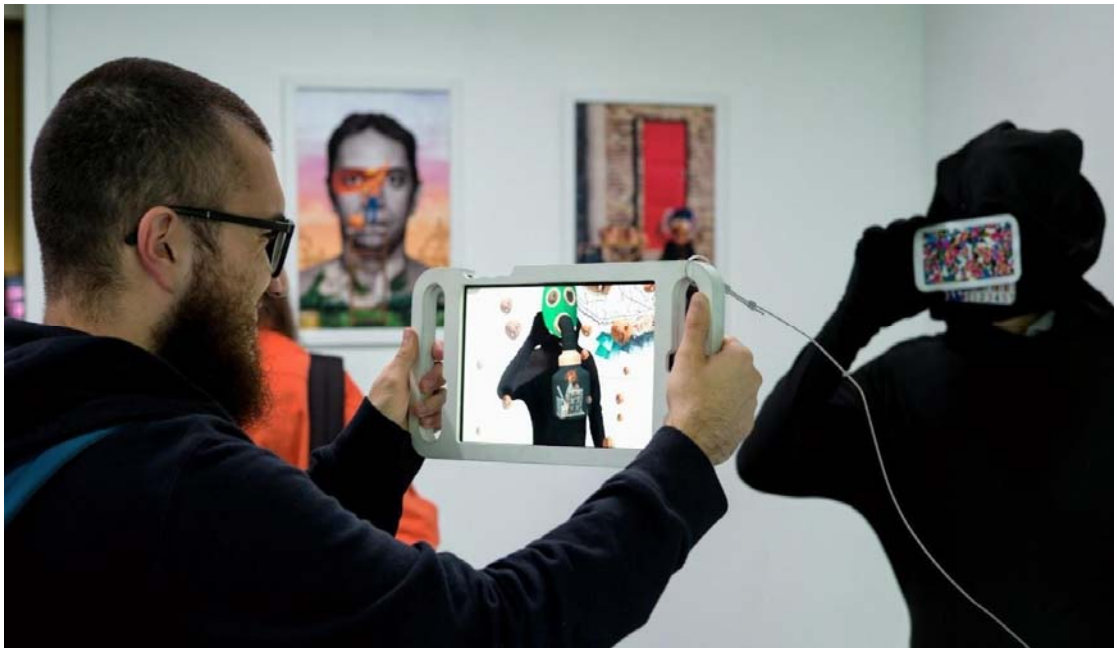

Figure 7 – Demonstration of the use of digital content on the performing body with AR. Image: Rita Carvalho | MILL. 40th *Ars Electronica Festival*, Linz, Áustria (2019). Source: Rita Carvalho | MILL (2019).

After each performance, audience participation and reaction were recorded and subsequently analyzed, leading to the following findings, supported by Human-Machine Interaction assessment methods (Hannington; Martin, 2012):

- digital content with some kind of animation attracted greater attention from the audience, like the gas mask, which featured animation in two elements, fire and smoke;
- the size of the markers required the audience to come closer to recognize the digital content, which somewhat prevented or hindered visualization of the performer's body as a whole. Although the application allows content viewing from simultaneous markers, the audience directed the tablet to specific points, observing the content individually rather than combined;

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- the quality of the tablet's camera, the room's lighting and the size of the markers interfered with their recognition through the AR application;
- the use of printed markers limited the audience's movement with the tablet to an angle of less than 120º around the performer;
- in general, the audience was surprised to observe the digital content on the body; however, as the performance was part of an exhibition within a huge festival lasting only a few days, it was expected that the audience's interest would quickly disperse after experiencing only part of the performance as a demonstration, rather than persist for the whole performance. Therefore, the performance was adapted to re-exhibit the initially planned ten minutes as a five-minute abridged demonstration.

These findings revealed that the use of markers to overlay digital content on the performer's body was not very effective, leading to the exploration of another AR interface without compromising the main goal of the investigation. Unlike the approach adopted in the *body* performance (2008), which used a fixed visualization system, a large projection area and a single marker on the audience's body, *Inter Faces* used six markers and reduced visualization to the limits of a 10.1 tablet screen. The use of mobile devices by the audience to experience the performance is a focal point of the investigation. By the final stage of the project the aim is to have the application available to be installed on the spectators' smartphones, providing them with mobility and individuality in experiencing the performance. Therefore, the need to keep the AR camera positioned close to the markers for their effective recognition may be a challenge if several devices are used simultaneously to view digital content.

In the following exploration, the markers were replaced by georeferencing of digital content in tangible spaces, thus allowing the performance to take place in a hybrid territory. That way the relationship between the body and the AR content would be preserved and digital content viewing would not depend on recognizing markers through mobile device cameras, but on recognizing the application's set-up coordinates through the devices' GPS. Another important aspect concerns the position of the audience in relation to the performer. With no need to recognize markers through the AR application, the audience would not have to come close to the performer to view the digital content or the performance. That

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implied changes in the conceptual framework of the performance and, consequently, in the digital content. The small digital objects loaded with memory were then transfigured in hybrid territories and the body, devoid of identity, metamorphosed into the figure of a pilgrim, a character conceived to inhabit the AR performance space.

The shift from exhibition space to urban space, thanks to the replacement of the marker recognition system by the digital content georeferencing system, brought the Inter *Faces* performance closer to *Parade to Hope* (2011). AR on mobile devices makes it possible to insert layers of digital content in the public space, expanding the urban intervention process. The process of redefining the environment by including new architectural structures, with images, videos and animation, enables an activist approach to intervention in the public space by addressing social, environmental and political issues.

Restructuring the performance in light of the new technical aspects, with the replacement of the marker system by the georeferencing system to explore digital content, made it possible to expand the project's concept. The manipulation of digital objects with self-referential content limited the performance to the body, neglecting the potential symbolic relationships provided by the occupation of different spatial contexts by the AR performance. The focus on the body as a reminder of the performer's memories limited the possibilities of dialogue with political, social and environmental issues which directly affect the construction of the performer's identity, as well as the way he is inserted and perceived in the world. The occupation of public space gave the project the opportunity to associate the performance, the self-referential aspect and AR with the activist approach, combining them in public acts whose element of protest is gradually linked with the relationship between the performing body and the urban space. The investigation ceases to be associated with a demonstration of the use of AR in performance to become an example of *artivism*.

> Artivism is a conceptual neologism whose consensus is still unstable both in the field of social sciences and in the field of arts. It draws on links, as classic as they are wordy and controversial, between art and politics, and stimulates the potential destinies of art as an act of resistance and subversion. It may be

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> found in social and political interventions, produced by people or collectives, through poetic and performative strategies (Raposo, 2015, p. 5).

The pilgrim character and its pilgrimage find in their origins the glimpse of a possibility: performance in the continuum of reality. Such circumstantiality gives rise to technical and conceptual challenges which can be overcome by the comparative analysis of artworks that have faced similar difficulties, especially when using the same technological resources. The analysis of *body* (2008) and *Parade to Hope* (2011) allowed the *Inter Faces* investigation to identify and compare the creation processes of the two works, showing in both of them the importance of the conceptual discourse to subvert the technology used. The use of AR was not restricted to the tool's functionalities. A mutual redefining relationship was established, with the concept poetizing the tool while the tool materialized the concept.

Journeying through a Hybrid Landscape

The new version of the *Inter Faces* performance, with the replacement of the AR camera format used for self-referential digital content, contributes to consolidate its conceptual framework in the relationship between AR, self-portrait and performance. Supporting this framework is the pilgrim, who blurs the boundaries by venturing out on a journey that will take him to spaces whose limits and structures have been redefined by AR technology. This reformulation enables the expansion of the urban space by interfering in the daily flows and appropriating dynamics typical of cities, because "the public space is configured by its multiplicity of flows, not as an isolated territory" (Ferreira, 2019, p. 5). Every pilgrimage is motivated by the desire to reach a sacred place, a sanctuary that lies latent and whose vigor will only be manifested with the arrival of the pilgrimage at that destination.

The pilgrim's journey was designed to take place from intervention in four different locations, through the overlay of AR digital content on the public space. The intervention process enables the performance to symbolically resize the landscape, with the inclusion of architectural structures or virtual characters. All stages of the pilgrimage process are recorded on Facebook and a blog, whose accounts were created exclusively to document and disclose the performance online.[14] The application to be

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developed for the last two stages of the performance will be available on virtual stores for the Android and iOS systems, allowing the audience to use their own smartphones to view the digital content.

Of the digital content created for the performance, a virtual character was designed to guide and accompany the pilgrim throughout the journey – the Angel of the Annunciation (Figure 8). This digital content introduces the audience to the pilgrim, contextualizing it within the spaces occupied by the performance. The performer's face is reflected in the angel's, which enhances the use of self-referential digital content. The insertion of the angel figure as digital content in a tangible space (Praça do Comércio, in Lisbon) enabled the performer's first experience of linking the body with digital content.

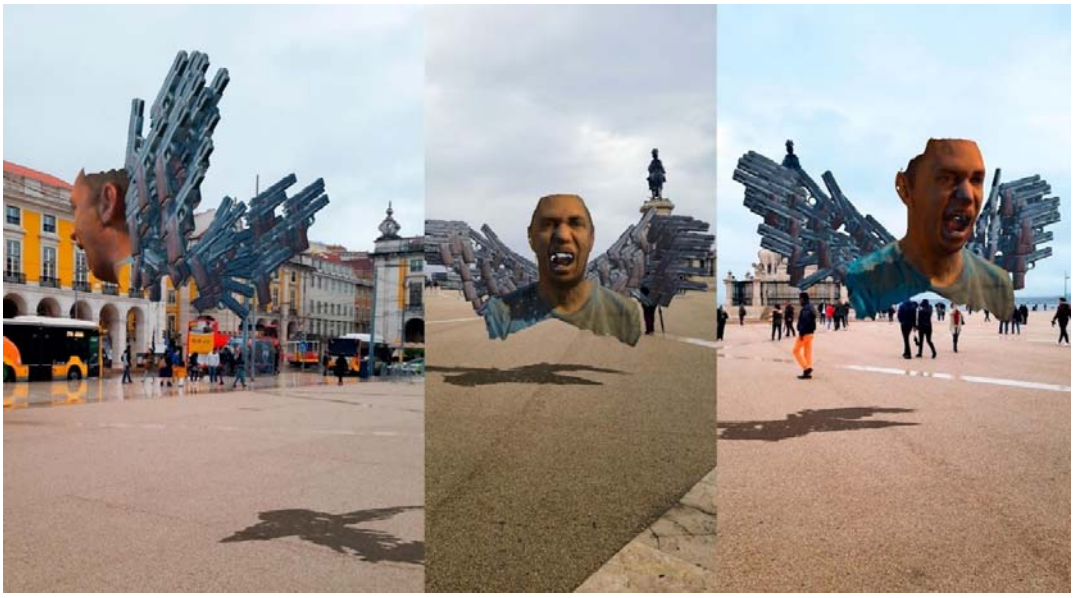

Figure 8 – The Angel of the Annunciation in Praça do Comércio in Lisbon / Portugal.
Source: Author's files (2019).

The first stage of the pilgrim's saga occurred before the AR mobile application had been released to be downloaded. Being a first experiment, it was decided to observe the reaction of passers-by faced with the unusual behavior of an individual who uses the smartphone to see something that is not present in the space. This first experiment also made it possible to analyze the operation of the AR application, especially regarding the georeferencing of digital content to the animation, to the shadow projection and to the relationship of that same content with the surrounding space, in addition to any possible unforeseen glitches. Therefore, this iteration of the

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performance also served as usability testing of the software (Hannington; Martin, 2012), both as a critical checkup to ensure its quality and as a final review of the project (Pressman, 2011).

The second phase of the pilgrimage was at the opening of the 11th edition of *INSHADOW: Lisbon Screendance Festival*,[15] with the inclusion of the *Inter Faces* performance in the event's program. New digital content was developed for this second phase, besides the Angel of the Annunciation. The performer's image was used for a visual interpretation of Exu Orisha.[16] Being a deity associated with pathways and which plays the role of messenger between humanity and the spiritual world, the figure of Exu was used for the creation of a new deity, a being which watches over the pathways between the tangible and the digital, which guides adventurers who venture out on the pathways that connect and transform matter into pixel or overlay pixel on matter. Such a relationship can be easily established:

> Exu is the beginning, middle and end. Exu lies in the tree, in the river, in the fish, the bird, the stone and every living thing. As a dynamizing and molding energy element, it develops, mobilizes, nurtures, transforms. It is responsible for linking the never-ending flow of everyday experiences between Orun and Aiyê, the spiritual world and the natural world. It is all and nothing. Its restless way of existing resonates with the philosophical thought of a universe without logic. A universe of infinite logics, a multilogical universe (Machado, 2010, p. 11).

An altar was designed for this deity ornamented with the image of the Orisha and flanked by two objects, a fire-spouting amphora and its symbol, the trident (Figure 9). This digital content provides the appropriation and expansion of religious syncretism by integrating the image of the performer with Exu's visual representation, assigning him new powers. The syncretization here blends religious symbols with the self-portrait and AR, setting up movements between the real and the virtual. The intangible altar invades the tangible space, building up the digital structures required for the development of the performance, with the performing body traversing hybrid territories.

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Figura 9 – Altar to Digital Exu. 11th *INSHADOW* 2019.
Source: Author's files (2019).

To ensure the audience could view the digital content the performer used a screen magnifier to increase the viewing area of the smartphone in use from 5.5" to 8.6". Although the increase in viewing area was not considerable, more people were able to gather around the suspended screen to see the digital content (Figure 10).

Figure 10 – Audience watching the digital content through screen magnifier. *11th INSHADOW* 2019.
Source: Author's files (2019).

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The sanctuary was designed to end the pilgrim's journey and introduce the activist aspect of performance. In this space where the tangible and the digital connect, the temporary effect of sacralizing the profane territory took on a political dimension. The sanctuary honors six people, victims of violence in the struggle to defend the environment and human rights – Marielle Franco, Chico Mendes, José Oliveira Guajajara, Nilce de Sousa Magalhães, Dorothy Stang and Rosenildo Pereira de Almeida (Figure 11). Six martyrs of violence in Brazil. The aim of the sanctuary is not only to serve as a site of tribute, but also as a site of memory and a means to demand justice. Thus, it is expected that the use of social networking sites as platforms to document and publicize the performance will attract a certain number of people to take part in the final stage of the pilgrimage,[17] consolidating it as a public act and reinforcing its conceptual element of protest. That justifies the choice of the sanctuary's georeferencing points. In the next version of the performance, the 27 Brazilian capital cities will be occupied by the sanctuary, which will always be located outside a court of justice. The pilgrim will end his pilgrimage at the georeferenced sanctuary in Brasilia, outside the Ministry of Justice, but anyone may visit him in each of the Brazilian capitals as long as they have the application installed on their smartphone.

Figure 11 – Three-dimensional model of the sanctuary with images of the martyrs.
Source: Author's files (2020).

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Designing an architecture structure on a sanctuary scale, building it in 27 different cities and leaving it permanently exposed in public spaces would be a huge task without the use of AR technology. Occupying public spaces with a digital architecture structure, creating a hybrid site that can be inhabited by the performing body, is one of the possibilities of the poetic use of AR (Figure 12). The pilgrim and his journey, the Angel of the Annunciation and the Sanctuary of the Martyrs of Our Time are part of a set of lenses that use AR beyond the fields of entertainment or production. The appropriation of public space with digital content through AR, as well as the proposal of the *Inter Faces* performance, can be widely used by contemporary poetics or activist movements. In both cases the messages digitally developed in the public space may be motivated by different interests, seeking to exploit the potential of AR as a tool to convey information. To this end, technology must adapt and expand based on the conceptual proposal that guides the work's process of creation, vitality and power.

Figure 12 – Sanctuary (application test). Source: Author's files (2020).

Being Present in an Absent Space

The language of performance has the freedom and flexibility to establish volatile relationships between body and space, making it possible

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to shift the perception of the tangible content of the territory occupied by the performance to a new symbolic territory. Such an act is responsible for causing a rupture in the borders that define the symbolic aspect and the daily use assigned to the occupied space, generating feelings of strangeness and uncertainty among those who inhabit or use the invaded territory, since, as stated by Carreira (2008, p 69) "[...] the occupation of city spaces by artistic interventions always implies the creation of 'states of rupture in daily life'".

The simple presence of the performance in a territory is strong enough to trigger an interference in the daily life of a given space, as in the pilgrim's first intervention in Praça do Comércio in Lisbon. However, the pilgrim's journey through a hybrid territory can go beyond interference in daily life, reviving the space and redefining its forms and symbols. Hybridization is made possible by the intangibility of the digital structures installed in the space through AR – a territory whose architecture is forged by the amalgamation of concrete and pixel. The performer is the unifying element of the concrete-digital structure of this hybrid territory. His action should reveal the presence of the hitherto invisible digital content that inhabits the territory, and evoke the use of screens by the audience as lenses that allow them to glimpse a changing landscape. By situating itself in a shifting space, the pilgrim's body crosses the boundary between the tangible and the digital and unites them. The performance draws on symbols present in the digital space to fix them on firm ground, in the tangible space, establishing between them the necessary relationship to create a new symbolic space, with layers of information capable of evoking political, social and environmental activism.

> The performance space, whose concept is linked to the idea of set design in the field of visual arts, and not in the field of decoration or communication, exists in relation to the notion of image and movement. The images are coordinated with the actions and activated on the scene. The set design acquires meaning through its integration or juxtaposition with the other elements, rather than being an end in itself, as in installation, which is materialized when it is seen by someone (Linke, 2006, p. 137).

With the interaction between AR and performance, different digital content can be inserted in a space. Combined with the tangible space on mobile devices through AR, the absent territory of virtualized existence

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enables the construction of a new territory, whose structures and surfaces reveal new symbolic meanings and provide new relationships between body and space (Figure 13). Likewise, the virtuality of the digital content georeferenced in the public space allows the performance to express activism through the insertion of information that will remain even after its exhibition, as it can be viewed by simply activating the application. Therefore, in its proposal of hybridizing the public space through interaction between the tangible and the digital, consolidating conditions for AR performance on mobile devices, the *Inter Faces* investigation is one of a number of exploratory works that view AR as an expanding field for the artistic creation process.

By incorporating AR into the creative process, the *Inter Faces* investigation drew on pioneering artistic works in the use of this technology in order to expand previously explored poetic possibilities, contributing new experiments. The comparative analysis of the creation processes of *body* (2008) and *Parade to Hope* (2011) enabled the adoption of strategies to insert digital content in the public space, which served as resources for activist re-symbolization in constant dialogue with the performance. This involved technical and conceptual challenges, requiring in the early development stage a change in the artistic use of AR technology originally planned. The photographic, videographic and descriptive records of the creation process of the *Inter Faces* performance, produced during the completed stages and focusing on the challenges faced and solutions found, comprise reference and research material for the next stages and for the development of future creative processes addressing the poetic use of AR, as such documents have been published on the project's website and social media platforms.

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Figure 13 – Documented test of the insertion of AR digital content in a public space.
Source: Author's files (2019).

Inter Faces thus contributes to the debate on the use of AR in creative processes, especially in the artistic field, by introducing the possibility of integrating digital content viewed on mobile devices with the performing body and the public space. At the same time it revives the activist approach assigned to this tool by Skwarek (2014), expanding it through its correlation with performance. The intrinsic aspects of AR, such as its promising growth, boosted by the expansion of the 5G network[18], artificial intelligence and wearables[19], with the predicted development of several functionalities and its use in the most diverse sectors, inserts *Inter Faces* in another debate which discusses the future massification and incorporation of AR technology into everyday life. This does not exempt the investigation from adopting a critical stance toward the use of AR, since, by subverting the functionalities of the technology to obtain an artistic product, the creation process instrumentalizes the artist with the lenses capable of revealing other potential uses of AR. In this respect, the hybrid ground formed by the overlay of the virtual over the real, whose access is made

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possible by AR, which provides the pilgrim character with the necessary strength for its existence and journey, may be flat and firm or rough and muddy. The journey's duration and progress will reveal the forthcoming landscapes stemming from the growing entwinement of the real and the digital.

Notes

[1] Available at: <https://peregrinodigigal.home.blog/>. Visited on: Dec. 12, 2019. Blog created to document the creation process stages of the *Inter Faces* investigation.

[2] As in the VR recreation of Van Gogh's *Starry Night* by George Peaslee. Available at: <https://www.youtube.com/watch?v=Woc0GZkDa7k>. Visited on: Dec. 12, 2019.

[3] Animation technique that consists of frame-by-frame photographic record or drawing with the aim of simulating movement.

[4] Available at: <http://stelarc.org/projects.php>. Visited on: Dec. 11, 2019.

[5] Available at: <https://www.ekac.org>. Visited on: Dec. 12, 2019.

[6] Markers are high-contrast printed images detected by the AR device, used for positioning and viewing content overlaid on the images of the real scene.

[7] Available at: <http://www.artoolkitx.org>. Visited on: Dec. 12, 2019.

[8] Copyleft indicates free copyright. It consists of an inverted copyright symbol.

[9] iOS is the mobile operating system from Apple Inc. developed in 2007. Android is the mobile operating system developed by the Open Handset Alliance consortium, with the Google group as its main contributor.

[10] Software developed by Unity Technologies (https://unity.com). It is used as an engine for the creation of games and applications.

[11] Available at: <https://www.ptc.com/en/products/augmented-reality/vuforia>. Visited on: Dec. 12, 2019.

[12] Available at: <http://aec.belasartes.ulisboa.pt/> and <http://ars.electronica.art/outofthebox/en/timelessness/>. Visited on: Dec. 12, 2019.

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[13] Character of the *Bumba-meu-Boi* folk dance in the state of Maranhão. Is is frequently present in the *zabumba* style of the dance and symbolizes the spirits of the woods.

[14] Available at: <https://www.facebook.com/O-Peregrino-Digital-101578641277523> and <https://peregrinodigigal.home.blog/>. Visited on: Dec. 11, 2019.

[15] Opened on November 21, 2019, at the FBAUL Galeria da Cisterna <http://www.belasartes.ulisboa.pt/inshadow-2019-screendance-festival/>. Visited on: Dec. 12, 2019.

[16] *Candomblé* deity whose function is to provide communication between the other Orishas and humanity.

[17] Until the conclusion of this article the last stage of the performance had not been publicly exhibited, which is scheduled for the second half of 2020.

[18] 5th generation technology for mobile network communication. The estimated speed is 10Gbps, significantly increasing broadband speed and decreasing latency time.

[19] Wearables are electronic devices that connect to other devices and can be worn as accessories or clothing items. The most common example is smartwatches.

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