

Immersive and participative environments¹

Immersive and participative environments in this text are spaces which use computing systems to promote a state of perceptive illusion and which incite the visitor to participation annihilating the difference between reality and representation. Immersion is also used in artistic media installations as an instrument to persuade the mind, making the passage between realism and fantasy. With the interfaces that build the bridge between the physical and virtual spheres, through graphic or haptic representation we can act in the virtual sphere. We can even control our action what can be seen in the robotic control of concrete distance operations, in simulations for therapeutic purposes used in cyber therapy, or in virtual games that aim the training of military strategies.

Immersion is produced when we do not register in our conscience the action of image apparatuses as intermediaries of sensory experience. This phenomenon takes place when “conscious perception is transformed into illusory unconsciousness”, as Florence Green Koettker comments on the lecture given by Oliver Grau (GRAU 2005) Remember the Phantasmagoria!

As it reduces critical distance and increases emotional involvement, immersion is an instrument that is extensively used in the entertainment and technoculture industry. Comparable to the definition proposed by Lombard and Ditton (LOMBARD 1997) of presence as perceptive illusion of non-mediation, in immersion we also have perceptive illusion and media apparatus as inseparable. As a concept, immersion is normally associated with the capacity of the interface that makes the link for being transparent.

Immersed in differentiated spheres

One of the prerogatives of immersive interfaces is that the apparatus that provokes immersion disappears. However, in Erkki Huhtamo’s view (HUHTAMO 1995), for the experience to be considered authentic, it is no longer necessary that technology is transparent.

Technology is gradually becoming a second nature, a territory both external and internalized, and an object of desire. There is no need to make it transparent any longer, simply because it is not felt to be in contradiction to the ‘authenticity’ of the experience².

In order that the experience is felt as authentic, the technology that produces representation and visualization form must be developed. This implies the application of perception

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This paper was presented at the REFRESH conference, First International Conference on the Media Arts, Sciences and Technologies held at the Banff Center sept 29-oct 4 2005 and co sponsored by the Banff New Media Institute, the Database of Virtual Art and Leonardo/ISAST.

² HUHTAMO (1995: p. 171).

psychology research, which deals with the most convincing visual representation models; of studies on how the brain is persuaded; of visualization devices that process reality representations and make them available as naturally as possible; and also of computing systems interfaces that establish the dialogue between input and output signs.

However, according to Erkki Huhtamo (HUHTAMO 1995), immersive machines do not need to be technological. The author considers as immersion technologies, side by side with apparatuses such as the Imax Theater, Cinerama, television and others, such as electronic music houses, shamanism and psychedelic drugs. It is possible to see in these examples that the author refers to different immersion technologies that alter the mind, causing perceptive illusion: for instance, chemical drugs, which act directly on neurotransmission, technologies that use persuasion, as in religious rituals, and also those that stimulate and impress sensory perception with multimedia resources.

If we expanded the concept, we would validate all the experiences that alter our state of sensory conscience as immersive. Thus, we would include, besides the immersive arts such as music, the cinema, virtual reality and interactive installations, telephone conversations, shopping in malls, and locomotion means, such as bicycles, trains, ships, cars and airplanes, which produce the sense of movement. In the case of transports, due to the speed of the movement, the visual perception of the environment that surrounds us is altered, which implies transposition from one perceptive state to another.

It is increasingly present, in our society, the demand and the awareness that we are immersed in portable artificial worlds which we elect according to the media. For example, in the past they were available through the static visual media of maps, books and photographs. Afterwards, through immaterial media, such as hearing resources transmitted by devices like the radio, the discman. More recently, with Internet multimedia, the new generations of cell phones and PDAs, we are immersed in an informational sphere that uses all the resources of text, sound and images in motion.

Taking into account the various portable apparatuses – which we use to communicate and store information: books, maps, paper notes, calendars, computers, floppy disk and CD files, entertainment devices such as the DVD and navigation ones like GPS, and cell phones – Augmented Reality is the system that maintains them aggregated and integrated, encompassing visualization, communication and information.

But prior to this we have to recognize that in fact, we have been immersed in a linguistic sea, that of oral and written languages, for a very long time. It should be noted that the example of the book, of written language, represents the material media, and those of sound, of oral language, and of the projective images of the cinema and installations, symbolize the immaterial media. One example of immersive installation that deals at the same time with the fact that we are immersed in the linguistic sea and in the informational sphere is Monika Fleischmann's *Energie*.

Grigorovici's continuum (GRIGOROVICI 2003) compares the experience afforded by the real environment with that afforded by media resources (and among them) in terms of immersion and interaction. In the continuum, in a decreasing scale, the real environment is

considered the one that provides the most perfect experience of presence, being followed by Augmented Reality, by the immersive media of virtual environments that use HMD, by virtual reality environments available in Desktop, by video, TV, radio, books, and finally by texts, which are considered the ones that provide the weakest experience of presence.

We also have, among the media that cause immersion, the static and mobile ones. On the one hand, we have the mobility of the means that cause the illusion of perception, but with few interaction and immersion resources. As we know, the Internet is an immersive telematic environment, although the veritable interactivity with which we dream is still unsatisfactory. On the other hand, although the more robust computing systems offer convincing illusory media scenarios, their structures still remain fixed. However, we can imagine that in the near future these systems may have the same illusion capacity and be integrated with the mobile apparatuses.

All these immersive technologies constitute the psychological and social meta-machines that allow the coupling human-machine that is characteristic of our time.

It is also possible to distinguish technologies that induce to these perceptive states as internalized and externalized immersive experiences. Chemical drugs and religious rituals clearly induce to internalized experiences, while television, the cinema, virtual games and computing systems that create media scenarios, like immersive environments which can be acoustic or visual, offer the possibility of experiencing immersion collectively, in groups, as externalized experiences.

Comparative examples of immersive environments

The immersive and participative environments that I intend to analyze and compare are different from one another. As segments of the experience and entertainment industry, they induce to immersion as externalized experience with multimedia resources and need sophisticated hardware technology. To generate these media environments, they require, generally speaking: intuitive use computing; media synchronization; immersion in virtual worlds and in 3D images; high-definition projection screens; touch-sensitive objects such as tables, screens, rugs, etc.; wireless computing; multi-channel sound output; a robust Internet link; potent machines for real time updates processing; ergonomic navigation interfaces.

The comparison aims to present the difference between the immersive apparatuses of the states of the south of Brazil: Santa Catarina and Rio Grande do Sul, with the purpose of conceptualizing them as immersive environments. Another aim is to discuss fostering chances, technological stage, computing system design and the aesthetic maturation of these environments, learning the possibilities so that it is possible to provide guidance for future projects of this nature.

As immersive and participative environments, we have, in Santa Catarina, the Mademotion cinema of the theme park Beto Carrero World; the multi-user virtual environment Mediaplatform, of MediaSoft; the Simmex platform (Simmulator of Multiple Experiences) of Certi (Reference Center in Innovative Technologies), and its applications to other similar

projects, such as Sapiens Circus, MPE.Br and the Sapiens platform. In Rio Grande do Sul, we have NTAV Cave, of the Nucleus of Visual Arts Technologies of the University of Caxias do Sul (UCS), and the exhibition space “Mundo Virtual” (Virtual World), of the Science and Technology Museum of the Catholic University of Rio Grande do Sul (PUCRG).

Distinguishing between these spaces

Beto Carrero World, which is the Brazilian theme park that corresponds to Disneyland, proposes, as one of its attractions, the alternative to the cinema experience of image in motion, projected onto a bidimensional screen: images in motion accompanied by physical movement. The intention is to make the movie experience as convincing as possible, just as it happens in the Mademotion cinema. In it, the movement of the seat is triggered by a sophisticated hydraulic system that, in turn, is synchronized with the movement of the scene.

Although the computing system used to promote the illusion of movement does not respond to human action and does not incite the visitor to participation (the visitor remains passive in the seat), the case of the Mademotion cinema is interesting to elucidate the different forms of human-computer coupling of the immersive apparatuses.

The Mademotion cinema unites the techniques of the cinema, of the flight simulator and of the entertainment attractions of theme parks. Its technique consists in the computer-synchronized combination of the triggering of the hydraulic apparatus and the images in motion; it emphasizes corporality, obtained with the jolts we experience as spectators, as opposed to the expected dematerialization of the body, when we are only imaginarily taken to other places. The inverse of the usual separation of the frontiers between the virtual world, projected onto the screen, and the concrete world also happens.

Mediaplatform is a multi-user communication platform in the Internet that offers virtual worlds. Developed by the company Mediasoft – Softwares e Produções Multimídia, Ltda., of Florianópolis –, it has its own browser and operates as a database, offering multi-user virtual spaces with real time interactivity through avatars and chats. Created to meet the corporate, educational and entertainment demand of real time communication and document sharing, it manages data and synchronizes media. It is directed mainly to the corporate area (for example, business meetings), but as it is a database and it is able to manage information and media, it is also indicated for Distance Teaching, E-commerce and the entertainment industry.

The platform also offers multimedia applications such as animations and others, which when inserted by power-users in the virtual space as “sensitive” objects, transport power point files, links to sites and videostreaming screens, which enable synchronous dialogic communication with a capacity of up to ten streamings at a time.

Besides functioning as a 3D interactive scale model, which allows for the simulation of routes in exhibition spaces in major fairs or provides the location of historic buildings in the map of downtown Florianópolis, for example, the platform can present museum collections

and document events and exhibitions, among many other applications. Among the three-dimensionally modeled virtual spaces available online are: Sala de Reunião (Meeting Room), Exposição de fotos no Beira Mar Shopping (Exhibition of photos at Beira Mar Shopping Mall), Exposição Cinco, Ilhas Flutuantes (Floating Islands), and Deserto Virtual (Virtual Desert). In our view, Largo da Alfândega (Customs Square), which reproduces the area next to the Public Market at historic downtown Florianópolis, is the most interesting.

In the virtual worlds offered by Mediaplatform, it is better to talk about places, not spaces, as they no longer refer only to the concrete environment; rather, they refer to places invested with social meanings by their visitors.

The technological platform Simmex, Simulator of Multiple Experiences, was developed by the Certi Foundation and is located in the same area where the Administrative Center of the State of Santa Catarina has its head office in Florianópolis. Simmex has touch-sensitive screens and tables used in interactive and participative games. Another project of the Certi Foundation, with the Sapiencia Institute, which uses the platform is MPE.Br. Having opinion-makers as the target audience, the project, requested by Sebrae, aims to provide training in the area of Entrepreneurships of Micro and Small Companies.

The Sapiens platform, which derives from Simmex, has touch-sensitive screens. Like Simmex, as a computing environment it establishes multimedia synchronization, but it also uses video conference with a database connected with the Internet as a governmental managing system of the Administrative Center of the State of Santa Catarina, promoting the participation of the 29 regional development departments.

Sapiens Circus, which is another application of the Simmex Platform, currently in operation in Manaus (north of Brazil), was developed in Florianópolis as a pilot project. In its first edition as a pilot project, it had the participation of 25 teachers and 750 students from six elementary schools, of which five were public schools. Under the theme of biodiversity, it presented, in its first edition, the participative game “Biodiversão: uma aventura na Amazônia” (Bio-entertainment: an adventure in the Amazon region), which used interactive tables, rugs and bracelets, together with simultaneous multimedia projections.

Parque Sapiens, projected by the Certi Foundation, does not have physical premises yet; it exists only in the form of a scale model. It intends to be a park like Beto Carrero World, with its own legislation, conducting the visitor to an unusual behavior. Its major focus will be on the knowledge and technological incubators industry.

NTAV Cave, the only one among these spaces that develops artistic contents, has the resource of 3D image projection. The images respond to the visitor’s movement, and are experienced in a settings cube with rear-projections in four of its five faces, the Cave.

The Science and Technology Museum, in the attraction Virtual Volley of “Mundo Virtual” (Virtual World), uses the resource of video projection on a flat screen, abandoning the three-dimensional projection, although the video responds to the visitor’s actions, just like

in Myron Krueger's research, in which the computer perceives the visitor by means of the video, which allows them to play a kind of virtual volleyball.

Media spaces?

The examples that I cite involve computing directed towards human-machine embodiment, emphasizing the playing appropriation of knowledge and entertainment. As a line that distances itself from computing for abstract cognitive processes, they center primarily on human-environment interaction through technology – for we act not only on technology, but also through it.

However, we would have some difficulty in fitting all these immersive models in the category “Media spaces”. The term – coined for the first time at XEROX Parc laboratories in the mid-eighties – is more adequate to “communication environments”, directed towards communication and collaborative work through audio and video, with computer tools and in a network environment (DOURISH 2001). Of the analyzed examples, only Mediaplatform and the Simmex platform would fit in this definition. The others focus on entertainment and the arts.

Although they have different purposes and target audiences, all these spaces use multi-sensory resources. They can be considered immersive media environments, which, as we have already mentioned, offer the experience as externalized immersion, which can be enjoyed collectively. Being computer environments, the majority of them responds to human action, besides stimulating interactivity and prioritizing the visitor's participation, proposing to make the experience become memorable.

Apart from Mediaplatform, which exists only as a virtual space for multi-users, all the others are spaces whose structures are concrete. They are physical spaces that can be physically visited and explored. Among the ones that have physical premises, two aim to have the kind of mobility circuses have. It is the case of NTAV Cave and of Certi's Sapiens Circus. The Science and Technology Museum exhibitions are also mobile, and specific attractions of Beto Carrero World have already toured the country; however, the former two are structured in such a way that they can be easily transported.

Nevertheless, all of them provide the visitor with the conditions to explore them without being guided by a linear narrative, as the traditional cinema does. However, it is not uncommon in these spaces the existence of antechambers and guides that persuade us to illusion even before the very experience begins. As Erkki Huhtamo (HUHTAMO 1995) says, the state of immersion implies a state of passage, a transition between the spheres of the concrete and virtual worlds. Thus, these performers-receptionists are considered part of the illusion apparatus. The Mademotion cinema of Beto Carrero World and the Certi examples that use the Simmex platform, like MPE.Br, the Sapiens platform and Sapiens Circus, use actors to welcome us.

Should we consider the physical structure that comes before the virtual attraction as part of the illusion apparatus, like antechambers that make the transition from one sphere to the

other? In the case of the Mademotion cinema, the total area of the theme park Beto Carrero World; in the Mediaplatform virtual worlds, the window with the tools of access to the worlds; in the Simmex platform applications, the area of the Government's Administrative Center that surrounds the building where Simmex is installed; in NTAV Cave, the hall of the Natural Sciences Museum of the University of Caxias do Sul (UCS), with its aquariums presented as dioramas; and in the "Virtual Museum", the premises of the Science and Technology Museum?

In its inauguration, NTAV Cave of UCS presented the immersive environments Heartscape and RV Aquarium. The latter projects the aquariums of the entrance hall captured by web cameras inside the Cave space. The aquariums, located in the hall of the Natural Sciences Museum of UCS, integrate in this way the concrete space into the projective space of the Cave. Like fluid metaphors, they refer to the malleability of the Cave's geometry, and fuse the concrete sphere – the entrance of the building of the Museum that precedes it – and the virtual sphere – the three-dimensional projection of the Cave. Thus, this space explores extremely well an important question concerning the design of immersive experiences: that of the transition between the stages of construction, perception and action, which is characteristic of a state of being between.

Searching for concepts

Immersion, viewed as escapism from reality and rejection of corporality, is inserted in the category of virtual reality. Pointing to Augmented Reality used with mobile, wireless technology, Myron Krueger's research (KRUEGER 2004) prioritizes the capacity of the images for responding to the visitor's movement, rather than three-dimensional projection. In his evaluation, the use of specific apparatuses that restrict movement and insert the observer in closed spaces, distancing him from his peers, hinders physical involvement and the naturalness of the sensation that we are interacting in the space.

The search in the phenomenology tradition has been useful to illuminate issues concerning the relationship between mind and body and the way in which our mind is interrelated to our daily experience of physically acting in the concrete world. Thus, Heidegger has been a common reference for the design of computer environments.

Heidegger (in DOURISH 2001, p. 109) makes a distinction between the tools *zuhanden* and *vorhanden*. The former exemplifies the ones we use as extensions of our movement without noticing that they mediate our action; and the latter are the ones that we use being aware that we act through them. According to this explanation, only the latter coincides with our concept of tool. The former is perceived by us as an entity. Therefore, in these environments, experimentation of the available tools is incorporated in our actions and disappears, like the tools that are classified as *zuhanden*.

We model the world through our action, interacting directly in the environment. It is important to emphasize that, more than the abstract knowledge of the world, our being needs to explore the environment, correlating perception and action. It is the exploration of the environment and the perspective based on the first person point of view that make navigation more intuitive in virtual reality.

The three positions suggested in the model proposed by DeLozier and Grinder (in ZODER 2001) show how subjective experience is influenced by different perspectives and points of view. The first one, representing the point of view of the first person of the action, shows the observer looking at the world through his inner reality; the second position shows the second person point of view, represented by the perspective of the observer placed outside the action field, like the camera perspective; the third one represents the meta-observer, who alternates between the two points of view and perceives the world simultaneously through the internal and external perspectives, which corresponds to the internal and external observers, like an independent observer in a dissociate state. Each change in point of view implies the redefinition of a new observer and of a new environment that surrounds him.

The first person perspective is the one used in Mediaplatform and in NTAV Cave. However, the Simmex platform also offers 3D animations, searching for the naturalness of the interaction with the computing system that the first person perspective provides. NTAV Cave is the only one that gives priority to the meta-observer's point of view, obtained as the visitor navigates with his physical body in the space, having projected the first person perspective. Among all these environments, only the Mademotion cinema of Beto Carrero World does not offer interactivity options to the visitor. Nevertheless, the projected scenes respect the first person perspective.

The pioneers of media and information spaces design

The Eames couple, Charles and Ray Eames, is an example of professionals that were able to deal with the issues of the new spaces, characterized as information spaces. As designers and juxtaposing multimedia projections and images of the traffic flow of express highways of the United States, the couple was in charge of the exhibition called Glimpses of the USA, held in the Moscow's auditorium of the World's Fair in 1959.

In fact, the couple had already participated in a multimedia experience before the 1959 exhibition, with George Nelson and Alexander Girard. George Nelson had been in charge of preparing a presentation material for the Fine Arts department of the University of Georgia in Athens. Art X, as the presentation was called, or in the Eameses' version, "A Rough Sketch for a Sample Lesson for a Hypothetical Course", consisted of the presentation of the content of the discipline of Communication. The objective was to break the barriers of the several learning areas, making them become more intuitive, and to increment communication between people and objects.

The performance included a live narrator, multiple images, both static and in motion, and even smells and sounds, like music and narration. The idea was to make the perceptive environment experience as intense as possible, so as to make it become sensorily significant.

The production involved team work and a complete equipment arsenal: a film projector, three slide projectors, three big screens, three to four sound recorders, cans of films, a slide

carrousel, and sound magnetic tapes. The arsenal was completed by odor bottles that fed the ducts of the central air conditioning system.

The comparison with a circus was not accidental. The presentation, which was intended to be a multi-sensory stimulus with a strong appeal to peripheral vision, was influenced by the couple's previous interest in circuses, which they had extensively photographed from the 1940s onwards, as for example the backstage of circuses' activities in Los Angeles. The example that the couple pursued in their multimedia presentations was the circus, as an epitome of pleasure, offering parallel and simultaneous experiences that cannot be entirely apprehended by the observer.

There is, in fact, the precedent of the information environments developed during the war. The war, which brought about the need, on the part of military officers and presidents, to make decisions and manage several data at the same time, was responsible for the creation of rooms that made a great number of information available. The multimedia presentations, the circus and these data management rooms for military purposes had in common a critical situation, called by the Eameses "crisis control". In this situation, the elimination of specific chances for the benefit of the realization of only some options is not carried out without stress, and solutions have to be found even though we do not know the real needs.

Many of the couple's friends were involved in secret military projects, such as the war rooms, which entailed simultaneous projections. Among them, we have Buckminster Fuller, Eero Saarinen and Herbert Dreyfuss. It is uncertain whether the couple knew about the military project at the time, but soon after the war they undoubtedly became aware of the similarity of the spatial treatment and of the developed concepts. Certainly, the same model could be applied to the management of cities, as Charles Eames stated in 1970, in a lecture he gave at Harvard University.

The management of cities involves, besides the constant transformations of the needs, conflicting interests and different points of view. Linear data presentation models cannot, in these cases, handle visual communication by themselves. It is necessary to create a visualization environment, imposed like a challenge to the visualization of discontinuous information, whose architecture should fit this need.

The experience of managing different information during the war enabled the creation of information flow theories, which were at their initial stage at the time, and the need for architecture to integrate those flows. Architecture, now in charge of the task of organizing information, focused on the creation of communication and computer spaces.

This legacy is used once more by the couple in the presentation of the multimedia projection *Think* in the inauguration of IBM's oval space in the 1964 World's Fair. The observer, saturated with the sensory overload, is incapable of distinguishing and discriminating between images; however, he is capable of establishing connections of relations. The great volume of information is only accessible as a juxtaposition of scattered icons and metaphorical images that have the function of condensing it.

Preliminary Concepts

We could say that immersion is different depending on the medium that induces it. It can be chemical as in the case of drugs, social as in religious rituals and in the dispersed connectivity of the net, in which people meet and exchange ideas, and sensory due to the stimulation of perception through projective apparatuses or corporal movement. In environments that offer media scenarios that are artificially generated and that surround the observer, the medium is clearly computational. The media that cause it can be associated. Just like the social medium that we observe in the immersion offered by the Internet, which occurs mainly through another one, the computational medium.

Dourish (DOURISH: 2001, p. 162-167) defends the idea that computing, and not just the computer, is a medium. It is the computing system that responds to human interaction in the immersive environments like the ones we have described. We observe, once again, that all the analyzed environments center the question of interaction inside computing systems. However, it is the computer design of these environments that defines the possibilities of interaction.

The technologies that allow for the coupling human being versus computing system prioritize the creation and communication of meanings through the various levels of coupling allowed by the system. The questions raised by social presence research investigate how we socially respond to computers and to other machine agents in the same way that we respond to our fellow humans that are physically present or technologically mediated. The issues raised by tangible computing research focus on how the human-computer coupling takes place.

The term embodiment means the human acquisition of one of the properties of the computing system deriving from interaction, denoting properties of a participative status, whose function is to transform action into meaning, rather than the concrete properties. Thus, embodiment means not only inhabiting the body with its technological extensions, but also creating computing surroundings. It is the opposite of the term “incorporamento” (incorporation), as it is normally translated into Portuguese, which expresses only the absorption of technologies.

According to Dourish (DOURISH 2001, p: 189), embodiment represents embodied action rather than disembodied cognition. The author also proposes that the term outlines two quite current lines of design: tangible computing and social computing. Tangible computing brings the computing system from the desktop to the environment in which it is spread. Thus, this line of computing unifies computational and physical experience, enabling us to be physically present in a concrete environment that responds to our actions. The environment communicates digital information, as the environment in which we act and which surrounds us also is technological, becoming, therefore, a medium.

The current situation of the field

Although NTAV Cave has obtained financial support from organs that foster research, such as FAPERGS, of the state of Rio Grande do Sul, and CNPq – National Council for Scientific and Technological Development – through scientific initiation and research

grants, and despite the fact that the Science and Technology Museum was built with funds also obtained through a CNPq grant, there is a clear lack of investments in the two states regarding artistic projects with the financial extent that the immersive environments require. The virtual inexistence of institutions that finance research on the design of computing systems for artistic media experiences makes these examples the most important immersive environments of the region.

It is probably safe to say that the state of current shortage is aggravated by the lack of courses that educate professionals with knowledge of programming language, interface design and with aesthetic maturity that can work in the area. Only recently has the University of Caxias do Sul (UCS) inaugurated its BA in digital technologies.

There is, for example, in the University of the State of Santa Catarina (UDESC), which we can observe more closely, a clear separation between courses that qualify for programming language, directed to Computer Science and Electrical Engineering students, such as the ones offered by the Sciences and Technology Center in the UDESC of Joinville, and courses directed to Arts students in Florianópolis, which qualify for the arts of traditional supports, and which accompany the development of the digital arts only in a conceptual way. Thus, they fail to provide its students with an introduction to the digital technologies, multimedia and programming languages.

These courses do not provide the arts students with practice concerning the design of computer environments for artistic purposes, and miss the opportunity of focusing on state-of-the-art contents. In addition, the Design course has not yet given the necessary attention to the design of human-computer interaction (HCI), which considers embodiment as central to the development of interfaces and to the analysis of interaction.

Theoretically, the Arts Center could establish partnerships for the study of computer interfaces with renowned laboratories of the university. Like, for example, the biomechanics laboratory of Cefid or those of the Science and Technology Center of Joinville, or even with other laboratories outside the university, like Certi.

In the light of this scenario, it is hard to believe that we will soon optimize the resources and the access to technological teams, so that more and more artists, even those linked to research institutions, are able to develop projects regarding the Design of immersive environments. What can we say about the chance of those who are not linked to research institutions?

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