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From wall-paintings to electronic technologies: the search for an ideal hybrid space

Translated by Ana Carolina Azevedo

ABSTRACT: Man have long used elements of his own architectural works, such as walls, floors and roofs, to devise figurative representations, displaying a different reality from the one before in that very space. Some of them, due to its characteristics, seem to have a virtual (represented) space, spatially integrated with the real (physical) space. We understand the hybrid space as the composition of real and virtual spaces, as if they were one. This article analyzes the representations of many historical periods to analyze the approach of the relationship between real and virtual spaces. He has studied wall-paintings and electronic technologies, showing that elements were gradually incorporated in these representations in order to achieve better results at proposing the hybrid space. He has also considered the ways that telecommunication technologies can contribute to the enabling of an old dream of a hybrid space.

KEYWORDS: Perspective. Representation. Perception. Hybrid space.

INTRODUCTION

The environment in which we choose to live reflects the way in which we see the world. The construction of our world-view happens through experiences in the space, involving the development of consciousness and the perception and self-perception of people, as well as their sense of identity (OSTROWER, 1995). As we build spaces, we use our cultural brand, without which the creative process becomes impossible.

> Although it is the individual who acts, chooses, defines and elaborates proposals and sets them to a given mode, it is also, perhaps above all, a cultural issue. Not only the individual's action is conditioned by the social environment, but also the possible ways to be created must come to meet the existing knowledge of possible techniques or technologies, thus responding to social needs and cultural aspirations. (OSTROWER, 2002, p. 40).

The social needs and cultural aspirations give rise to changes in the setting of spaces. Similarly, these modified spaces serve as source for the perception of identity for an individual, acting also as modifier factors of social relations. Influenced by social, commercial and technological relations, artists and intellectuals compile our culture and generate reflections about such changes, displaying the world-view of their times in their artistic production.

Take the Renaissance, for example. The representation in perspective, an important technical development whose "most obvious function was to rationalize the representation of space" (KUBOVY, 1986, p. 1), reflects the way to intervene in the world. Given the technological conditions at the time, the developed method has formalized the rational view of the three-dimensional space.

We consider "space" in the sense described by Zevi:

> Architecture doesn't consist in the sum of the width, length and height of the structural elements which enclose space, but in the void itself, the enclosed space in which man lives and moves. (ZEVI, 1996, p. 18).

The technological change has an impact over the life and the way that people think. These factors reshape their world-view from new forms of interaction, establishing new relations for the construction of their spaces.

Openings function as the space's interface elements towards other same-context elements within a limited space. When we open a window to an adjacent space, its imaginary surface functions as an interface between both spaces. The outside space is interfaced with the internal space by means of an imaginary plan defined by the opening. It creates interfaces through the definition of wall openings like windows, and that which is displayed on the other side of the window is concrete, thus limiting its own possibilities. In a window opening, sensorial stimuli are genuine and confer the characteristic of natural reality to perception.

As well as natural interfaces exist in architecture, men saw the elements from their works (walls, floors and ceilings) as aids to the most diverse representations. Some instances expose a specific look on these supports, which are proposed as potential elements to enlarge the architectural space, creating a perceptual interaction between the space that was represented (virtual space) and the space in which it was inserted (real space). To the composition of these two spaces we give the name hybrid space.

Such interfaces (how we treat these surfaces) cause artificial stimuli that sometimes emulate natural stimuli. This resource uses the capacity of cognitive processing of the visual information, which interferes and contributes to the final perception of the environment. Thus, we study how representations embodied in the architectural space emulated the spatial perception for the perceptive construction of the hybrid space.

English

METHODOLOGY

For this analysis, we will focus on visual perception, in its most important aspect for the spatial integration: depth perception, which is given by the combination of several variables that appear in our visual field.

Just like Sternberg (2000), Gibson (1974) explains how depth perception works by showing us that some variables depend on binocular vision (each eye captures an image of the object, thus enabling depth perception) and that others may be absorbed by monocular vision, through the comparison of how objects are presented to the visual field. Monocular indicators show, for example, that the object's size decreases in the visual field as it distances itself from the observer. Therefore, even without binocular vision, it is still possible to recognize the object that is nearer and farther by comparing their sizes.

The movement of the head to the right and to the leftwhen we see an object allows us to explore its visual aspect by viewing images of the object from different angles. We will call this aspect of the exploratory mechanism as *laterality*.[1] The eye runs across the object, bringing multiple extra visual information that contributes to the communication of the object's structural dimensions.

Thus, we complement the evidence described by Sternberg (2000), also considering the principles of "detail viewing", "chromatic saturation" and "laterality".

Here, we have the monocular and binocular clues for the depth perception considered in this study:

What we analyze in the following is how the various initiatives of including an interface (information device) in the architectural space have evolved, in the sense of seeking to integrate the real space with that which is represented, in a single perceived space that we call here "hybrid space".

HISTORY

There were several initiatives to take advantage of the wall surface to generate a virtual space, often with the presence of virtual characters that, combined with real people, formed a space perceived as hybrid. However, not all the paintings contain represented elements that provide an integration of different realities. Some were mere pictorial registers, detached from any relation of space.

CUES FOR DEPTH PERCEPTION		APPEARS CLOSER	APPEARS FARTHER AWAY
MONOCULAR DEPTH CUES	Texture gradients	Larger grains, farther apart	Smaller grains, closer together
	Chromatic Saturation	More saturated	Less saturated
	Relative size	Bigger	Smaller
	Interposition	Partially obscures other object	Is partially obscured by other object
	Linear Perspective	Apparently parallel lines seem to diverge as they move away from the horizon	Apparently parallel lines seem to converge as they approach the horizon
	Aerial perspective	Images seem crisper, more clearly delineated	Images seem fuzzier, less clearly delineated
	Location in the picture plane	Above the horizon, objects are higher in the picture plane; below the horizon, objects are lower in the picture plane	Above the horizon, objects are lower in the picture plane; below the horizon, objects are higher in the picture plane
	Motion parallax	Objects approaching get larger at an ever-increasing speed (i.e., big and moving quickly closer)	Objects departing get larger at an ever-decreasing speed (i.e., small and moving slowly farther away)
	Visualization of detail	More details can be seen	Less details can be seen
BINOCULAR DEPTH CUES	Binocular convergence	Eyes feel tug inward toward nose	Eyes relax outward toward ears
	Binocular disparity	Huge discrepancy between image seen by left eye and image seen by right eye	Minuscule discrepancy between image seen by left eye and image seen by right eye
	Laterality	Great rotation of angle of viewing	Small rotation of angle of viewing

Framework 1. monocular and binocular clues for the depth perception considered in this study. Source: Gibson (1974), Sternberg (2000) and complemented by the author[2].

1. This term shall be understood under the specific connotation defined by the author.

2. All illustrations and charts in this article were done by the author.

Ancient Rome (element interposing)

Roman frescoes found in Pompeii and Herculaneum dating from 1 AD and include sceneries of houses and gardens, of the countryside, the sea, blue skies and trees. The most relevant example of this era, which has enough elements to induce the perception of a hybrid space, was found in the Villa of Livia at Prima Porta, near Rome. Frescoes were painted on the walls of a 5x11m room under the construction's ground, and represent gardens with trees and flowers.

> In 1863, he gained notoriety when the statue of Augustus and the underground room with the famous paintings of gardens were discovered, but earned no protection. (CARRARA, 2005, p. 17).

The fact that these paintings have been made in a basement and are positioned on every wall of the enclosure is quite relevant for showing the clear intention of articulating the inner space with the content represented. It is a clear attempt to seek, through representation, an interaction with the external space that is impossible in real conditions, causing it to act as a virtualizer element of reality.

The scale next to the real scale facilitates the inclusion of elements of scene in the real space. The many represented plans amplify the perception of the represented space's depth, and the last plan, the one with the heavy vegetation, leads the represented

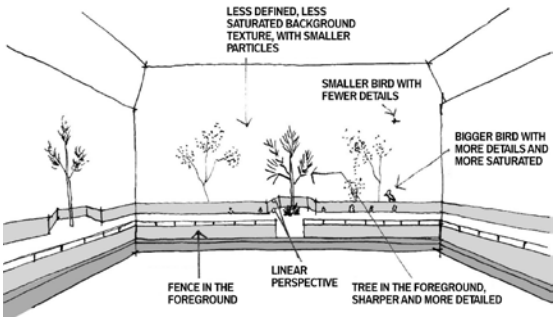

Figure 1. Villa of Livia: a subterranean chamber covered with frescoes.

space to inifinity. The linear interposition is easily identified by this superimposition of successive several plans, starting with the wicker fence, the main trees, the second fence and the vegetation.

The size principle is also evident in the drawings of birds and fruit that, the closer they are represented, the bigger they are drawn.

A small detail in the second fence (pointed at in the picture) displays parallel lines in the space, which converge in the representation as the represented principle of linear perspective.

The principle of aerial perspective can be identified mainly in the drawing of vegetation and birds. The vegetation in the foreground is sharp and detailed, while the background foliage looks merely like the "smudges" of a heavy vegetation. Its texture is less defined, with smaller grains, and resembles a green mass. Regarding the birds, the biggest one is drawn in more detail.

The closest objects, such as the largest bird and trees, are also more chromatically saturated, corroborating with the homonymous clue. The various elements represented there value the real spatial integration versus the virtual.

Some additional references can contribute to the understanding of this place:

– room's perspective: <http://migre.me/fcRvp>;

– the whole room: < http://migre.me/fcRym>;

– chromatic saturation, aerial perspective, texture gradient: <http://migre.me/fcRfg>;

– linear perspective: <http://migre.me/fcRvp>;

– location in the pictorial plan: <http://migre.me/fcRrd>.

Middle Ages (clues of a linear perspective)

Among all the artwork produced during this period, the frescoes are the ones that can connect both spaces: the real and that of painting. Rare examples purposefully work the relationship between the real and the virtual space, perhaps because the religious theme facilitates an interaction with the real world. The many representations of a natural landscape in the background also do not form an image with vanishing point. Thus, more sophisticate clues, such as linear perspective, are hardly found. The most basic ones, composed of interposition and of relative size, prevail amongst the clues of depth that were most widely used at the time

In Giotto's *Presentation of the Blessed Virgin Mary* (1305) we find the linear perspective principle, rarely used at the time. In addition to the wide use of interposition and relative size, it uses this feature to amplify the sense of depth.

The fact that the images are not life-size representations testifies against spatial integration. They are represented in a scale of approximately 70% of the natural size, therefore, they highlight the character of a representation disconnected from the real space.

Rebirth (perspective with vanishing point)

With the perspective drawing in Renaissance paintings, new technological resources contributed to enlarge the sense of spatial integration. During that period, the space was the subject of paintings.

English

The advent of perspective put in question the visual aspect of the physical space and the observer's point of view, enabling the production of representations that visually integrate with the space in which they were.

A significant example is Masaccio's "Trinity" (1425-28), whose ambient space perspective proposes the virtual space.[3] Upon painting this piece, Masaccio set the vanishing point on the vertical axis of the image, on the average height of a standing person. He could have chosen any other vanishing point to represent his painted reality. However, when Masaccio made his choice, he created a perceptive link with the real space. Such a link increases the painting's value by adding one more perspective aspect, that of space contextualization.

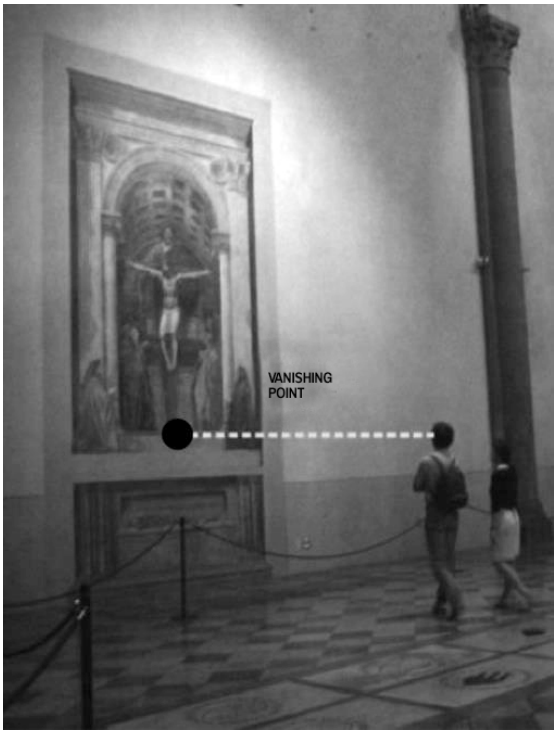

Figure 2. *Trinity*. Spatial context and observer coinciding with a vanishing point (picture taken in 2005).

Masaccio's perspective shows a space whose depth insinuates itself to the background of the wall's surface and opens a new possibility of manipulating the interfaces of space, thus recreating

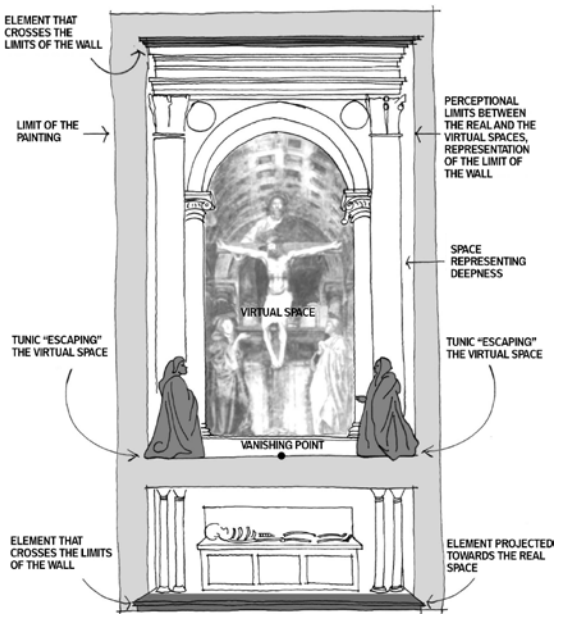

Figure 3. Trinity. Main elements that establish an interaction between the real and the virtual spaces.

the architectural space. Obviously, the observer does not expect what is "behind" the wall to be real spaces or objects. However, the spatial implication is evident, and the imaginary space is awakened to the possibility of spatial realities that consider the virtual space in its composition.

We can also perceive elements that make us notice the interaction between real and virtual spaces, since these are exposed by the coherence of the evidences of deep perception described by Sternberg (2000).

According to the physiology of vision, as objects become more distant, they appear smaller. Masaccio was aware of this rule and exercised it with mastery. The figures diminish in size as they enter deeper into the virtual space.

There are two shapes that, according to the interposition principle, seem to be out of the virtual space: an old merchant and his wife, painted "outside" the scene. To represent these figures superimposed on the pillars (instead of side by side with the Church's wall, as they would've been painted were this not a representation), Masaccio took these characters from the scene, trying to break with the wall's very interface. The size of the figures are true to the real size of the things they are representing, which makes the visual information ergonomically similar to the one we would have if the

3. By "virtual space", we consider the three-dimensional space that is depicted in the painting and that represents a physical space adjacent to that in which the painting is inserted.

characters were real people, occupying the same space in the visual field. Following this assessment, we may wonder if the two profane characters (the merchant and his wife) were painted using this strategy because they belong to the human world and, therefore, should accordingly occupy the space of humans, as opposed to the deities, who are unreachable to humans and, therefore, should be the ones to occupy the virtual space. However, this statement does not follow. Had this been the purpose of this pictorial message, the ergonomic configuration would be in accordance with such a hypothesis.

A peculiar feature of the human view makes the proximity of the observer depreciate another ergonomic aspect: stereoscopic vision. Under this aspect, the information offered by the representation painted on the wall's surface is distant from its natural view equivalent.

> As the steady eye flattens everything positioned more than five meters away, it is possible to understand the space in optical terms. (HALL, 2005, p. 110).

According to Hall (2005), this only happens with a distance equal or superior to five feet, which means that the images presented in the foreground are closer than that.

Kubovy warns us that stereoscopic vision gives us the ability to measure and compare distances in our immediate environment, something like a few yards.

> For instance, you will have a hard time accomplishing tasks that require motor coordination in a short distance if you have one of your eyes closed (such as threading a needle and so on). One-eyed people are not really handicapped at all when it comes to visual tasks that require them to aim action toward long-range targets, such as throwing a ball of landing an airplane. (KUBOVY, 1986, p. 40).

In this sense, Brunelleschi's first demonstration featured a gap of information when compared to natural visual information and offered by representation in perspective because, by making a single hole in the painted panel, it denied stereoscopic vision. Because of this, perspective's monocular view matched the very principles of this drawing, denying the ergonomic variable.

Obviously, Masaccio's paintings do not encompass this aspect of vision, causing the attempt to create a similar representation to the natural world to have limited efficiency, but still be impressive for its time.

> It is possible to picture the perplexity of the Florentines when this wall-painting was unveiled and seemed to have made a hole in the wall through which they could look into a new burial chapel in. Brunelleschi's modern style (GOMBRICH, 1999, p. 229).

Masaccio did not only use visual information to convey messages to the observer of his works. A tomb, painted at the foot of the painting, has an inscription that conveys a verbal cognitive energy to the scene. There was written, in Latin, "I was what you are. You shall be what I am." The verbal message is very precise and forwarded to the reader through the usage of the word "you", creating an explicit cognitive bond with the reader, i.e. the observer of the scene.

Appreciation of perspective with volumes

With the development of representations, we learn important lessons of ergonomic integration of ambiance by using the principles of vision to establish links between the perceptual representation and the physical space. With illusion as a main goal, elements such as lights and shadows are worked to approach the visual stimuli offered by the representation of the viewing of real objects besides the work of volumetric specific elements.

The example of the work of architect Donato Bramante (Donato di Pascuccio D'Antonio Bramante) at Santa Maria presso San Satiro Church, in Milan, dated from 1497, is perhaps most evident in the expectation of a virtualized space in a representation to replace a real space whose building had not been possible.

In this example, a contextual problem (a road behind the Church that prevented the implementation of the Church's plan in the traditional shape of a Roman cross) offered subsidies for an architectural decision:instead of building it in the form of a cross, the part that couldn't be built was replaced by an optical effect of perspective to provide a similar visual stimuli analogous to that of a space that could have been built.

A limitation imposed by the spatial context of the site entailed the use of the new technology of perspective to create a virtual space using the wall as an interface.

The site visitation allowed the architects to find out that some ergonomic variables contribute to the amplification of this effect. Firstly, the main space of the Church (the nave) coincides with the angle of view proposed by the perspective presented, with a central vanishing point. Second, the effect of perspective is amplified not by dealing with a plane representation, but with of a series of planes, creating a real spatial depth (significantly smaller than the previously presented sense of depth). This effect is amplified by the coincidence of its lines with the lines of perspective, creating a mixture of painting and space volume. This trick creates a slight stereoscopic effect, decreasing the restriction of painting in this sense.

English

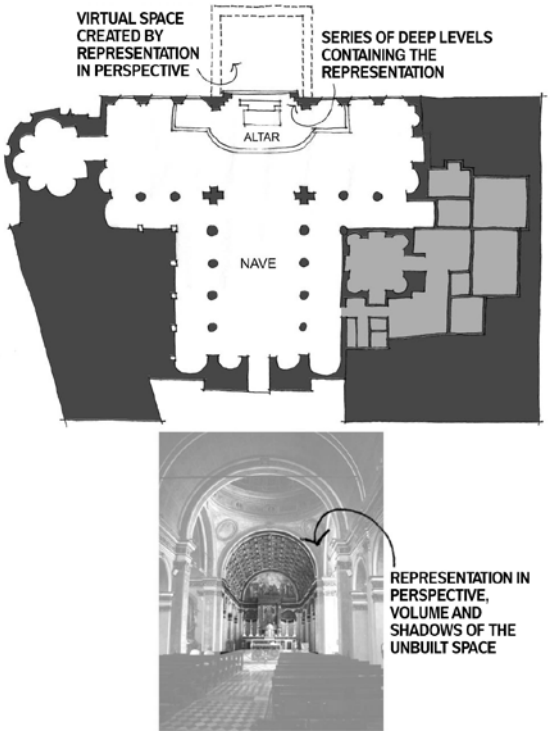

Figure 4. Plant and perspective (highlighted) of the non-built-up area of the Santa Maria presso San Satiro Church in Milan.

In addition, we note that the integral use of the wall plane for the representation of perspective serves contextualizes it in terms of space and architecture, reducing the noise of communication of the work – like Masaccio – that is intended as an opening in an architectural surface.

Industrial Revolution (3D elements in the scene)

The European panoramas of the early 19th century is characterized by paintings of scenes in cylindrical surfaces painted in buildings designed for the purpose of exhibition. For greater realism in the representation, they used bi- and three-dimensional features for the viewer to be immersed in the represented space. The strategies of perceptual interaction between the elements represented bi- and three-dimensionally used a wider range of ergonomic criteria, since they addressed binocular vision indicators in addition to monocular.

The importance of the use of curved surfaces to envelop the spectator was explained by Aumont:

> There are only traces of what was one of the most popular shows in the 19th century. Huge crowds came to see the panoramas. These huge paintings have been hosted by immense and costly buildings; their production demanded months, sometimes years, and their marketing was resembling of the publicity of contemporary movie blockbusters. (AUMONT, 2004, p. 54).

The earliest versions of the panoramas measured 18 feet in diameter and some of the following were as tall as 40mt high. In 1787, Robert Barker copyrighted the technique and, in the course of the 19th century, several buildings were specially designed to house this form of artistic expression.

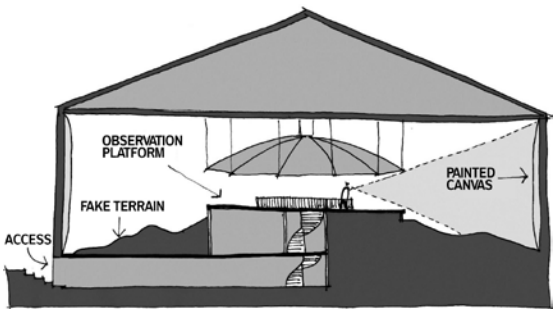

Figure 5. Schematic cut of a panorama.

> The basic aim of a panorama was to reproduce the real world so skillfully that spectators could believe what they were seeing was genuine. [...] When finished, the panorama must provide the illusion of a 360-degree view, as if a real landscape, from a single point of identifiable observation. (OETTERMANN, p. 49, 51).

The “real landscape” and “identifiable point” exposed by Oettermann (1997) show the evident link between representation and a space that exists in a different location from that in which the representation was established, carrying, albeit narrowly, a spatial reality through its visual context. There was an implicit attempt to apply ergonomic principles to the ambiance of the panorama.

This is shown by various ergonomic strategies adopted.

The screen’s 360-degree cylindrical shape allows the spectator to be surrounded, enveloped by the landscape. The whole horizontal visual field is taken by the painted scene. The cylindrical screen is an interface between the physical world and the virtualized world in painting, a device of information that makes the spectator a part of the scene.

The viewing angle of the observer is carefully positioned, thus making it clear the importance of the visual field being widely covered by the painting.

In order to increase the vertical field of vision of the scene that is defined by the edges of the screen, two strategic resources

were used: (1) a fake terrain for the transition from the two-dimensional to the three-dimensional world of screen representation and (2) the representation, at the bottom of the painting, of a floor integrated with the platform's lower floor. In the first case, objects were arranged on the floor, fitting the contextualization of these figures in the scene's plot. Additionally, both strategies had to disguise the sceen's lower edges, expanding, through this artifice, the perception of the visual field vertical limit of the scene.

The panoramas' dimensions position the spectator in a large space of observation, which allows us to walk through the observation deck to view the work and enables us to observe from many points of view. When we compare the incoming stimuli with those offered by the real space situation, in the sense of dynamic indicators of depth, it depreciates the spatial perception of the scene in a visual sense. When we move, objects that are closer to us move quickly in our visual field, while those that are most distant keep a slow pace. On the horizon, objects can even look like they are motionless. Thus, we can absorb the information of how distant the objects are from us from the observation of the speed with which they go through our visual field as we move.

Regarding panoramas, because they are two-dimensional paintings, the fact that we can move to observe the artwork does not contribute to a more precise ergonomic stimulus on the spatial information contained therein, except to the observation of objects arranged in the *fake terrain* which, by presenting themselves in front of a painted canvas, they preserve, albeit discreetly, that dynamic depth indicator.

Ergonomics was considered in the panoramas of the eighteenth and nineteenth centuries,[4] both in the compositional organization of scene as architectural solutions, in both cases, in pursuit of a common goal: carry or play a deep space elsewhere in the world.

End of the twentieth century (stereoscopic effect)

In the late 20th century, electronic projection technologies added the possibility of representation of the stereoscopic image effect, with polarized projection systems, offering an image to each eye, as is the workings of the natural vision.

Although they present themselves as tridimensional images, they come from a single projection on the screen. This allows for different viewers to have the same vision of an object, regardless of their positions at the screening room, which contradicts the principle of binocular laterality. When you turn your head to the side and then the other, you can see the object turning as well, as if its position related directly to your eye. This feature is an information noise, for when we turn our heads whilst looking at a physical object still in space, we can see their sides, and the closer the object is, the more pronounced the effect. Despite having aggregated spatial information, this technology does so in a distorted fashion, since it does not take into account the position of the point of observation. On the other hand, as the observer's eye gets closer to the object, this feature allows us to see details more accurately than the alternative.

The fidelity of the image represented sparked the potential use for the implementation of the hybrid space. However, the real integration between real space and the virtualized demanded specific constructions for projection, as well as the panoramas. This could be the reason why most movies do not consider the location in which they will be displayed.

A few places, like theme parks – in which the projection and the screening room are co-designed – take advantage of the large-format projection and stereoscopic effect to integrate the physical space to the virtualized space of the representation. This intention is strengthened when special effects (like swinging chairs, smoke, water, real actors and other gimmicks) are added to the spatial feature to produce tactile sensations that are compatible with the content shown in the film. By being inserted into the movie plot, mentally and physically, the spectator becomes entirely engaged. The perception of the represented space integrates into the natural space in both a visual and a semantic sense.

In a reverse strategy, objects represented in the film are strategically positioned in such a way as to seem to compose the room's physical space. As an example, the physically existing curtains are also in the representation of the film.

These forms of offering visual stimuli show different solutions, adopted to amplify the visual information communicated in order to perceptively integrate the real space into the virtual, in the pursuit of creating a hybrid space.

CONCLUSION

History has shown us that the path of the development of technologies of representation sought the improvement of ergonomic aspects for the implementation of a more plausible hybrid space (actual+virtual).

However, as much as the ways of image representation may have evolved, the boundary between these two spaces has always been well defined, and the communication between them, void. This

4. Even though this science had no structured knowledge at the time.

English

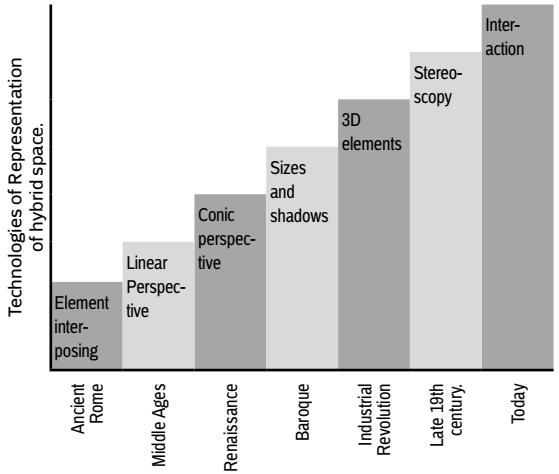

Chart 1. evolution of the hybrid space.

fact leads us to think about the need to incorporate the element of interaction in this context.

The existing telecommunications technologies can bring on great contributions so that instead of representation as a predefined projection, the contents represented come from a spatial reality that is alive, a real space elsewhere.

> Imagine a square room, and in that room, one of the walls receives a projection of what is going on at a second room, a few miles away, and that the second room also has a projection likewise. Then, a group of ten people is placed in each of the rooms. After that, a sound system is installed to allow conversation between the inhabitants of rooms A and B, and we ask them about the geometric shape of the space that they are experiencing. It is possible to imagine that some would not be able to answer about the square and the rectangle [...]. After all, what would differentiate this situation in a rectangular room with a glass in its middle, dividing it into two spaces? The same interaction would be possible in both situations as well as if it had the same limitations. (BRAGA, 2005, p. 12).

An interface that can make the hybrid space possible, considering the communication between the physical (real) and the virtual spaces, will modify the spatial relationships in a work of architecture. The transformation of nowadays architecture's spatial paradigm – limited to physical relations – shall bring about new horizons to the architectural production when it is replaced by hybrid space. This fact can lead the way to debates on a new theoretical universe that is ready to be cracked open and explored.

REFERENCES

AUMONT, Jacques. O *olho interminável:* cinema e pintura. São Paulo: Cosac & Naify, 2004.

BRAGA, Gisele P. A realidade reinventada: o espaço arquitetônico na era digital. *Da Vinci*, Curitiba, v.2, n.1, p. 9-16, 2005.

CARRARA, Matilde. La Villa di Livia a Prima Porta da praedium suburbanum a Villa Caesarum. In: FRIZELL B. S.; KLYNNE, A. (Org.). *Roman villas around the urbs:* interaction with landscape and environment. Proceedings of a Conference at the Swedish Institute in Rome, September 17-18, 2004. Roma: Swedish Institute in Rome, 2005. p. 17-18.

GIBSON, James J. *The Perception of the Visual World.* Westport: Greenwood Press, 1974.

GOMBRICH, Ernst H. *História da Arte*. 16. ed. Rio de Janeiro: LTC, 1999.

HALL, Edward T. *A dimensão oculta.* São Paulo: Martins Fontes, 2005.

KUBOVY, Michael. *The Psychology of Perspective and Renaissance Art.* Cambridge: Cambridge University Press, 1986.

OETTERMAN, Stephan. *The Panorama:* History of a Mass Medium. New York: Zone Books, 1997.

OSTROWER, Fayga. *Criatividade e processos de criação*. 16. ed. Petrópolis: Vozes, 2002.

STERNBERG, Robert J. *Psicologia cognitiva.* Porto Alegre: Artes Médicas Sul, 2000.

ZEVI, Bruno. *Saber ver a Arquitetura.* São Paulo: Martins Fontes, 1996.

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