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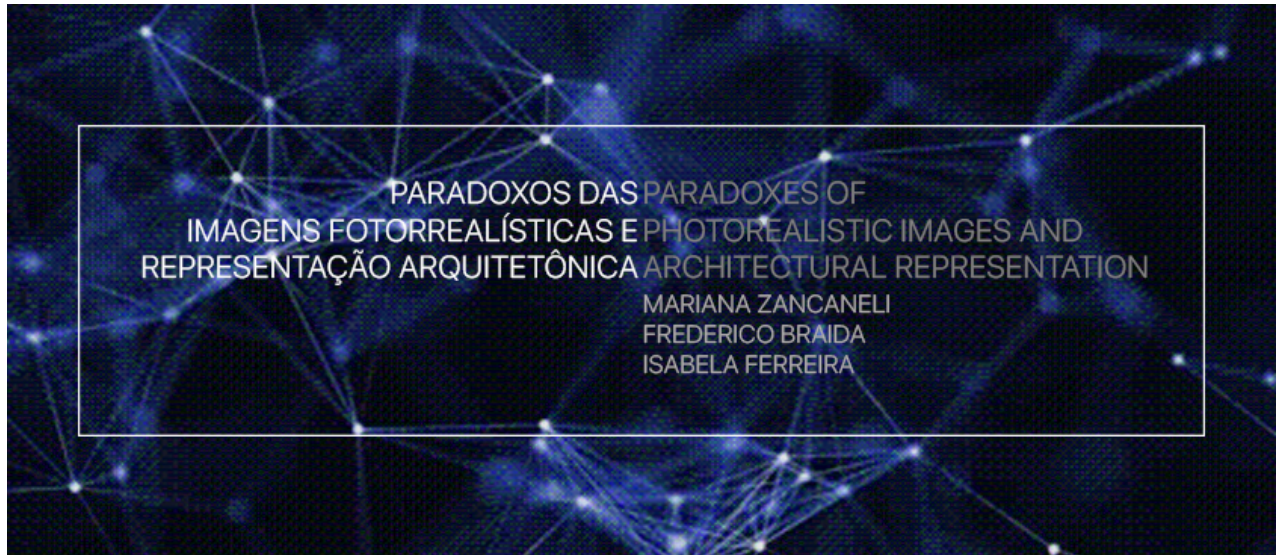
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Mariana Zancaneli is an Architect and researcher at the Graduate Program in Built Environment at the Federal University of Juiz de Fora, Brazil. She researches graphic representation, communication processes in architecture in the digital age and photorealistic images, and teaches photorealistic digital image production for the presentation of architectural projects.

Frederico Braida is an Architect and Urbanist and Doctor of Design. He is an Associate Professor at the Faculty of Architecture and Urbanism of the Federal University of Juiz de Fora, Brazil, and the Postgraduate Programs in Built Environment, and Management and Evaluation of Public Education, both from the same university. His main research theme is digital graphic representations. He coordinates the research group Languages and Expressions of Architecture, Urbanism, and Design.

Isabela Ferreira holds a degree in Industrial Design with an emphasis on Visual Communication and a Ph.D. in Design. She performs a post-doctoral internship in the Graduate Program in Built Environment at the Federal University of Juiz de Fora, where she studies urban interventions, design methodologies, social design, semiotics, graphic production, and design history. She is a member of the Editorial Board of the scientific journal Triades em Revista.

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Abstract

This paper addresses the topic of digitally produced photorealistic pictures as a way of representation recurrently used in the fields of architecture, urbanism, and design. The main developments arising from the appropriation of photorealistic pictures for the presentation of projects are discussed, taking into account the complexities of the contemporary condition highly influenced by digital technologies. These pictures have a prominent place in the construction of information in architecture, as they perform the function of anticipating reality and being a representation of the real. The main goal of this paper is to discuss how photorealistic pictures have currently been influencing the communication and representation processes of architectural design in contemporary times. From a methodological point of view, this article is the result of qualitative research based on literature review, which underlies a reflection on the impacts of photorealistic digital pictures in the fields of expression and representation of the architectural design. Finally, it concludes that, due to their intrinsic characteristics, photorealistic images have established a new paradigm of architectural representation that demands from professionals an ethical and moral position regarding the paradox between the valorization of the image and the legitimate expression of the architectural essence.

Keywords: Project presentation, Photorealistic digital picture, Digital processes, Architecture, Three-dimensional geometric modeling

1 Introduction

Architectural design can be understood as a set of mental ideas and solutions that take shape in the architect's mind during the design and development process. In this process, he must examine the characteristics of the problems and propose correct solutions (Lawson, 2005, p.127).

Therefore, the architect must develop specific mental processes, by using principles, strategies, and tactics. After all, the designer's thinking is directed at a final product, whose characteristics must be passed on to people (Lawson, 2005, pp.127-128). Thus, the ideas that make up the design are materialized through representations establishing connections between the abstractions field and the real world, enabling communication between the designer and his peers or clients.

During this process, the architect needs to communicate on three different scales: (1) the individual scale, on which he needs to develop fast communication skills both with himself and with other architects; (2) the scale of the team, on which the challenge is to communicate to inform colleagues; (3) the public scale, as the architect must develop ways of communication in order to push the boundaries of traditional professional language (Laseau, 2001, p.179). Therefore, in the context of contemporary architectural design communication, this article addresses the subject of digitally produced photorealistic images as a means of presentation employed by architects in the digital age.

Graphic representation encompasses a series of means for communicating the architectural space, the main one being the various types of drawings (Ching and Eckler, 2012, p.321). Zevi (2009, p.51) lists plans, facades, cross-sections, models, photographs, and films as the primary means of representing space, although each one presents its contribution leaving eventual gaps. According to the author, plans are abstract types of graphic representation. The plans are completely outside the concrete visual experiences of a building, making it difficult for lay people or even young architecture students to read them.

Zevi (2009, pp.50-51) addresses photographs as a way of representing architectural spaces and defends that they are good solutions to the problem of three-dimensional representation since they faithfully reproduce the building dimensions, minus its spatial essence. He concludes that the physical experience of an area is solely responsible for making us understand and be part of it, considering that all other tools are useful and necessary, but mere allusions which have a preparatory function for this moment of spatial enjoyment.

The best way to represent projects is a constant search of architects, especially regarding the presentation drawings (Zevi, 2009). According to Ching (2009, p.195),

A feature widely used by architects today is the photorealistic rendering of digital perspectives. Photorealism

[...] these drawings describe a design proposal in a graphic manner intended to persuade an audience of its value. [...] Whether produced to assist the client's imagination or to obtain a commission, either privately or through a competition, presentation drawings should communicate as clearly and accurately as possible the three-dimensional qualities of a design.

is based on a theory of approximation with reality since it has a mimetic nature with the real world. Bates-Brkljac (2012, pp.187-188) states that photorealism is a recurring style of architectural representation which produces pictures aimed at communicating how a building will look like after it is built. The author points out that the realism of the pictures is a cultural convention, a sum of cultural experiences and social conditioning, and in the contemporary digital age, society is used to the photorealistic representations produced by computer designs.

The photorealistic digital pictures are part of the current-day society as a type of communication. Sometimes even as the primary source of information concerning the architectural design to which clients/lay people have access. Using these pictures as a means of anticipating the real thing has occupied a prominent place in the graphic presentation processes of projects. Photorealistic pictures are technical and aesthetic sophisticated, fully constructed with a high load of design information. They carry a multitude of details and design components, proving to be a current paradigm for the credible materialization of an architectural idea before it becomes materially built.

The main argument used in promoting computer visualization methods is based on the fact that they make it easier for the professional from built environment disciplines and the public to assess the visual and spatial impacts of development proposals (Bates-Brkljac, 2008, p.4). Therefore, the issue to be discussed herein is: How are photorealistic pictures a way of present architectural projects in the current scenario?

These pictures play an important role in persuading clients, as well as a type of communication that is intrinsic to the current digital context. They represent an important communicative role due to its language of a comprehensive understanding for various audiences, which approaches the paradigm of the photographic image.

This paper is the result of qualitative research based on a literature review, and also a reflection on the impacts of photorealistic digital pictures in the fields of expression and representation of architectural projects. The issues addressed herein are present in the research for the master's degree developed within the Laboratory of Studies of Languages and Expressions of Architecture, Urbanism and Design (LEAUD), linked to the Graduation Program in Built Environments (PROAC) and to the Department of Design, Representation and Technology (DPRT) of the Course of Architecture and Urbanism of the Federal University of Juiz de Fora (FAU/UFJF). This research aims to understand the reasons why architects and interior designers have used photorealistic pictures to present their projects by incorporating, in addition to the literature review, the application of questionnaires and interviews with professionals.

The primary purpose of this paper is to discuss how photorealistic pictures have currently been influencing communication and representation processes of architectural design, establishing themselves as a current paradigm of anticipation of the architectural object credibly concerning the built reality. Thus, it contributes to a discussion about a current way of representation, therefore, about a type of communication mediated by digital technologies, often produced from hybrid picture production processes. Photorealistic pictures can be understood as objects of construction of information in architecture and urbanism due to their communicational aspects. They anticipate architectural artifacts, influencing not only the creation processes but also, the processes of representation, perception, and apprehension of the project and of reality.

2 The communication process of the architectural project

In architecture, as important as having varying ideas and solutions to design problems is communicating those thoughts to the ones involved in the process. According to Ching and Eckler (2012, p.321), in order to accomplish all tasks pertinent to them, architects "must clearly communicate to all involved parties. Specific kinds of drawings are the primary way this is done". Each step of the design process is essentially a communication task, where one type of description is converted into another, appropriate for the next step, promoting decision-making by clients (Laseau, 2001, p.182).

According to Martins (2012, p.14), architects use drawings to present their projects. The graphical presentation allows exposing and discussing ideas. The success of the architect's proposals and achievements

of clients is directly related to their representation skills.

Laseau (2001, p.4) concludes architects' graphic thinking (generally and not only with regard to presentation drawings) may open various channels of communication with themselves and with those with whom he works, considering drawings are important because they show the entire path from the problem set to the proposed solution. For the author, graphic thinking takes advantage of the power of visual perception, making mental pictures external and explicit, since, by putting them on paper, they gain objectivity and existence of their own.

To be effective communicators, and therefore achieve clarity and accuracy required in their presentation drawings, architects must: (1) understand basic elements of communication (the communicator, the receiver, the medium and the context); (2) develop a graphic language in which drawings correspond to a communication task they perform; and (3) never take communication process for granted, and its effectiveness needs to be verified (Laseau, 2001, p.11).

3 The presentation of the architectural project today

It is noticed the use of computers to create photorealistic digital pictures which, because they resemble photographs, gained prominence among architects as a means of graphic presentation of their projects.

Florio (2008, p.2) states that manual drawings, as well as volumetric models and presentation models, are now complemented by digital resources, with three-dimensional models at the center of the production of various types of drawings, with different communicative functions. According to Ghizzi (2011, p.3), in spite of the similarity between manual and digital drawings, in some respects, this one enables creative stimuli, and electronic models allow easier corrections or changes in the project.

Moreover, the representation through electronic models no longer has a role exclusively related to the viewing of plastic issues, as they are now also organizational tools of numerical data (Tramontano and Soares, 2012, p.7).

In amongst three-dimensional digital models (or electronic models), we may mention still pictures (perspectives), panoramas, animations and virtual reality (VR) paths, each with different intentions in the presentation of architectural projects, in which it is possible to test and simulate projected areas, anticipating the reality to be built (Florio, 2008, p.4). In addition, there is also augmented reality (AR) and mixed reality (RM), defined by Milgram and Kishino (1994) as "[...] a particular subset of Virtual Reality (VR) related technologies that involve the merging of real and virtual worlds [...]" which connects "[...] completely real environments to completely virtual ones".

According to Orbey and Gürel (2013, p.419), digital technology has influenced architectural representation and transmission of design ideas with new methods and tools in the last few years. For the authors, graphic representation in architecture was previously a language that could often be understood only by architects and professionals of the sector and has now been transformed into a language that can potentially be understood by all.

Florio (2008, p.5) states that three-dimensional digital models allow you to: (1) verify the behavior of buildings at different times of the day and throughout the year; (2) simulate countless views from the same model, obtaining fast results from various points of view of beholders; (3) combine various technical aspects and submit them for analysis; (4) better communicate what is being designed for greater security and reliability; (5) simulate the relationship with the surroundings; (6) create virtual paths, resembling those we perform when physically present in a given area.

There was an evolution that merged photorealism into still digital pictures produced by three-dimensional digital models, as can be seen in Figure 1, considering that this type of picture is intended specifically for project presentation purposes (Orbey and Gürel, 2008, p.421).



Fig. 1: Simulation of different stages of pictures produced by three-dimensional digital models. Modeling made in SketchUp 2017 and rendered in V-Ray 3.4. Source: By authors, 2019.

The oldest digital pictures were very economic, usually presented or printed in black and white and wireframe style or with little shading effects. The second generation of pictures had a little more complex modeling than previous ones; volumes are distinguished more clearly and usually have different colors to mark the various materialities of the planes. Finally, there are pictures resembling photographic ones, with high design information loads reproducing textures, colors, etc. in detail.

Therefore, pictures have become more complex throughout the history of digital graphic representation. Photorealistic pictures potentially started incorporating more information about the project, revealing details that were invisible in less sophisticated representations.

The different productions of pictures are conditioned by the influences of the skills of their producers, by the technologies available at all times, by the processing capabilities of the hardware, by the potential of geometric modeling software and rendering software, and, therefore, they carry within themselves the historical indicative traces of the technological limitations. When addressing digital pictures, we notice a shift from the volumetric representation of the architectural project to a photorealistic representation, based on the principles of photographic pictures, but without the concrete and material existence of the object represented, producing pictures called by Santaella and Noth (2005, p.157, our translation) "post-photographic", "synthetic or infographic" pictures, which are entirely produced and "calculated with computers".

When revisiting pictures of the presentation of architectural projects produced in the early 2000s, you notice a predominance of volumetric representation, an abstraction of details, especially due to the low processing capacity of computers usually purchased by students and professionals. Perhaps, at the time, there was already a desire for producing photorealistic pictures, but this type of picture could not be materialized, mainly due to technological aspects.

Figure 2 shows the volumetric simplification of the represented architectural object. Textures are marginally explored and the representation of human figures is not highly detailed. Also, the vegetation, which considerably impacted rendering time, is economical in detail. In this case, the surroundings are removed and the contrast between light and shadow is quite poor.

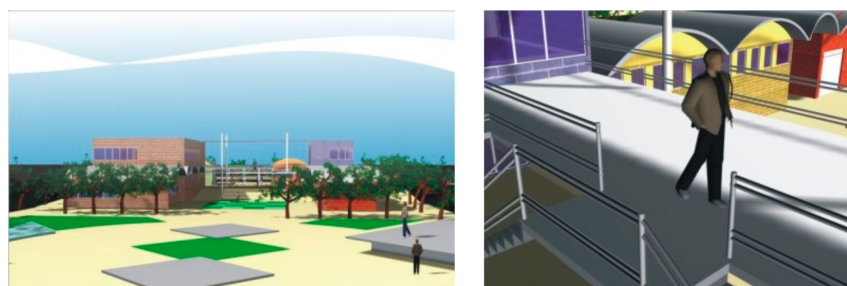


Fig. 2: Project presentation of a community center. Modeling in 3D *Studio Max* in 2002. Source: By authors, 2002.

Figure 3 shows a photorealistic representation. The picture is the result of modeling with *SketchUp* 2017 and rendering with *Lumion* 6.0. Greater definition of details, especially textures and lighting may be noticed, as

well as the incorporation of more detailed human figures and vegetations which may be processed faster by hardware and software. Compared to previous pictures, photorealistic ones include a vast array of design information, requiring architects to have broad control over design decisions, including constructive details. The photorealistic pictures contribute to a reflection on the current construction of information in architecture.



Fig. 3: Project presentation of a single-family residence. Modeling made in *SketchUp* 2017 and rendered in *Lumion* 6.0. Source: By authors, 2017.

The incorporation of Building Information Modeling (BIM) technology in the design process requires greater control from designers over the physical and functional characteristics of a particular building by bringing characteristics and relationships near the reality of built works into three-dimensional models. Similarly, photorealistic pictures incorporate a high level of information on a particular project, since they are designed from the sophistication of graphic representation.

4 Photorealistic digital pictures as a paradigm of architectural projects presentation

Still digital pictures are a kind of presentation of architectural projects which has assumptions of inclusion and exposition (Orbey and Gürel, 2008, p.421). They are used to reveal how space designed acts during different times of the day, and also to give clues regarding how it may be used and what kind of atmosphere will take place once it is inhabited (Orbey and Gürel, 2008, p.421).

According to Bates-Brkljac (2009, p.424), computer generated representations (rendered and/or photomontage) are perceived as more credible means than traditional (analog) representations because they convey more accuracy, realism and are considered more descriptive pictures. According to Florio (2008, p.4), rendered pictures make the communication of the architectural project between architects and customers easier, besides making the decision-making process faster and safer.

In another research by Bates-Brkljac (2012), four types of presentation drawings (computer generated photomontage, computer rendered 3D model, watercolor impressions, and perspective hand drawings) were presented for four distinct groups (experienced architects, young architects, built environment professionals, and politicians). She was seeking an insight into the nature and attributes of computer generated photorealistic representations that make them effective for decision-makers, built environment professionals and architects.

Overall, the survey results showed that computer generated pictures were considered more realistic than perspective hand drawings. Photomontages were the most liked pictures due to their similarity with photographs. They were considered more convincing and reliable. Renderings took second place having missed out on first place because they were "inappropriately flawless", where their "beautification" made them "ghostly", due to the lack of details such as dirt and the perfection of the weather.

In addition to photorealistic still digital pictures, it is also possible to make sequentially framed animations to simulate a walk through the projected building. Starting in 2016, VR technologies became more popular with the releases of the Head Mounted Display (HMD) Oculus Rift and the PlayStation VR, which were more accessible devices for the general public. Therefore, it is being used to create interactive, immersive pathways, where beholders may be virtually inserted into the environment. It is possible to create 360° panoramas and videos which may be viewed through an HMD or interactive three-dimensional models, where

users create their own paths and interact with the environment by changing colors of objects or the time of day. Table 1 shows a possible categorization of photorealistic digital pictures for architectural project presentations.

Category	Description
Photorealistic still pictures	Concerns the <i>renders</i> , showing a photorealistic picture as a photograph of a building not yet built.
Interactive photorealistic still pictures	Refers to 360° rendered pictures which enable viewers to move the still picture on a device screen, conferring some interactivity with it.
Interactive, immersive photorealistic still pictures	Corresponds to 360° pictures, but using HMD devices, conferring the same interactivity as those from the previous category, but with the immersive aspect that such device provides.
Immersive photorealistic pictures	Concerns videos recorded by VR programs, with which an immersion feeling is possible if an HMD device is used, taking a path which has been preset by the video developer.
Interactive photorealistic pictures	Refers to AR technologies, where it is possible to interact with the model virtually inserted into the real environment.
Interactive, immersive photorealistic pictures	These are the models developed with VR software, where beholders are virtually inserted into the environment to be built and may make paths on their own and interact with the environment, such as turning on lights or changing colors.

Table 1: Categorization of photorealistic still pictures. Source: By authors, 2019.

Another important aspect to be pointed out is the market requirement for using computer tools in presentations and representations of projects, conferring a competitive advantage to those using them (Damas, 2018).

Kutyla (2015) discusses the natural condition of human beings to cling to their comfort zone, a scenario which reduces the variables arising from change and from the unknown. The author states that a properly made photorealistic digital picture may help reduce customer anxieties and fears. An example is when the context is embedded in the picture, making it more reliable since the existing aspects will be mixed in with the new ones.

5 Criticism on the use of photorealistic pictures in project presentations

The adoption of photorealistic pictures as a paradigm for the presentation of architectural projects nowadays has several potentials to improve the communication of the architects' ideas. The photorealistic pictures enable the representation of a project similar to a built work which is close to the photographic picture, especially because it shows a high level of information. However, they also bring up a series of issues that should be discussed.

According to Rawn (2015), architects started being enchanted by photorealistic pictures and using them because customers understand these pictures better than they do plans. Also, according to the author, technology is constantly developing, which creates a scenario where tools for creating pictures develop faster than the architecture itself, making it possible to use video game software to create interactive virtual pathways, for example.

The common way with which 3D models started being built brought criticism on the possible consequences of this tool for the architectural language, since it may be construed as a resumption of the perspective controlling the design process, as occurred during the Renaissance period (Ghizzi, 2011, p.2).

Kutyla (2015) states that renderings made without the necessary references, using a "style" which is misleading to the project proposal, may impair customers' understanding rather than help them, disappointing the team and creating stress and distrust. The author adds that many professionals in the field condemn using photorealistic digital pictures because they consider them poor. Kutyla (2015) points out that this is an inaccurate, misleading statement since a picture made "correctly" will only contribute to better communicate the ideas. For the author, elements such as context, accurate lighting, and scene photography (in order to make the digital picture similar to photography) can bring the picture closer to reality and not cause communication issues, thus fulfilling its role well.

There is also some criticism stating photorealistic pictures are so perfect they end up being detached from real, built and imperfect architecture (Quirk, 2013). The excessive and deliberate search for producing

photorealistic pictures may lead to a kind of fetishism and to the construction of utopian pictures in architectural teaching. Sometimes such pictures may eventually represent an ideal architecture not only for the public but also for the architects themselves (Quirk, 2013).

Freeman (2013), adopting a critical stance on photorealistic rendered pictures, claims these pictures are routinely used in architecture to show what a structure might look like after it is built, and these representations are sometimes mere fantasy. Freeman (2013) states that “[...] our eyes are trained to believe that a photograph is a true representation of an existing condition. Thus, in the digital age the graphic representation of architecture has moved beyond an exercise in persuasion; it has become an exercise in deception”. Quirk (2013) also claims that “mistakes” caused by these pictures considered perfect, but incongruous, occur not only due to the education or media influence suffered by architects, but are also the result of a therapeutic act of self-deception, where architects have little commitment concerning their built work. Therefore, Quirk (2013) raises the following question:

[...] renderings, often slightly idealized, are necessary to try sell the idea of a design to a client, in which case a bit of artistic leeway is a necessary evil. However, once that idea is sold, what happens when a more realistic rendering, one which shows as truthfully as possible how the building will look (air conditioning units and all) is presented?

These idealized pictures eventually set expectations that are far higher than reality could reach (Quirk, 2013), and their spreading may lead the public to expect from architecture and architects a level of quality and perfection which is impossible in the real world (Freeman, 2013). Santiago (2015, p.3) points out that these mismatches between pictures produced on computer screens and the building built may be due to the fact that the architecture of the digital age does not have materials consistent with the technology existing in computers, since many of these projects are built with traditional materials such as brick and concrete. This argument underlies a discussion between graphic representation technologies and constructive/tectonic technologies.

Baratto (2016, our translation), states that “the absence of people, the excess of brightness and the insipidity of environments reveal that it is a deception, an image carefully composed to look like a photograph of something that has already been built but still inhabits the plane of ideas.” The author adds the example of Portuguese firm FALA, which uses pictures with no intention of resembling photographs, where human figures are seen in a playful way, by portraying ordinary moments of everyday life. According to him, the firm’s pictures show the “reality” that photorealistic pictures do not: details such as a half-cup of coffee, crumbs on the table or a cat looking out the window.

Piedmont-Palladino (2018) shares her experience as an architect and professor at Virginia Tech University School of Architecture and Design when she came across a picture of the inside of an elegant glazed apartment in a magazine with a footnote saying: “This is an actual photograph.” The author states that “it is disconcerting to realize that we can’t quite sort out the relationship of an image to the world; like not understanding whether someone is telling you a true story or a tall tale”.

Freeman (2013), also an architect and director of Belmont Freeman Architects in New York, portrays a similar situation after having been annoyed by the masterful, amusing misconception occurred when looking at a picture by artist Filip Dujardin, in which a strange-looking building, with a cantilevered superstructure, was inserted into a park-like environment on the edge of a forest. In this case, the picture was a digital rendering, the result of 3D modeling in SketchUp, which led the author to confuse it with a real photograph.

Piedmont-Palladino (2018) discusses the topic, claiming that the dazzling 17th-century paintings, while extremely realistic, leave no doubt as to their reality; you could see they were mere paintings. Piedmont-Palladino (2018) wonders why the distinction between true and false is important to architecture. According to the author, the importance of this distinction refers to the existence of the real world and the projected world, where

[...] in a design proposal, there is a necessary overlap between the two worlds, and, as with the intersecting sets of a Venn diagram, that overlap is negotiated at every stage of a project, getting ever thicker as the design moves from concept to construction.

The author notices that photographs look like digital pictures and digital pictures look like photographs and argue that this representational chiasm leaves viewers intrigued by the intentions of the pictures since they

do not know what they are looking at or how to assess it.

However, Freeman (2013) considers that the best photorealistic digital pictures may be a powerful art form, criticizing the urban condition, promoting theoretical positions and overcoming the limits of conventional architecture. The author contends that photographers manipulate photos to improve reality, strengthening the architect's intentions or to create a specific artistic effect. As with photorealistic digital pictures, edited photographs can test the fidelity of contemporary photographers to reality (Freeman, 2013).

Contrary to Baratto's statements, Piedmont-Palladino (2018) considers that the frequent strangeness between what is familiar and the unknown in photorealistic digital pictures may be reduced by an effective rendering, where new buildings or landscapes share the same illusionist space with pictures of existing buildings or landscapes. The author, citing Freud's thoughts, argues that a strange effect (which the psychoanalyst calls an "uncanny effect") is easily produced by eliminating the distinction between imagination and reality, for example, when something previously considered imaginary actually appears before us. Freeman (2013) compares it with the two-dimensional graphical representation of architecture, which has traditionally been the precursor or subsequent by-product of architecture but has never been considered a substitute. A digital picture may be a powerful artistic or theoretical conception, but it is not architecture.

Piedmont-Palladino (2018) states that photorealistic rendering often makes promises that the built building will not be able to deliver. Therefore, it can be concluded, from the thoughts of Piedmont-Palladino (2018), that,

[...] when reality eclipses the imagination, the result is banality; when the imagination eclipses reality, then we have abandoned architecture for the untethered spheres of science fiction, or gaming, or art. It's at this point that images become ends in themselves rather than representations of a plausible new reality.

In view of the arguments presented by different authors, multiple views that point to the potential and to the limitations of photorealistic pictures have been established, demanding from architects a critical stance on their usage as a way of communication and presentation of architectural projects.

6 Final considerations

In this paper, we sought to bring up a discussion on the communication of the architectural project nowadays, especially regarding the presentation of projects, strongly influenced by the digital language. The photorealistic digital pictures are being frequently used as a way of presenting architectural projects, especially when it comes to interior projects, where these pictures present possibilities for the project to be read by a wider audience, whereas they also have limitations as a communication tool for the project.

The photorealistic digital pictures are the result of the currently existing digital culture, where people routinely have contact with computer generated pictures. Architects use them with the assumption that they present the area to be built through a language better understood by those not directly involved with the field of architecture since they resemble photographs, pictures easily recognized as records of reality. This similarity is the main point of discussion in this paper.

In the large scenario of digital imagery constructions, there are at least two major types of pictures: first, those that cause confusion because they are too similar to reality, not allowing differences to be made between photographs of things that exist and a rendered picture of something yet to be built, which may produce false expectations regarding the project; a second type refers to pictures that become incongruous, incorporating into the project a reality that will never exist, eventually becoming an end in themselves rather than playing their communicative role between architects and their counterparts.

The photorealistic digital pictures may be developed as an art form, with no limits to the imagination of the artists creating them. However, as a form of presenting the architectural project, these pictures are communication tools for professionals and should make the decision-making process easier for customers rather than confusing them.

The architects themselves are immersed in the communication ecosystem of the digital culture and, therefore, they take ownership of the technological resources available to produce models and pictures

containing high information loads in order to represent their ideas through increasingly sophisticated graphic resources. However, this search for credible, close-to-reality pictures may raise false expectations concerning the project, even though such an effect is not deliberately desired by architects using this kind of picture as a type of communication.

The photorealistic pictures also bring about a vision of the world and are characterized as ideological productions. Thus, given the possibilities of producing representations that aim to reach a reality not yet materialized, photorealistic pictures, as the current paradigm of the form of presenting architectural projects in the digital age, demand from professionals an ethical, critical and reflective stance.

These pictures contribute to the construction of information in architecture as they act as mediators between the architects' ideas, the customers' expectations, and the real areas nowadays. They emerge as another kind of architectural representation mediated by digital technologies, as communication tools of the project and a means of anticipating the works not yet built. Just as the discovery of perspective greatly impacted the types of representation during the Renaissance period, photorealistic digital pictures play a similar role in their time, establishing a new paradigm, creating paradoxes and causing reflections and questions about their application.

Therefore, what can be inferred at the end of this reflection is that photorealistic digital pictures, within the hybrid, complex context of the current day, should be applied at the service of the communicative process between architects and customers, and professionals may use certain resources to persuade and market their projects. However, there seems to be a need to preserve a tacit ethical and moral commitment not to make the image a more relevant object than architecture itself.

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References

Baratto, R., 2016. A imagem fala: ou, por que precisamos ir além dos renders. *ArchDaily Brasil*, [online] Available at: <https://bit.ly/30yZigZ> [Accessed 3 July 2019].

Bates-Brkljac, N., 2009. Assessing perceived credibility of traditional and computer generated architectural representations. *Design Studies*, [e-journal] 30(4), pp.415-437. Available at: <http://twixar.me/0nw1> [Accessed 2 August 2019].

Bates-Brkljac, N., 2012. Photorealistic computer generated representations as a means of visual communication of architectural schemes in the contemporary culture. *International Journal of Architectural Computing*, [e-journal] 10(2), pp.185-204. Available at: <https://bit.ly/2G3J6MM> [Accessed 19 December 2018].

Bates-Brkljac, N., 2008. Towards client-focused architectural representations as a facilitator for improved design decision-making process. In: *Proceedings of DDSS, 9th International Conference On Design & Decision Support Systems In Architecture And Urban Planning*. Leende: Technische Universiteit Eindhoven. pp. 1 - 16. Available at: <https://bit.ly/2S7Ah9m> [Accessed 24 April 2019].

Ching, F.D.K. 2009. *Architectural graphics*. 5th ed. Hoboken, NJ: Wiley & Sons.

Ching, F.D.K. and Eckler, J.F., 2012. *Introduction to architecture*. Hoboken, NJ: John Wiley & Sons.

Damas, L.C., 2018. Do croqui à maquete eletrônica: reflexões sobre a utilização de softwares gráficos no processo de concepção e representação de projetos de arquitetura e design de interiores. *Intramuros*, [e-journal] 11(1), pp.1-9. Available at: <https://bit.ly/2ZL1h1y> [Accessed 7 August 2019].

Florio, W., 2008. Animações, Renderizações e Panoramas VR em Arquitetura. 3o Congresso Nacional De Ambientes Hipermedia Para Aprendizagem. In: *CONAHPA, 3o Congresso Nacional de Ambientes Hipermedia*

para *Aprendizagem*. São Paulo: Universidade Anhembi Morumbi. pp. 1 - 12. Available at: <http://twixar.me/ZKw1> [Accessed 1 August 2019].

Freeman, B., 2013. Digital deception. *Places Journal*. Available at: <https://bit.ly/2YLQJPp> [Accessed 24 April 2019].

Ghizzi, E.B., 2011. Reallocating the problem of architecture: from projective processes to language revision. *Virus*, [e-journal] 6. Available at: <http://www.nomads.usp.br/virus/virus06/?sec=4&item=4&lang=en> [Accessed 14 August 2019].

Kutyla, J., 2015. Are 3D renderings deceiving architects and clients? *ArchDaily*. Available at: <https://www.archdaily.com/774853/are-3d-renderings-deceiving-architects-and-clients> [Accessed 7 August 2019].

Laseau, P., 2001. *Graphic thinking for architects & designers*. 3rd ed. Nova York: John Wiley & Sons.

Lawson, B., 2005. *How designers think: the design process demystified*. 5th ed. Oxford: Architectural Press.

Martins, C.A., 2012. *O desenho como forma de comunicação da arquitetura*. Dissertação (Mestrado em Arquitetura e Urbanismo) - Universidade Presbiteriana Mackenzie. São Paulo. Available at: <http://twixar.me/TKw1> [Accessed 31 July 2019].

Milgram, P. and Kishino, F., 1994. A taxonomy of mixed reality visual displays. *IEICE Transactions on Information Systems*, [e-journal] 77(12). Available at: <https://bit.ly/2b4fpcc> [Accessed 22 October 2019].

Orbey, B. and Gürel, N., 2013. Digital design tools versus architectural representation and design approach: a reading off architectural press. In: *Proceedings of the 31st eCAADe Conference*. Delft: Delft University of Technology. pp. 415 - 424. Available at: <http://twixar.me/JKw1> [Accessed 1 August 2019].

Piedmont-Palladino, S., 2018. Into the uncanny valley. *Places Journal*, [online] Available at: <https://bit.ly/2vOmVYd> [Accessed 8 August 2019].

Quirk, V., 2013. Are renderings bad for architecture? *ArchDaily*, [online] Available at: <https://www.archdaily.com/383325/are-renderings-bad-for-architecture/> [Accessed 24 April 2019].

Rawn, E., 2015. Unreal visualizations: 3 pros and 3 cons of rendering with a video game engine. *ArchDaily*, [online] Available at: <https://www.archdaily.com/607849/unreal-visualizations-3-pros-and-3-cons-of-rendering-with-a-video-game-engine> [Accessed 8 August 2019].

Santaella, L. and Nöth, W., 2005. Os três paradigmas da imagem In: Santaella, L. *Imagem: cognição, semiótica, mídia*. 4th ed. São Paulo: Iluminuras, pp. 157-186.

Santiago, A., 2015. Digital techne. *Virus*, [e-journal] 11. Available at: <http://www.nomads.usp.br/virus/virus11/?sec=4&item=8&lang=en> [Accessed 14 August 2019].

Tramontano, M. and Soares, J.P., 2012. Emerging architecture, parametric design and representation by means of information models. *Virus*, [e-journal] 8. Available at: <http://www.nomads.usp.br/virus/virus08/?sec=6&item=1&lang=en> [Accessed 14 August 2019].

Zevi, B., 2009. *Saber ver a arquitetura*. 6th ed. São Paulo: Martins Fontes.