

From (Flat) Drawings to the (Ultra) Real: A Taxonomy of Architectural Visualizations

Ioanna Symeonidou¹, Panagiotis Papapanagiotou¹


¹ Department of Architecture, University of Thessaly, Greece
symeonidou@uth.gr
panagpapapanag@gmail.com

Abstract. Architectural visualizations play an important role in transmitting architectural ideas. The research presented in this paper focuses on digital images and investigates the different types of architectural representations and visualizations in relation to the architectural/designerly workflow. The study of a series architectural images reveals that based on the stylistic characteristics they tend to coalesce into categories, ranging from (flat) drawings to (ultra) real architectural visualizations. The research aims to identify different types of architectural visualizations, question whether there are links between the style and the design tools and software used and decipher the digital workflow employed for their creation. Taking into consideration the findings, a pilot 3D scene is selected as a case study to test the hypothesis of replicating different visualization styles, using a corresponding workflow and methodology, in order to compare the results and reach conclusions about the features, characteristics and workflow.

Keywords: architectural visualizations, renderings, digital workflows, visualization styles, photorealistic representations

1 Introduction

Digital representation methods have had a significant impact in the advancement of architectural visualizations. Nowadays, digital representations of architectural space form a substantial part of architectural research. Architectural representation evolves with the evolution of technology, digitalization and intermediality, considering the overlapping of different disciplines in the digital media (Carbonell Segarra & Díaz García, 2019). The continuous development of technology has had an obvious impact in the way architectural representations are placing themselves within the industry, it is often believed that architectural representation has emerged as a discipline on its own. Light, color and perspective are the key elements that become the



supports of this new craft of architectural visualizations (Alonso Rodríguez et al., 2019). Through the systematic study of architectural images we can observe that architectural visualizations can be grouped into distinct categories based on their characteristics. Hence, a number of styles emerge, ranging from (flat) two-dimensional drawings to the (ultra) real three-dimensional architectural visualizations. The study presented in this paper aims to identify different types of architectural visualizations, aiming to present a taxonomy and decipher the digital workflow employed for their creation. Of course, there are several different ways to classify and categorize architectural visualizations. This study presents one attempt to do so, based on the available literature but also on forums for digital designers, videos and software. The aim of this research is to study, analyze and classify the emerging typologies of digital architectural images and provide the methodology to reconstruct them with the use of digital media.

2 Research methodology

The initial hypothesis that there are different styles of architectural visualizations and that they agglomerate to form distinct taxonomies, is to be verified through the analysis of hundreds of images found on the internet. The aim is to identify their relationship to the general production methodology as well as the digital workflows employed. It is evident that style and technology affect each other reciprocally. Mario Carpo remarks that *“all tools feed back onto the actions of their users, and digital tools are no exception [...] manufactured objects can easily reveal their software bloodline to educated observers”* (Carpo, 2011). At the same time, contemporary aesthetics push the technological boundaries aiming at the utilization of new media and design processes to address the design intent. It is clear that software selection strongly affects design outcome, as Pierluigi Serraino brilliantly explained in the lecture *“Form Follows Software”* during ACADIA 2003 (Serraino, 2003).

Due to the fact that there is very limited bibliography on this topic, in order to respond to the aforementioned hypothesis, a combination of research methods is employed with the aim to reach valid conclusions. The hypothesis will be confirmed through a methodology of observation and documentation of samples drawn from prominent architectural sites. In addition to the bibliography, the web pages and video tutorials of 3D artists have been a great source of information *“If you want to understand what a science is [...] you should look at what practitioners do”* (Geertz, 1973). A technical analysis of the production methodology of the above digital imaging categories will be carried out based on both bibliography and on online sources. Having decoded the digital processes by speculating on how certain types of images are produced according to style, a strategy for their creation is established.

2.1 Selection of online sources for collecting and analyzing images

Aiming at objective observation of the above trends, it was considered necessary to monitor and research the dominant three-dimensional imaging sites as well as relevant architectural publications. This disciplinary field is relatively unstable (Fekry, 2014), continuously evolving. Apart from the stylistic variations, the development of new software plays an important role in the production process. For this reason, a search based on Google's search engine optimization (SEO) and the percentage of recorded traffic, was used as a basis to determine the most prevalent sites that were used for image collection:

1. **Archdaily.com** is a site with remarkable architectural projects around the world with 14 million registered users worldwide. Its validity is enhanced by the great number of curators who daily evaluate the content of the site. It plays an important role in the inspiration and influence the design process of many architects, resulting in new stylistic approaches to visualization.

2. **Pinterest.com** is a social networking site through online images. Its 250,000 active monthly users have the ability to find, categorize in the form of boards, but also share pictures that appear in every possible location of the internet. Millions of users have created public boards related to architectural visualizations where everyone can see the images and evaluate them by commenting on their views. This creates a collective list of ideas and reinforces creative dialogue.


3. **Instagram mobile app** is also a social networking application through image sharing. Users have the ability to continuously discover new multi-subject images using filters such as title and location. There are currently 317,000 posts with the hashtag architectural visualization.

4. **RonenBekerman.com** is a blog that deals exclusively with architectural visualization. Its contribution to the industry is important as it includes not only the most famous architectural visualizations but also tutorials of acclaimed 3D artists who accurately explain the methodology that led them to the final result.

5. **Evermotion.org** is a site oriented towards the technical part of the production as it provides a separate category on the production process. It has an active forum in which visitors can not only network but also exchange views on some technical issues that concern them.

6. **AlexHographe.com** is a site that displays a variety of architectural visualizations. Alex Hographe is considered expert by the majority of the 3D community. The tutorials are aimed at beginners, making the site accessible to everyone. Various styles and explanations are continuously updated catching up with the latest tendencies.

It is important to highlight here that an important source of architectural representation images are the official websites of major architectural offices of the so-called "starchitects" as they influence the global design community through their paradigmatic and often recognizable architectural visualization approach. Among them Zaha Hadid Architects, Schmidt Hammer Lassen



Architects, Foster & Partners, BIG have developed easily identifiable representation styles. Nevertheless, the websites of architectural offices tend to follow a unified aesthetic approach that is present in the totality of their work, therefore a survey on architectural offices alone would not display the totality of rendering styles and novel representation practices.

2.2 Methodology for the analysis of images

Having collected around 500 images from the aforementioned sources, a methodology for the analysis and categorization of the images was deemed necessary. As there are no prescribed research protocols for the analysis of architectural visualization (Rendell, 2004; Roberts, 2007), therefore a combination of methods for design research (Cross, 2006) has been used. Taking into consideration the above, the analysis of the images follows the following strategies - methods:

Decomposition: This technique refers to the decomposition of a project to explore the most important elements, it enables the researcher to place emphasis on the individual parts of the composition as well as to investigate their relationship to the whole.

Variation: Through the systematic organization and structure of imaging, scholars gain the ability to perceive synthetic variations based on dimensions, rhythms, proportions, differentiations, connections, materials, colors, etc.

Visualization: This relates to the visualizations itself, as the image is categorized based on the amount of information it gives about the architecture it depicts.

Reference study: The research of previous architectural imagery enables us to create a library. We are thus able to compare and contrast similar projects and images. This involves the comparison of similar rendering styles to draw conclusions and suggestions.

3 Identifying 7 styles of architectural visualization

There have been precedent studies in the architectural press suggesting categories of design representation and visualizations (Grozdanic, 2017) which have formed a preliminary body of knowledge, however they do not cover the entire spectrum of architectural visualizations. Following the systematic analysis of the images based on criteria of decomposition, variation, visualization, reference study, the following 7 styles of architectural visualization emerge:

- **Digital painting**

A digital painting is usually created as a free-hand drawing on a digital tablet (Lorenzo & Fraga, 2015). The outlines of the forms as well as the shadows are

strongly emphasized with black colour and the rest of the image stands back with soft shades, displaying a graphic character. The proportions of the objects depicted are real. According to the deconstructive research approach, the built environment occupies most of the composition (70%) while the natural environment is mainly decorative. The main representative of digital painting is the architect Fernando Neyra. His influential images with 130,000 followers on Instagram have inspired many artists. The workflow usually includes 2D drawing and digital image editing in a corresponding software (Fig. 1).



Figure 1. Digital painting of Casa Medianeras by Fernando Neyra. Source: <https://www.behance.net/ferneyra>

- **The Sketch**

Based on single perspective sketches, this style of representation may look unfinished. It may combine hand drawings with superimposition of images or photographs. The sketches are deliberately abstract leaving space for interpretation. A sketch may pay less emphasis on proportion, but would highlight the atmosphere, texture and materiality. No 3D modeling or rendering is used and most of the images are the result of superimposition of pictures or photographs in 2D (Fig.2). There are computer graphics techniques and methodologies that can facilitate the photomontage of images with the same point of view (Maestre López-Salazar & Juan Gutiérrez, 2018).

- **Collage**

Despite the advancements of technology in architectural visualizations, there are architectural offices that opt for low tech representations, such as collages. The main representative of this style is KWY studio Lisbon which uses exclusively the above method for all illustrations. These works are distinguished for the simplicity of the forms and the intense color tones. Proportions as well as materials are realistic (Gomes & Bae, 2009). In particular, for the processing of the textures a collage of elements from photographs that do not fully adapt to the shape of the objects may accentuate this low-tech approach. Due to the absence of shadows and sun the images look relatively flat. Usually the camera

is placed quite far from the architecture and the building occupies around 1/3 of the image. To create an architectural collage, only image editing software is used, and in rare cases the result of a 3D render may be used as a geometric guideline, but this will not be visible on the final image (Fig.3).



Figure 2. Architectural sketch by Wissam Bou Chahine (2018). Source: <https://pinterest.com/pin/507992032950430680/>



Figure 3. Digital collage of Patio de Santiago by KWY. Source: <http://www.k-wy.org>

- **Tweaked saturation**

The main representative of this style is the architect Pedro Fernandez, founder of the Arquí9 London, along with the architectural offices BIG and OMA. In tweaked saturation images, the main features are the use of orange and brown color palettes, a strong colour contrast with overexposure as well as light beams and light blur or light spots are often encountered. The sun and artificial light contribute significantly to the appearance of reflective surfaces, delivering realism to the image. Tweaked saturation images transmit a large amount of information to the viewer. The workflow relies highly on rendering techniques,

and usually the colour balance is enhanced during post-production to achieve the tweaked saturation character. The overall composition evokes a romantic, nostalgic atmosphere (Fig.4).

- **Neutral**

This architectural representation style resembles clay rendering and has become a trend due to Zaha Hadid Architects, as it dominates their minimalistic architectural representations. Its futuristic architectural approach also has an impact on the way its ideas are presented. The colour palette is dominated by white and black. Proportions are realistic, but textures are minimal, usually white glossy materials and transparent elements. The human figures are minimal, volumetric and transparent, only to provide a visual reference with regards to the scale. The natural environment is most often absent, placing emphasis on the geometric feature of the architectural volumes (Fig.5). With regards to the production process, the render strongly relies on the use of the ambient occlusion, surfaces with similar colors are darkened to create contrast. For the majority of cases no substantial postproduction is needed.



Figure 4. Rendered image with tweaked saturation levels by Pedro Fernandez. Source: <https://arqui9.com/portfolio/perkinswill-oman/>

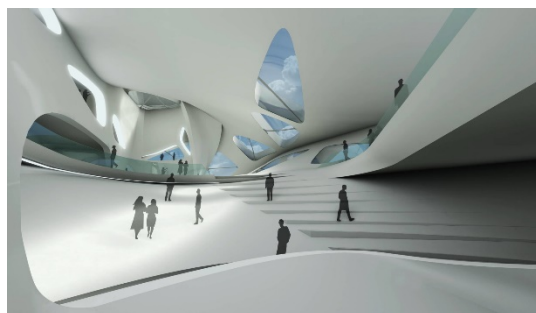


Figure 5. Neutral rendering of Nuragic and Contemporary Art Museum by Zaha Hadid Architects. Source: <https://www.zahahadid.com/archive>

- **Lights on!**

The main representative of this style of illustration is architect Thomas Dubois and the office Brick Architecture. It usually depicts the time of the day when, although it is partly late at night, it is not totally dark and we can still see details. The buildings are always illuminated. The use of light makes the image come to life. The background is of minor importance and usually covered by a strong fog (blur) and is seldom illuminated thus creating a cold - mystical mood for the viewer (Palvelli, 2018). The color palette used is based on the combination of blue-yellow or gray-yellow etc. There is a winter atmosphere in most of the images as cold colours are dominant to contrast with the yellow light elements. The sun and shadows are completely absent from the composition. Regarding the production process, photorealistic rendering plays the main role in creating the image. Although in some places the modeling details are not visible, the way the light diffuses suggests that a complete modeling work was undertaken. Image editing can further enhance the atmosphere by accentuating light sources and adding fog and human figures (Fig.6). In addition, the light sources are enhanced and the desired mood was rendered with small color processing.



Figure 6. "Lights on" rendering of BIG Architects' Children Hospital by Brick Visual.
Source: <https://brickvisual.com/portfolio/>

- **Is it real?**

As the name suggests, this rendering style is so realistic that it might be perceived as a real photograph of the building. There are no specific representatives of this style, as it is the preference of the majority of 3D artists. This style is characterized by exceptional precision and meticulous details. The aim of the 3D artist is to make the observer believe that it is a photograph and not an image made with technical means (Lisyanskiy, 2016). The architecture is depicted as clear as possible with no fog or traces of the light paths (Reutersvärd & Lindqvist, 2016). The liveliness of the image is achieved by the carefully placed textures and the realistic human figures. Particular attention is paid to lighting conditions which are often based on photographs in order to

achieve greater accuracy (Fig.7). The textures are carefully designed so that even the impact of time on the buildings (rust, mold, etc.) is visible.



Figure 7. Award winning realistic rendering by Nikolay Lisyskiy. Source: https://www.behance.net/Nik_Fox

4 Case study








It is easily understood that some visualization styles rely more on the precise 3D modeling and photorealistic rendering in a CAD software, while others may be obtained through the 2D composition of elements, textures and forms in image editing software. Often both methods are used, depending on the design intent and stylistic approach. Rendering usually includes the assignation of materials, textures, light conditions and cameras, while image editing would address issues of transparency, blending, filters, as well as the addition of elements or objects. An experienced rendering artist is precisely what Carpo would refer to as an “*educated observer*” to whom the “*software bloodline*” is revealed (Carpo, 2011). Careful observation of the images reveals whether their creation relies on 3D or 2D design processes, whether the light is the result of a rendering engine (in a 3D modeling CAD software) or an artistic interpretation of light (in an image editing software). In most cases both processes are present, however to a different extent. Linking certain rendering style to certain design workflow, departs from an initial hypothesis expressed as an educated guess based on the image characteristics, that is to be verified through a case study that will replicate the deciphered design process. The case study will verify that the digital workflow will result in images that stylistically adhere to the archetypical representatives of each style. The case study uses a 3D model of a School placed within the urban context created by Ronen Bekerman (Bekerman, 2018). The camera is placed at the entrance of the school. This will result in the capturing of what is visible from the observer's

eyes and the relationship of the architecture with the surrounding space. This position has been maintained throughout the case study to facilitate comparison of the images (Fig.8). The resulting images verify the hypothesis as they present great affinity to the main representatives of each visualization style. During this study, the researchers measured the time required for 3D modeling and/or rendering as well as for image editing and/or postprocessing, in order to quantify the percentages of 2D and 3D design processes. It is important to highlight here that these percentages refer to the specific case study and may vary from designer to designer, nevertheless, even though these numbers may fluctuate, they do offer an insight into the proportion of time needed per process, based on empirical observation. The results are presented in Table 1.



Figure 8. Tweaked Saturation, Neutral and “Lights on!” rendering of the case study

Table 1. Catalogue of visualization taxonomies with main features and characteristics

Visualization taxonomies	Aprox. Design Process	Features	Characteristics	Representatives
 Digital Painting	3D modeling/Rendering: 15% Image editing: 85%	Volume outlines Soft textures Strong shading	Lack of details Laceriness Graphic character	Fernando Neyra Agra Arquitectos Tec Taller EC
 The Sketch	3D modeling/Rendering: 15% Image editing: 85%	Volume outlines Color rendering of textures	Limited details Fake perspective Dynamic character	Wissam bou Chahine Fabian Dejtiar Ris Yao ARTECH Minor Lab
 Collage	3D modeling/Rendering: 5% Image editing: 95%	Volumetric representation Minimalist	Flat representation Artificial character Volumetric purity	Nishizawa Architects Kwy studio Lisbon Dua studio
 Tweaked Saturation	3D modeling/Rendering: 35% Image editing: 65%	Light diffusion Romantic character	Isolation from environment Invoking emotions Idealizing	Pedro Fernandes Matteo Botelli Case3D Lucia Frascerra
 Neutral	3D modeling/Rendering: 75% Image editing: 25%	Austerity Volumetric representation	No details Fake perspective Dynamic character	Zaha Hadid Future Architects PetaPixel Planning Korea
 Lights on!	3D modeling/Rendering: 75% Image editing: 25%	Volumetric representation Contrast	Volumetric purity	Thomas Dubois Andrew Price CUBYC architects Schmidt Hammer Arch
 Is it real?	3D modeling/Rendering: 85% Image editing: 15%	Photorealistic textures & lights Uniformity	Highly realistic Attention to details	Daniel Reuterswärd Nikolay Lisyskiy Fabio Palvelli

5 Findings and conclusions

The paper has presented one of the possible taxonomies of architectural visualizations and has highlighted that there are certain parameters that affect the design process to produce visualizations using different techniques. These are the geometric accuracy of a design proposal, the popularity of a particular software and the digital literacy of the designer, the available time and budget, the designer's style (realistic vs artistic), the available equipment, the access to knowledge (ex. tutorials), the influence of famous designers or 3D artists. Just as in art, there is no better or worse visualization styles, just different approaches, with their respective characteristics and objectives of communicating a design idea. It is seen that image editing is prevalent in artistic or abstract representation styles, moodboards or preliminary ideas while render engines is the core of the creative process for photorealistic approaches, which usually require a rather elaborated 3D model and present much more detail. This is also reflected in the proportional allocation of time needed for each work.

The internet and social media have influenced both the production of visualizations as well as the dissemination of information and images through the web, encouraging dialogue and critical thinking. There have been developments of digital social media that are largely based on the attractiveness of architectural illustrations to spark the interest of their viewers (Fekry, 2014). Not only in fashion, but also in architectural visualization, there seem to be influencers. In an era of fast information transfer and quick decision making, capturing the interest of the viewer with an impressive image may be enough to create a positive initial opinion of the architectural composition. The result of the above is the fact that many architects (Pedro Fernandez, Neyra Fernando, etc.) became known to the online community through primordially their illustrations and secondarily through their architectural production.

Having studied the prevailing styles of architectural visualization, it is seen that certain features are common, with regards to composition, colour palette, and storytelling. The compositional approach may emphasize a building within its environment, one particular architectural element, or a desired atmosphere. A typical example is "*Lights on*" style in which the main light source is emitted from the architecture itself. With regards to the narrative and storytelling of an image, one of the most dominant features is the presence of people, plants or even animals. This transmits different notions such as scale, use and function of a building. It is important to consider that the field of architectural illustrations is fluid and constantly evolving. Due to the interconnection offered by today's social media but also the influence of popular architectural sites it is expected that following the advancements of technology and style, new representation styles will keep emerging and will inspire designers and architects worldwide.

References

- Alonso Rodríguez, M., Galván Desvaux, N., & Álvaro-Tordesillas, A. (2019). Makers of Atmospheres. The Image Beyond the Architecture. In C. L. Marcos (Ed.), *Graphic Imprints* (pp. 857–866). Springer.
- Bekerman, R. (2018). Tomorrow Challenge 2018 Archives. Ronen Bekerman - 3D Architectural Visualization & Rendering Blog. Retrieved July 20, 2021, from <https://www.ronenbekerman.com/challenges/tomorrow-challenge-2018/>
- Carbonell Segarra, M., & Díaz García, A. (2019). The Graphic Evolution of Architectural Competitions. In C. L. Marcos (Ed.), *Graphic Imprints* (pp. 506–520). Springer.
- Carpo, M. (2011). *The Alphabet and the Algorithm* (1 edition). The MIT Press.
- Cross, N. (2006). *Designerly ways of knowing*. Springer.
- Fekry, H. (2014). Architectural Visualisation Techniques by Hesh Fekry, BIM@UWE. <https://www.youtube.com/watch?v=iDcnhWUIChc&t=2231s>
- Geertz, C. (1973). Thick Description: Toward an Interpretive vii Theory of Culture. In *The Interpretation of Cultures: Selected Essays* (p. 478). Basic Books.
- Gomes, R., & Bae, J. (2009). KWW studio. <http://www.k-w-y.org/filter/architecture>
- Grozdanic, L. (2017). The Art of Rendering: 7 Trending Architectural Visualization Styles - Architizer. Retrieved July 20, 2021, from <https://architizer.com/blog/practice/tools/7-most-common-architectural-visualization-styles/>
- Lisyanskiy, N. (2016). 3D visualization Lancaster Road W11 and St. Marks Road W11 London. <https://vimeo.com/182442821>
- Lorenzo, A., & Fraga, F. (2015). El dibujante digital. Dibujo a mano alzada sobre tabletas digitales. *EGA. Revista de Expresión Gráfica Arquitectónica*, 20, 108.
- Maestre López-Salazar, R., & Juan Gutiérrez, P. J. (2018). Photomontage of Images with the Same Point of View. In E. Castaño Perea & E. Echeverría Valiente (Eds.), *Architectural Draughtsmanship* (pp. 27–36). Springer International Publishing.
- Palvelli, F. (2018). The secret of how to make great architectural visualizations! <https://www.youtube.com/watch?v=LUJRt4RmkxQ&t=317s>
- Rendell, J. (2004). Architectural research and disciplinarity. *Arq: Architectural Research Quarterly*, 8(02), 141–147.
- Reutersvärd, D., & Lindqvist, J. (2016). It's all about your image | Illusive Images. Retrieved July 20, 2021, from <http://illusiveimages.com/>
- Roberts, A. (2007). The Link between Research and Teaching in Architecture. *Journal for Education in the Built Environment*, 2(2), 3–20.
- Serriano, P. (2003). Form follows software. *ANNUAL CONFERENCE OF THE ASSOCIATION FOR COMPUTER AIDED DESIGN*, Indianapolis, 185–205.