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SCALE AND PATTERNS IN ARCHITECTURE

THE IMPORTANCE OF SCALE IN THE DEFINITION OF PATTERNS IN ARCHITECTURE

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Abstract: The importance of scale in the definition of patterns in architecture. The scale will define the pattern recognition capability. It is the basis for defining structuring elements, catalysts of perceptible patterns, which support the legibility of a territory, zone, or place, following scales of visual and perceptual appropriation.

The formation of patterns, or rather the recognition of formed patterns, invariably depends on the scale of approximation associated with the moment of recognition. This means that a pattern does not exist permanently on its own, regardless of scale. The definition of proximity of visualization and perception, which recognizes elements as coordinated with each other and identified by the perceptive action of the observer, is a non-negligible determinant for the formation of the definition of pattern before the observer.

Faced with different scales of approximation, the recomposition of patterns takes place, through the annulment of elements, or the sublimation of others, which are visibly conjugated in a certain scale that can be annulled by another scale considered. The choice of the appropriate scale to the perception of a certain agglutinating pattern of characteristics that seem relevant to characterize a certain architectural context, may be irrelevant in another scale of analysis that omits them and does not allow the connection of the previously identified elements. This presentation aims to provide contributions to the relevance of scale in the definition and appropriation of patterns in architecture, presenting examples and their consequences, to identify precautions to be taken, in defining the scale of observation.

Palavras-chave: Patterns; Scale; Grid; Perception; Detail.

Intention

This presentation aims to provide contributions to the relevance of scale in the definition and appropriation of patterns in architecture, presenting examples and their consequences, to identify precautions to be taken, in defining the scale of observation.

I've been trying to make some evolution, and some coordination between some participations that I've already structured, and this time I wanted to draw your attention to a theme, which like many other themes, we can consider that is just basic. But basic being can also mean being fundamental, and in this case we will look about patterns, in what I would like to draw your attention to a particular detail, which it is precisely the scale and its relationship with the observer.

The scale will define the pattern recognition capability.

The importance of scale in the definition of patterns in architecture. The scale will define the pattern recognition capability¹.

It is the basis for defining structuring elements, catalysts of perceptible patterns, which support the legibility of a territory, zone, or place, following scales of visual and perceptual appropriation.



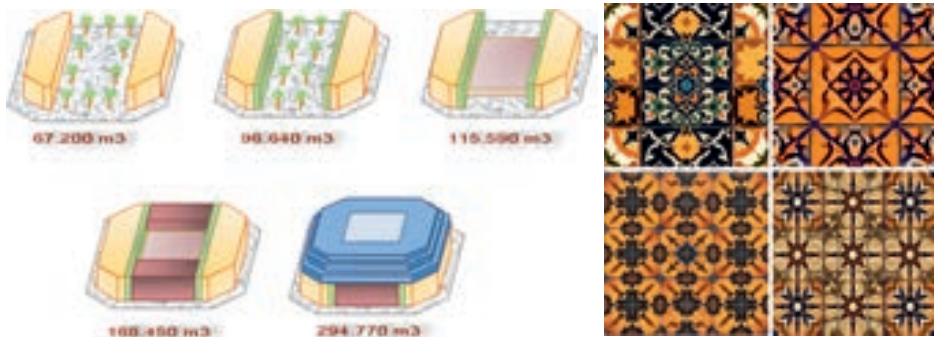
Picture 1 and 2 - Plan Cerdà - Barcelona

So, all of a sudden, I think it won't be necessary to go looking for the little caption down here, so that many of us can already recognize here Barcelona, that has a very characteristic urban plan, with these square blocks, with the cut corners, the Plano Cerdà, which we see there in small, purposely, and that we realize that we can easily perceive its characteristics, depending on the scale at which we observe it. (see picture 1 and 2)

¹ In scale problems, see Silva, Maria de Fátima. A Importância do conceito de Escala para a harmonia do Espaço Urbano, Universidade de Sevilha, 2010.

In the smaller image, we actually see how this plane interpenetrates the surroundings, we see, for example, a diagonal line that is a structuring path that does not appear in this image, which means that we do not have the same relationship with the sites depending on the dimensions.

Different scales, from city to house



Picture 3 - Repetition patterns based on square. **Picture 4** - Spanish tiles pattern.

We can even move from large scales, to a much smaller scale, to a similarity, this is not just a transposition of scale, but a similarity, (see picture 3) in which we realize that we can obtain patterns on different scales, which have reminiscences of each other.

When we simplify from the urban scale to a few small modules, and discover that the application itself in the wainscoting of tiles, which swarm all over the city, we can find a type of repetition that has no limitation. It can be extended almost to infinity in this way. (see picture4)

A world of signs surrounds us.

The formation of patterns, or rather the recognition of formed patterns, invariably depends on the scale of approximation associated with the moment of recognition. This means that a pattern does not exist permanently on its own, regardless of scale.

Find the pattern at the convenient scale is the challenge we always face.

Learning around us is permanent activity, the mental recomposition of the world around us, is a need for balance between Man and the built environment, to decode what we need to be mental part of all.

We always try to find the meaning in reality around us, try to decoder the visuality of things.



Picture 5 and 6 - Taj Mahal and surroundings – India.

Different perspectives, different point of view, give new ways to decode the surroundings, and make new patterns appear. (see pictures 5 and 6)

There is a whole world of meanings around us. Finding the most convenient scale to analyze each pattern is a needed requirement. These images are not very common because they are a little less touristy, the promotion of India, the Taj-Mahal, one of the great monuments, focuses a lot on the most wonderful part that it really is, but the complete reality is a little more diverse.

If we come to a distant point of view here, we leave the small, more organized and pre-programmed area that the tourist area is, to find out a part of a certain urbanism that we usually could call disordered.

Let us also note that what we sometimes call disordered, we call chaos, and it is just another degree of order, less visible, and what we call these chaotic appellations, which are usually pejorative. Normally, we value a programmed order that is easy to understand, and we devalue the other, more occasional situation, which, by the way, also has a richness of functioning, but which seems less obvious to us.

Normalization and rupture

The underlying mathematical visual communication is fundamental to the success of the collective appropriation of meaning, and consequent value.

The formation of patterns, predicted, resulting or unforeseen or occasional, is the way in which visual information can be described and understood, in order to form a relevant part of our visual appropriation of the built surrounding space.

That means what? That there can be a normalization, or a rupture. In normalization what do we have? A similarity of actions, a similarity of actions that are individual, but that generate a collective organized in a certain way.

Notice that I'm using examples that are extremely diverse, in their geography, and even in their time of implementation, but I'm talking about a search for base invariants, which can be found over time, and over from various regions.

This translates into cultural and identity consequences, whether through the normalization of the collective or the sublimation of individualisms:

- Normalization of the collective

In next example, here in another large European city, here in Prague, (see picture 7) we see a formulation of an façade of a entire street, that we can say in a loose manner that's neoclassical, with an architecture very ruled by classical rules, in which the buildings have diversity, but at the same time they have similarity, more specifically in the openings as in the overall and partial dimensions.



Picture 7 - Rašínovo nábř. Street in Nové Město, Czechia

- Sublimation of individualisms

More recently, an intervention in a corner building, at one end, by Frank Gehry, will generate a rupture with that design, this building was called a dancing house, because it seems that the shapes at the end are dancing, but in Frank's own explanation about what were the motivations that led him to design this, he said that he thought of its facade as a fabric that unravels.



Picture 8 - "Dancing house" by Frank Gehry - Praha

So this form here, (see picture 8) could be like an unfolding of the facade, which could be continued out there, this would be one of the designs of this. So he makes an interpretation of what classical drawing is, and tries to draw attention to his own way.

If we look at things at a certain distance, we see something, but if we look at things at another distance we see something else. This is not just a recent issue, scale has been always important in the intervention of the territory, and even in the city.

Scale

The importance of scale in the definition of patterns in architecture. The scale will define the pattern recognition capability. It is the basis for defining structuring elements, catalysts of perceptible patterns, which support the legibility of a territory, zone, or place, following scales of visual and perceptual appropriation.

Here we have a plan that did not materialize, the Voisin plan, from Corbusier to France and we see a mockup and a simulation drawing.

Different viewpoints give us different images, we understand how repetition works, we understand how models work. Note the interesting thing about being a model, and not just a drawing, because the model gives a three-dimensionality, gives an aerial view, which will allow you to understand the whole, and understand something that is not possible in a close relationship. (see picture 9)



Picture 9 - Le Corbusier – Plan Voisin

The definition of proximity of visualization and perception, which recognizes elements as coordinated with each other and identified by the perceptive action of the observer, is a non-negligible determinant for the formation of the definition of pattern before the observer.

Faced with different scales of approximation, the recomposition of patterns takes place, through the annulment of elements, or the sublimation of others, which are visibly conjugated in a certain scale that can be annulled by another scale considered.

We also realize that we are talking about times of an increase in transport, aviation, seeing from above the cities where you arrive, and the search for emblematic elements, note that even in Paris, the Eiffel Tower was an element of rupture, it was thought that it would be dismantled after fulfilling its function, but after all, the growing symbolic function and its emblematic and positive utility, along with its technical utility as an antenna, was decisive for its persistence until today.

It was thought that it was going to be dismantled, after being used in the great universal exposition of Paris, and it was not, it became a landmark of the territory, for its singularity, for being a non-repeatable element.

Here we have another version, in the voisin plane, (see picture 10) we have a repeatable element, but very characteristic, but we will come back later. This is a scale beyond the human, a scale that requires, to be perceived, the flight by plane, there is a great distance of the body in relation to housing.



Picture 10 - Le Corbusier – Plan Voisin

The over-human scale of territory

The observer's vision does not cease to seek and find typological organizations of multiples and sub-multiples, and this is the essence of mathematics with which we are thus able to transpose the mental to the visual, with the help of this way of referencing.

“Seeing ideas” is to resort to a graphic reference pattern, which through geometry and mathematics shows us what is thought and is supported by the signs present.

The Chess game

There is something in these actions very close to what a game of chess is. It is a game in which it is only fully organized and balanced at the first moment, but there is a whole game of tensions, and pre-defined forces in motion, which will generate conjugations, I won't say infinite, but almost.

Duplay, M.; Duplay, C. (1982)²:

L'échiquier est un suport tramé.

Chaque unité de division géométrique de l'espace est «qualifiée», de sorte qu'elle ne peut recevoir que certains des éléments. Chaque pièce est belle en soi (sans que sa participation à une composition avec d'autres éléments soit nécessaire). Chaque pièce est autostable (n'a pas besoin d'une autre pièce comme béquille). Le tableau des pièces sur un échiquier est susceptible de deux niveaux de lecture: Un niveau de lecture formel immédiat (comme une ville vue d'avion); Un niveau de lecture qui suppose la compréhension des règles du jeu et l'idée que le temps modifiera l'image.

Mais on ne comprend pas les règles du jeu pour la simple observation de l'échiquier à un moment donné: la lisibilité n'est pas plus immédiate que celle d'une page de langue inconnue, des caractères au graphisme séduisant.

La analogie d'un fragment de tissu Urbain avec un jeu d'échecs est formelle et ne devrait surtout pas conduire à une image simpliste de la division géométrique de l'espace, des éléments de la composition ou des règles du jeu. L'intérêt réside dans l'analogie de la dynamique qui préside aux règles de composition: l'image résulte de l'application à un état antérieur, par des agents éventuellement multiples, d'une règle du jeu portant sur chaque élément (et non sur un ensemble).

La composition ne doit donc pas consister à organiser des masses, mais à donner à une combinaison d'éléments d'échelle inférieure une signification à l'échelle supérieure, c'est-à-dire une lisibilité en tant qu'élément de l'échelle supérieure.

En revanche, il y a structuration additive sur un maillage qui donne cohérence à l'ensemble.

Urbanism and the world is a place we arrived at with our birth, with our moment of life, in which the chess game is always halfway through. Therefore,

² Duplay, M.; Duplay, C. - Méthode illustrée de création architecturale (pág.80). Paris - França. Éditions du Moniteur. ISBN 2-281-15062-3. (1982)

finding out what the pattern is, what the grid is, what the network that unites all events is, is in fact a permanent challenge, in order to be able to understand and understand the reasons for the diversity that will surround us.

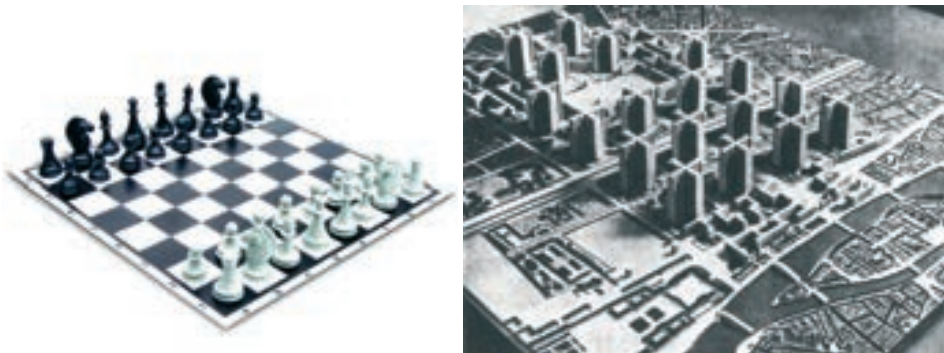
It is not for nothing that I make this similitude of images, because our whole brain works by these associations and conjugations, and it is when we understand things that we perceive their logic. (see pictures 11 and 12) If the game board is a limited board, and we realize that the placement of those pieces of urbanism is also a limited game, they are contained in another space and generate an alternative form in the face of the surroundings. All this plays with the aim of interpreting and understanding, all of this is always done in relation to the human scale.



Picture 11 and 12 – Le Échequier, The Chess game.

Why is pattern recognition so need? Because you always get the reality game going... The begin is lost, but the game is around us, and humanity feels the need to process information and give a sense about surrounds. For safe material reasons, but also in deep need to connection, cultural, artistic, to feel the balance with world.

The choice of the appropriate scale to the perception of a certain agglutinating pattern of characteristics that seem relevant to characterize a certain architectural context, may be irrelevant in another scale of analysis that omits them and does not allow the connection of the previously identified elements. (see pictures 13 and 14)



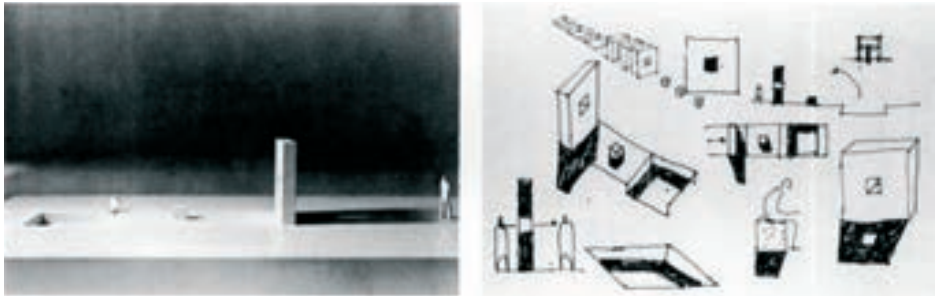
Picture 13 and 14 –The Chess game, and Plan Voisin

Interpret to understand

Qualitative requirement ever present with human scale

Charles Jencks (1979)³

'ce qui est évidemment impossible, c'est de ne pas classifier, nous considérons les choses à travers des catégories et non pas avec des yeux innocents. Et ces catégories du voir sont d'abord historiques et, en même temps, personnelles'



“Dino”. Monumento para el parque de Gavá. dentro de un proyecto de A. Armesto y C. Marti.

Picture 15 - Antonio Rosseló – artist

This example here of a visual artist Antonio Rosseló, (see picture 15) in which I can explain this image, because he is curious, imagine a homogeneous territory, in which nothing happened and nothing existed, but there is a soil material with which to work and build, and what is done here, was to open a square on the floor, remove the material that was there, and place it vertically.

This vertical wall is placed, which has exactly the same size and the same mass that came out of the ground, and then a small square hole is opened, and the piece that is removed is placed here on the ground.

The dimensions that this has will generate what? The escape from this homogeneity will create a singularity in the territory, with which the user will face and relate. And the individual will feel excited somehow. I'm exaggerating, but the truth is, find out what new use you can give it, it will be a flower bed, or a swimming pool, a place where you can put your legs down and sit.

And this cube, it can be great to sit on, if the size allows it. This wall immediately creates a side there and a side here, it creates a qualification of the space. A hole appears, which can be a window, a catalyst for the look, it can be a place to peek.

Children have an innate sense of curiosity and discovery, an interaction of mind with gaze and movement that enriches the experience of what it is like to live in a place. If it has more sensory richness, it will be more striking. Children react well to this type of space, because they have a natural curiosity, and an immediate action to appropriate the space.

³ Jencks, C. – Architecture bizarre (pág.9). Paris – França. Academy Editions. (1979)

Therefore, if we have this reality on a scale appropriate to the use of human beings, we find in this a fundamental primary aspect, which gives us indications that the same phenomenon occurs in more complicated situations, because they are more complex.

The small-human scale of things

Another example, the importance of the scale of things related to a human size. Here again in Barcelona, but now not at the level of *cerdà*, at the scale of a neighborhood, but at the scale of a singular building, the Barcelona pavilion designed by Mies Van Der Rohe, which was later demolished, and then rebuilt again, because it seemed to be essential for criticism, for the history of architecture, and as such, it needed an interpretation.



Picture 16 and 17 - Mies Van Der Rohe – Barcelona pavilion

The observer's vision does not cease to seek and find typological organizations of multiples and sub-multiples, now in this example how a similar cross form is integrated in support columns, at human hand scale, the touch of cold chrome metal (see pictures 16 and 17)

"Seeing ideas" is to connect to a graphic reference pattern, here the repetition of straight lines in columns against the visual "chaos" of the homogeneous green grain of marble from walls, background of contrast.

There is a scale of proximity, in which the hand can reach, see and observe, and it is interesting to note that this cross here in the pillar section finds a visual allegory in the same form as the buildings in Corbusier's *voisin* plan. There is no direct relationship, but the shape can be very similar, and these games of differentiation can exist between the different objects.

The small detail

We can even get closer, so that things appear that we hadn't seen before, for the stereotomy of the stone cuts to appear, for the screw that fixes the piece to appear, for small details of the soil texture to appear, almost micro realities, in space, notice, we have already seen a general image of the city, and we are now in the minimum dimension, almost the palm of our hand. (see picture 18)



Picture 18 - Mies Van Der Rohe – Barcelona pavilion

Faced with different scales of approximation, the recomposition of patterns takes place, through the annulment of elements, or the sublimation of others, which are visibly conjugated in a certain scale that can be annulled by another scale considered.

The small scale of things

If I look at the pieces that make up that column, that very specific pillar, I can still discover other things, for example, in this cut of the image I don't have the assumed vertical here, I have only one section, and when I have the section I have another reality, and I have a cross that reminds us again of the voisin plane. (see picture 19)



Picture 19 - Mies Van Der Rohe – Barcelona pavilion



Picture 20 - Mies Van Der Rohe – Barcelona pavilion

It is important to notice that there is a whole game of forms that are transformed, between one and the other, and there is fundamental the relationship with the hand, with the person, with the intervening person, who is an observer, but also an integral part of the immersive process of context. (See picture 20)

It is the relationship with gesture, with understanding, with walking, in fact, professor Nikos Salingaros also mentioned the issue of proximity to the hand, with reaching, touching and grasping, and this small pillar has precisely the same characteristic of seductive possibility tactile.

The choice of the appropriate scale to the perception of a certain agglutinating pattern of characteristics that seem relevant to characterize a certain architectural context, may be irrelevant in another scale of analysis that omits them and does not allow the connection of the previously identified elements.

Overall, what does this mean? That if we discover the patterns of the world around us, when we create something we can intentionally create that pattern as well.

Final reminds

This is not a complete history, just a simplification we are introducing in this subject to highlight that we can not use technology and construction by itself, but always with knowledge of the meaning in a larger grid of Visual perception that will support a symbolic content and perceptual feeling.

This is a call for attention, it is not a specific work on a single point in itself, but this is a call for attention, that it is important to define patterns, that we take from reality, and then invert the process, when we become creative people, doers or builders, because those patterns are going to be there, whether we like it or not.

Because those patterns are going to be there. If we don't create them, we're going to have a chaotic pattern, we're going to have chaos, we're going to have that sort of difficulty, if we imitate what's there, if we make a singularity, how are we going to act. We always have to position ourselves to achieve a maximum value of expressiveness, of quality.

Tecnology only lasts if supported by meaning, cultural acceptance.

This is about texture/layers of tridimensional reality and patterns, but patterns in different scales, so that is need of our point of view we can provide and find has an observers of the reality that is around us.

This is a world that is ruled by ideas by contents, and those contents will reveal itself in certain way in patterns and grids that provide comprehension and significance.

The discovery of meanings is what reconciles us to the world around us. If we understand it better, we get a better positioning, better design, and maybe we can fill some gaps or not, and there is a desire for balance, between man and the world, the desire to always look for a utopia and try to find it.

That's the challenge, that's my call for attention, for each one, in their action, in their more informed practice, in their personal discovery, who can look for it, and complete their journey.

What we can find around us, is the constructed reality. Because every time that we construct something, we are constructing a paralel world that is made inside this one.

This is a world that is ruled by ideas by contents, and those contents will reveal itself in certain way in patterns and grids that provide comprehension and significance.

This form the net that brings all togheter, thats the diference from chaos, from no order, to became a construted world support of powerful meaning.

This meaning will reveal by itself at diferent scales that you can aproach, and willll bring different perception of the same subject, but in different ways, and will bring a more complete sense of balance between the man and the world, a desire always like an utopia to ask for...

Always looking for a better practice, for a better world, desiring sustentable future.

References

- Ali, H., Seifert, C., Jindal, N., Paletta, L., Paar, G.: Window detection in facades. In: 14th International Conference on Image Analysis and Processing (ICIAP 2007). Springer, Heidelberg (2007)
- Corbusier, L. - The Modulor: A Harmonious Measure to the Human Scale, Universally Applicable to Architecture and Mechanics. Basel & Boston: Birkhäuser. ISBN 3764361883. (2004)
- Cornelis, N., Leibe, B., Cornelis, K., Gool, L.V.: 3d urban scene modeling integrating recognition and reconstruction. International Journal of Computer Vision 78, 121-141 (2008)

- Duplay, M.; Duplay, C. – *Méthode illustrée de création architecturale* (pág.80). Paris – França. Éditions du Moniteur. ISBN 2-281-15062-3. (1982)
- Fathy, H. – *Arquitectura para os pobres*. Lisboa. Argumentum – Dinalivro. ISBN 978-972-576-550-0. Novembro 2009.
- Goel, A., Juneja, M., Jawahar, C.V.: Are buildings only instances?: exploration in architectural style categories.
- Gombrich, E. – *Classification and its Discontents* (pág.81-83), in *Norm and Form*. Londres. Phaidon Press. (1960)
- Gómez, Pedro. (1983). La filosofía oculta en la antropología estructuralista. *Gazeta de antropología*, ISSN 0214-7564, N.º. 2, 1983. 10.30827/Digibug.6751.
- Jencks, C. – *Architecture bizarre* (pág.9). Paris – França. Academy Editions. (1979)
- Martins, J.; Silva, J.; Sousa, A. – Reconhecimento de Fachadas de Edifícios em Imagens de Ambientes Urbanos, disponível em https://www.it.ubi.pt/17epcg/Actas/artigos/17epcg_submission_18.pdf
- Mathias, M., Martinovic, A., Weissenberg, J., Haegler, S., Gool, L.V.: Automatic architectural style recognition. In: *Proceedings of the 4th International Workshop on 3D Virtual Reconstruction and Visualization of Complex Architectures*. International Society for Photogrammetry and Remote Sensing, Trento, Italy, pp. 280–289 (2011)
- Michèle GALLY, « Permanences échiquéennes ou le sens d’une métaphore trans-séculaire », *ibid.*, p. 58.
- Mojtaba Parsaee, Mohammad Parva & Bagher Karimi - Space and place concepts analysis based on semiology approach in residential architecture, *HBRC Journal*, 11:3, 368-383, DOI: 10.1016/j.hbrj.2014.07.001. Ano de 2015.
- Moore, C.; Bloomer, K. – *Body, Memory and Architecture*. Yale University Press. 1977.
- Sarah TROCHE, « Marcel Duchamp et les échecs. Tous les joueurs d’échecs sont des artistes », *ibid.*, p. 85
- Silva, Maria de Fátima. *A Importância do conceito de Escala para a harmonia do Espaço Urbano*, Universidade de Sevilha, 2010.
- Shalunts, G., Haxhimusa, Y., Sablatnig, R. - Classification of gothic and baroque architectural elements. In: *Proceedings of the 19th IWSSIP*. LNCS, Vienna, Austria, pp. 330–333. IEEE (2012)
- Shalunts, G., Haxhimusa, Y., Sablatnig, R. - Architectural style classification of domes. In: *Bebis, G., et al. (eds.) ISVC 2012, Part II*. LNCS, vol. 7432, pp. 420–429. Springer, Heidelberg (2012)
- Trespeuch, Hélène, « Le motif de l’échiquier dans l’œuvre de Kandinsky : quelle abstraction ? », *ibid.*, p. 106.
- Xu, Z., Tao, D., Zhang, Y., Wu, J., Tsoi, A.C.: Architectural style classification using multinomial latent logistic regression. In: *Fleet, D., Pajdla, T., Schiele, B., Tuytelaars, T. (eds.) ECCV 2014, Part I*. LNCS, vol. 8689, pp. 600–615. Springer, Heidelberg (2014)
- Zevi, B. – *Saber ver a arquitetura* (págs 37-42). São Paulo – Brasil. Martins Fontes – Dinalivro. Outubro 1978.

- Zhang, W., Kosecka, J.: Hierarchical building recognition. *Image and Vision Computing* 25(5), 704–716 (2004)
- Zhang, L., Song, M., Liu, X., Sun, L., Chen, C., Bu, J.: Recognizing architecture styles by hierarchical sparse coding of blocklets. *Inf. Sci.* **254**, 141–154 (2014)
- Zheng, Y.T., Zhao, M., Song, Y., Adam, H., Buddemeier, U., Bissacco, A., Brucher, F., Chua, T.S., Neven, H.: - Tour the world: building a web-scale landmark recognition engine. In: *Proceedings of the 20th International Conference on Computer Vision and Pattern Recognition (CVPR)*, Miami, Florida, USA, pp. 1085–1092. IEEE (2009)
- Zhang, W., Kosecka, J.: Hierarchical building recognition. *Image Vis. Comput.* **25**(5), 704–716 (2004)
- <https://upcommons.upc.edu/bitstream/handle/2099/5072/Article07.pdf> access in 2022

Media

- Picture 1 and 2: Cerdà's Revised Plan in 1859 and aerial view in Chamfers, Wide Avenues, and Green Space in Barcelona.
- Picture 3: Barcelona General Plan - Cerda. (2007, November 5). Retrieved March 14, 2015, from <https://www.youtube.com/watch?v=zX6sZeJEmv4>.
- Picture 4: Blue ornaments on the tiles, watercolor, spain, italy, Majolica, floral ornament Stock Ilustração ID: 605536151, in Shutterstock, Inc.
- Picture 5: retrieved in 2022 from <https://preview.redd.it/80tka59v4k241.jpg?width=1080&crop=smart&auto=webp&s=750274d38ad7f82d415aabbd44094c32b38ba23d>.
- Picture 6: Polluted with garbage, the Yamuna River with Taj Mahal in the background, full color retrieved from Polluted With Garbage The Yamuna River With Taj Mahal In The Background Full Color - Fotografias de stock e mais imagens de Índia - iStock (istockphoto.com).
- Picture 7: From google maps street view, retrieved in 2022.
- Picture 8: From google maps street view, retrieved in 2022.
- Picture 9. The Plan Voisin for Paris redevelopment proposed by Le Corbusier... | Download Scientific Diagram (researchgate.net).
- Picture 10: Le Corbusier. Plan Voisin for the rebuilding of Paris. Model. 1925. Courtesy of the Museum of Modern Art, New York.
- Picture 11: https://image.invaluable.com/housePhotos/pcv/14/705914/H2854-L261279156_original.jpg.
- Picture 12: <https://i0.wp.com/correiodoribatejo.pt/wp-content/uploads/2019/12/Xadrez-jogo.jpg?fit=1000%2C625&ssl=1>.
- Picture 13: <https://a-static.mlcdn.com.br/800x560/jogo-de-xadrez-escolar-com-tabuleiro-lugo-xdl025-lugo-brinquedos/fabricaalegriabrinquedos/17401/7d3bb120e59c7fa5b0406d847a40287f.jpeg>
- Picture 14: <https://www.researchgate.net/profile/Ruan-Amaral-Oliveira/publication/352197403/figure/fig5/AS:1032138837209096@1623092483926/Figura-11-Ville-Contemporaine-modelo-proposto-por-Corbusier-em-1922.png>

Picture 15: <https://www.urbidermis.com/biographies/antoni-rosello/>

Picture 16: https://blogger.googleusercontent.com/img/b/R29vZ2xl/AVvXsEj8mqieOftgXhF3RA4q4sEeKpKC9crxANehPltMGv7QxzIIEEVEA-he0yDxGVAsCeyqTuMl4OUrp7UOMnB_X4KaS-znbt_w97Qhyphenhyphen4Q7BYMgkh-VkbGtrQdfxgFpEZ_ojUTlaPJF2HGQ04NM/s1600/BP_FinalLayout.jpg

Picture 17: Barcelona, Deutscher Weltausstellungspavillon 1929 (Rekonstruktion), Detail 2, Architekt: Mies van der Rohe, year 2000, photo by Hans Peter Schaefer

Picture 18: https://images.adsttc.com/media/images/5386/00cf/c07a/800b/6500/004b/slideshow/Pabell%C3%B3n_de_Barcelona_Flickr_Faasdant.jpg?1401290955

Picture 19: image-800-5d37f0a5eb1efae884823257a064b15b.jpeg (800×533) (upc.edu)

Picture 20: image-800-5d37f0a5eb1efae884823257a064b15b.jpeg (800×533) (upc.edu)