

SUBMISSION OF PROPOSAL

12th international, interdisciplinary conference “Nexus 2018: Relationships Between Architecture and Mathematics”
11-14 June 2018, Pisa, Italy.

Name: João Paulo Cabeleira Marques Coelho

Profession: Assistant Professor

Affiliation: Lab2PT; School of Architecture, University of Minho

Physical Mailing address: Escola de Arquitectura (EA) - Campus de Azurém, 4800 - 058 Guimarães

Mailing address: joaocoelho@arquitectura.uminho.pt

Title of proposed paper: *Deconstructing a quadratura's imaginary space.*

Category of research: Representation of architecture: perspective; modelling

Keywords: baroque; perspective; quadratura; geometric analysis; proportional analysis

Deconstructing a *quadratura*'s imaginary space.

Introduction

Focusing the architectural qualities inherent to Quadratura painting, this essay embraces the acknowledgment of its perspectival strategies, ambioned space/form and achieved synthesis between represented and built space. To accomplish such an inquiry, was taken under consideration the imaginary architectures outlined by Luís Gonçalves Sena (1754), at the Church of Santarém's Jesuit College.

Verifying the structural, compositional, ornamental, and spatial qualities, underneath the outlined image, two methods to its deconstruction are explored: the perspective restitution, dismantling the quadratura through a reverse application of perspective procedures and removing parameters strictly related to the *Ars Pingendi*; and the rehabilitation of the architectural idea, exploring compositional logics of the illusory space confronting it with the wider practice of the *Scientia Aedificandi*. Methodologies that allows to fully analyze the Quadratura's architectural contents as well as the relation among image and tectonic of the resulting global baroque space.

The Research

To accomplish the presented objectives the research departed from an exhaustive recognition of Sena's quadratura, including theoretical and practical procedures in its delineation and projection (Cabeleira and Xavier 2016), along with the survey of the supporting space, followed by the deconstruction of the architectural image (Valenti 2016). A sequence that allows to assesses the image contents as well as the author's ability in maneuvering projective and compositional rules fostering the visual effect of an induced space.

The rehabilitation of the architectural idea is set from the detected synchronisms amongst the work of the Portuguese painter and the engravings of coeval treatises, namely the *Perspectivae pictorum et architectorum* of Andrea Pozzo (1693, 1700) and the *Studio d'Architettura Civile* by Domenico de Rossi (1702, 1711, 1721), along with the forms applied throughout the Portuguese baroque experience. A process that required the recognition of sources, and the speculation over the conceptual and graphic process of the quadratura, exploring the author's response to the desired illusion renewing the appearance of the built

space. A methodology that aims the (re)design of a possible architectural project of Sena's illusory space.

Thus, and aiming for the orthogonal projections of the proposed space/form materialized by the Quadratura, the geometric matrix is identified (Pozzo 1693, 89th figure) as well as the employed architectural elements and composition model (Pozzo 1693, 99th figure), Figure 1/2. In this sense, the presented organism stems from an assemblage process gathering images, taken from coeval treatises following a combinatorial procedure, in line with baroque compositive strategies, properly adjusted to the specific spatial circumstances.

A process of assembling, combining and compressing images strongly bonded to Pozzo's perspective examples (such as the 33rd, 79th, 85th and 86th figures taken from his 1st volume), along with other referents such as the counter curved pediment, from Rossi's treatise (1721, tav15) and Bellini's altar piece (1740), on the same church, or the wavy brackets, resembling the ones built by João Antunes (1711) and painted by João Nunes de Abreu (1731) both at the church of Menino-Deus, Lisbon. As such, the influence of Pozzo's treatise surpasses the acknowledgement of technical procedures to become the aesthetic model, materializing an architectural image coincident with the one implemented by the Italian Jesuit at the Collegio Romano's church (The glorification of Saint Ignatius, 1691-94) disclosed through his treatise. But, if Sena demonstrates the ability in absorb and adapt the Pozzo's model to the spatial circumstances in which he operates, incongruences between represented and built space are detected (obedience of alignments, proportion and measure). These are a fatal consequence of the followed compositive process as well as result of the orientation of the architectural image under conditions of a credible appearance. Under this assumption the author neglects an absolute regulation of the architectural form (surpassing the fixation of an architectural project in order to control the outlined space) and projective resolution (neglecting a rigorous depth determination consequent to the combination of engravings bonded to different spatial settings).

According to such consideration the *venustas* of the represented organism depends more from its appearance than from an absolute control of the underlying architectural scheme, also freed at the respond to the Vitruvians' *firmitas* and *utilitas*.

Alternatively, the perspectival restitution of Sena's quadratura, Figure 3, is based upon projective presuppositions following, in the reverse order, Pozzo's operative sequence certainly known by Sena (Mello 2001; Raggi 2004; Cabeleira 2015): recognition of the projective space (survey of the built space and adoption of a viewpoint in its interior);

architectural composition (outline of the proposed space assuring compositive logics); perspective outline (defining convergence and rigorously determining the depth of represented elements); perspective sketch (volume to the proposed composition); expressive reinforcement and light (determination of shadows and material characterization of the represented facts); image projection (transposition of the outlined perspective into the built surface and pictorial characterization).

Nevertheless, in a small province town, Sena operates from the reverberation of images and treatises abbreviating the sequence by dispensing preparatory stages correspondent to the specific action of architecture either in its instrumental scope (graphical resolution of shape and space in the design of the plan, section and elevations), theoretical (pursuing coherence amongst compositional features and its proportions) or tectonic (at the urge of congruence and constructive reason).

Although chasing an idea of architectural space, he put aside the rigorous formulation of the architectural project and of a projective space ensuring the spatial effect through unification to a single convergence point and establishing connections with the built space.

Thus, starting from the quadratura's survey, eliminating chromatic and luminous constituents of the painting, the achieved linear outline of the represented organism was projected in the surrounding vertical plans, later rotated, in order to obtain the elevations that will support the evaluation of composition, proportion, measure and spatial relations. In parallel the horizontal sections are outlined evidencing successive perimeters and the vertical development of the illusory space.

The same plans and elevations, expressing the architectural dimension of the analysed quadratura, allow gauging its compositional and proportional qualities resorting with the canons diffused through architectural treatises, Figure 4. Going beyond the image evaluation, the relation amongst built and represented space is verified. But here, deviations from the canons are revealed evidencing Sena's *modus operandi* (image assemblage), as well as the malleability of the architectural and projective truth in order to reach the recognition and visual verisimilitude of the represented facts. Perceptual features manoeuvre the overall composition, empowering an apparent spatial truth set upon the perspective potential.

However, what kind of space is perceived from the visual synthesis amongst constructed and represented?

Overlapping the outlined projections, both from the illusory and built space, it is possible to assess the perceived global space, Figure 5. And, although conflicts incompatible with the

logic of a *Scientia Aedificandi* are revealed, such does not prevent the desired visual synthesis transforming space.

If the quadratura responds to the objectives of an *Architectura ficta* (space revelation and perceptive persuasion), the detected incongruities reveal that the whole operation is based upon the image domain, *Ars Pingendi*, at the expense of a tectonic thought, *Scientia Aedificandi*. From the edifying art, the image absorbs motives in correspondence with the experience of the inhabited space, in terms of the plasticity of form and measure to foster the rupture of the built surface, but not necessarily logics its physical construction.

Giving a glimpse of the perceived global space, resulting from the overlapping of the sections of the represented and the built, a ratio of 1 to 1 was detected (a proportion identical to the one applied by Pozzo at the nave of Saint Ignatius) duplicating, perceptually, the chapel's height.

However, let us recall that the last version of the plans and elevations of the illusory space considered the correction of elements oversize (distorted by Sena in the pursuit of standards of recognition and likelihood), according to coeval principals of architectural composition and proportion. In this follow up, is reinforced the assumption of an ideal form and space managed under the perception of a global and truthful architectural structure.

Conclusion

The investigation as passed through the evaluation of conceptual (ideological and artistic) or scientific (projective resolution and image projection) valences in order to focus on those of an architectural nature (absorption and implementation of imaginery models) seeking the interference of the represented architectures over the built space.

The quality of the spatial effect of Sena's quadratura is evident, but this does not come from a strict obedience to the projective rules or compositional strategies of architecture, but from the ability in maneuvering them to establish a credible sensory space capable of perceptually founding continuities with the built support.

Through its potential, in interfering over the built environment, Quadratura is here understood as an architectural matter. Even so, Sena is essentially a painter controlling the image of architecture but not its substance.

References

- Cabeleira, J. 2015. *Arquitecturas Imaginárias. Espaço real e ilusório no Barroco português*. Ph.D. thesis University of Minho.
- Cabeleira, J. and J. P. Xavier. 2016. Projecting Quadratura image. Euclidean propositions and common practices at painter's workshop. *Nexus Network Journal, Architecture and Mathematics* 18 (2): 651-668.
- Camerota, F. 2006. *La prospettiva del rinascimento*. Arte, architettura, scienza. Milão: Electa.
- Mello, M. M. 2001. *Os tectos pintados em Santarém durante a fase barroca*. Santarém: Câmara Municipal.
- Pozzo, A. 1693. *Perspectiva pictorum, et architectorum. Prospettiva de pittori, e architetti*. Roma: Giacomo Komarek Boemo.
- Raggi, G. 2004. *Arquitecturas do engano: a longa construção da ilusão*. Ph.D. thesis University of Lisbon.
- Rossi, D. 1702. *Studio d'architettura civile, Studio d'architettura civile sopra gli ornamenti di porte e finestre tratti da alcune fabbriche insigni di Roma*. Rome: Domenico de Rossi,
- Valenti, G. M. (eds.). 2014. *Prospettive architettoniche conservazione digitale, divulgazione e studio*. Rome: Sapienza Università Editrice.

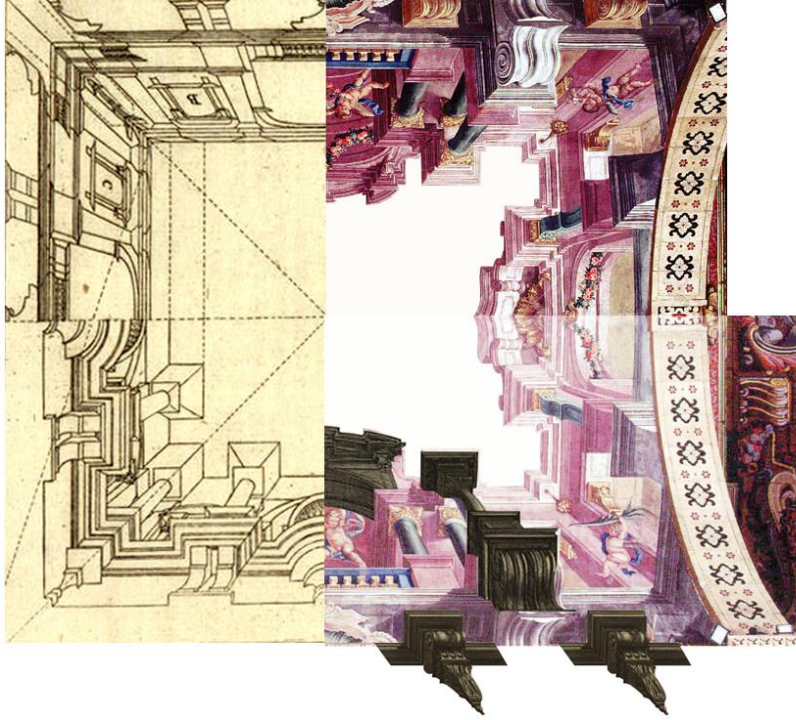


Figure 1. Confrontation between Pozzo's 89th figure (1693) and Sena's *Quadratura* (1754) evidencing the adopted compositive matrix.

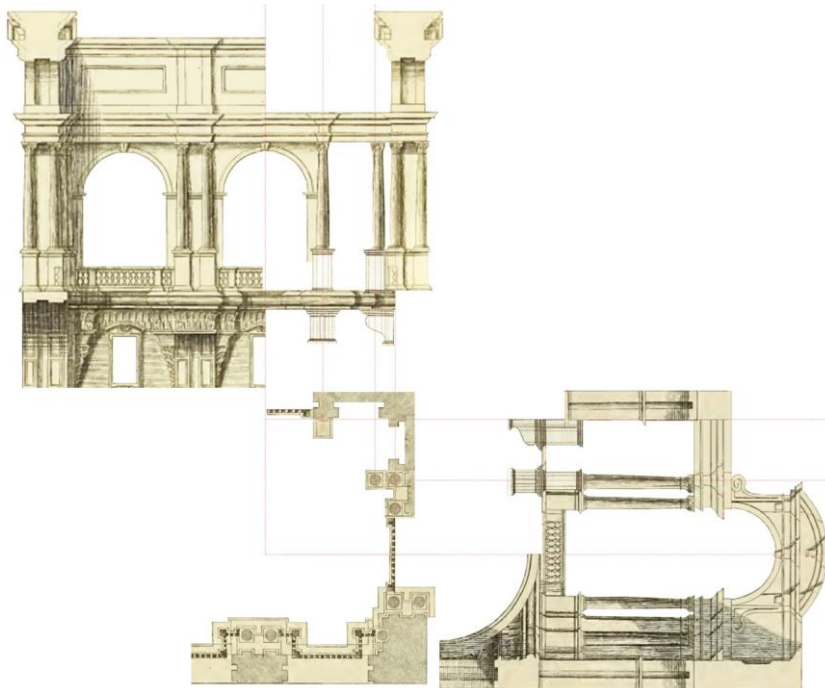


Figure 2. Rehabilitation of the architectural idea: elevation and plan reconstruction of Sena's illusory space combining architectural elements from Pozzo's 96th and 86th figures (1693)

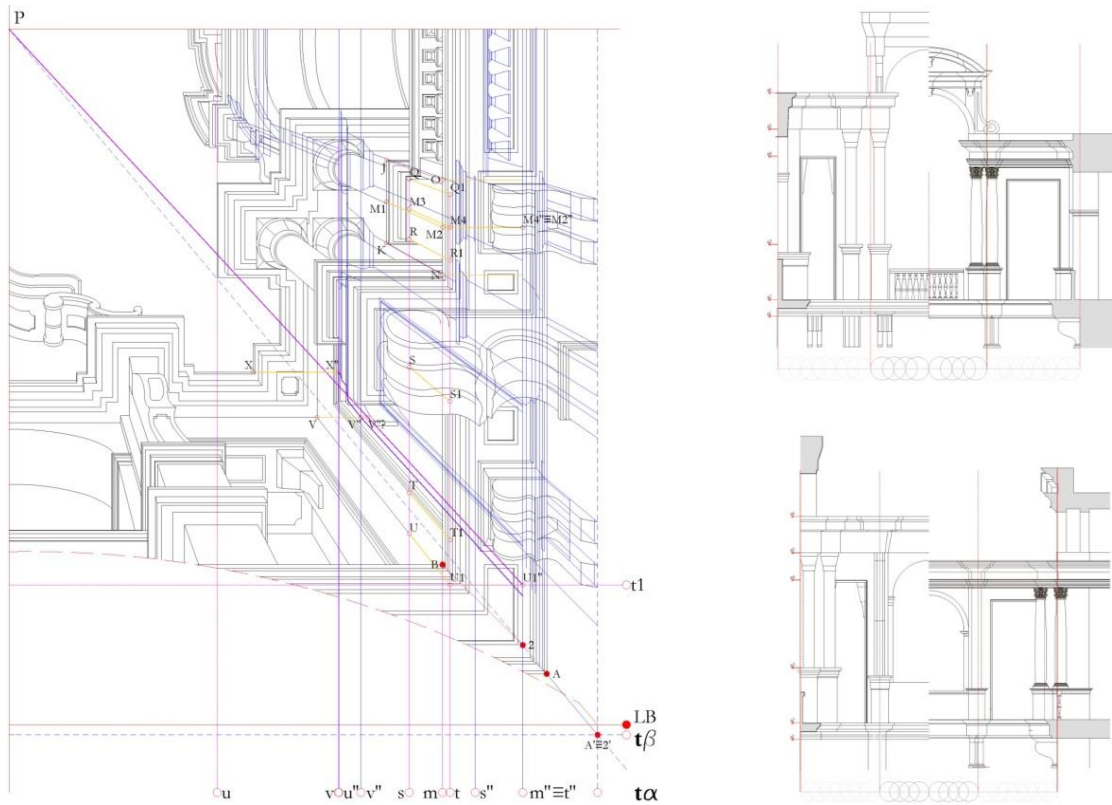


Figure 3. Perspective restitution: delineation of hypothesis in order to obtain the lateral elevation. **Figure 4.** Confrontation between the elevations obtained through perspective restitution, on the left, and rehabilitation of the architectural idea, on the right.

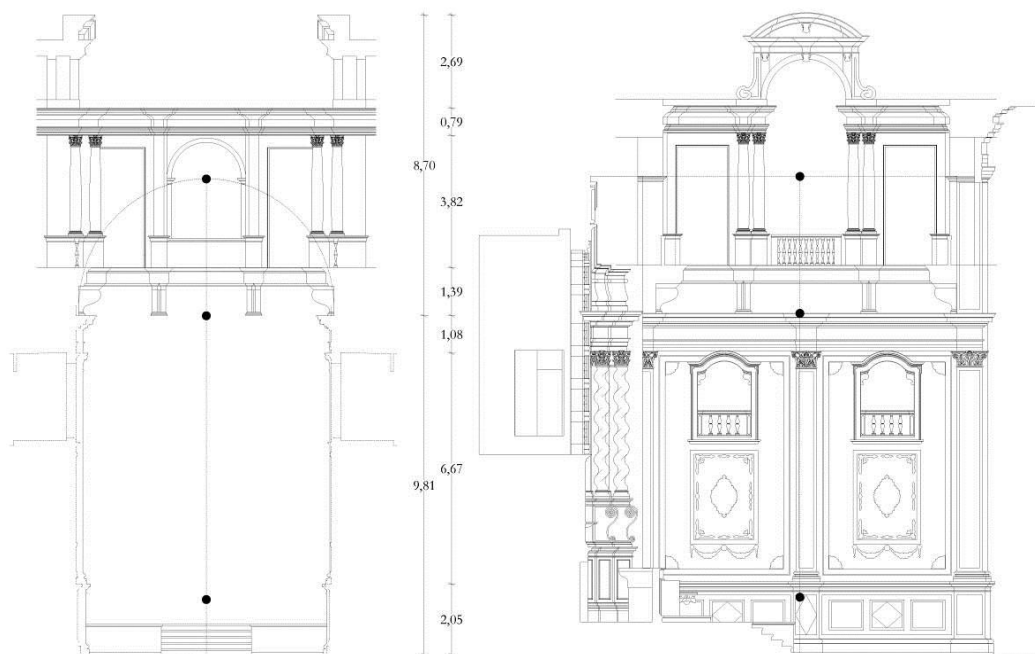


Figure 5. Overlapping of the cross-sectional and longitudinal sections allowing evaluating the perceived spatial synthesis.

Curriculum Vitae

João Cabeleira is an Architect and Assistant Professor at the School of Architecture of the University of Minho (EAUM), being responsible for the courses of Geometry and Seminar 1C (History and Ucronia). Currently he is the director of the architecture master degree, coordinator of the group spacer_Lab2pt, member of the scientific council and of the pedagogical council of the EAUM. Holding a degree in Architecture (2002) and a Master degree in Methodologies of Intervention on the Architectural Heritage (2006), both granted by the Architecture Faculty of the University of Porto (FAUP), he concluded his PhD, at EAUM (2015), with the research “*Imaginary Architecture: Real and illusory space in Portuguese baroque*” which looked into architecture and perspective treatises searching for intersections between projective science and architectural design.

Related to his pedagogical and research activity, organized exhibitions_“Cabinet de Curiosités” and “A+D 15/16”_ workshops_“Espaço dobrado”_ participated on the organizing committee_“*Common Places Architecture*” (2008) and “*1st International Meeting EAHN*” (2010)_ scientific committees_“A língua que habitamos”_ presented communications_“*Le Modulor: Experiencing measure*” (Guimarães, 2008); “*Realidade e Ilusão. A dimensão arquitectónica na Quadratura de Gonçalves Sena.*” (Santarém, 2011); “*Espaços de Representação do Espaço. O engano do olhar e a transformação do concreto*” (Vila Real, 2012); “*Codificar o Infinito. Conceção gráfica e arquitectónica do cosmos.*” (Vila Real, 2014); “*Scenografia. Speculazione teorica e l'applicazione pratica della prospettiva nei collegi gesuiti portoghesi*” (Milano, 2015)_ and published_“*Inácio Vieira: Optics and Perspective. Instruments towards a sensitive space*” (Nexus Network Journal, 2011); “*Experiencing architecture through baroque image: Gonçalves Sena, painted architecture as architectural space.*” (The International Journal of the Image, 2011); “*Espaço e imagem, Abstracção e materialização. Dois exercícios de investigação em geometria*” (II Encontro Internacional Sobre Educação Artística. 2013); “A reflexão patrimonial no contexto de formação em arquitectura”. (JOELHO, 2015); “*Projecting Quadratura image. Euclidean propositions and common practices at painter’s workshop*” (Nexus Network Journal, 2016_ with João Pedro Xavier); “Ciência perspéctica e imaginário arquitectónico, de Roma para a província portuguesa.” (Convocarte, 2016); “*Amplifying reality through Quadratura. Contrappunto among corporeal and visual space.*” (Proceedings of the 2nd International Multidisciplinary Congress, 2016).