

TITLE OF THE RESEARCH PROJECT

Digital Stereotomy: from treatises to geometry for interventions

SUPERVISORS

	First name	LAST NAME	University	Research Unit
Supervisor	Paolo	Borin	University of Brescia	Department of Civil, Environmental, Architectural Engineering and Mathematics - DICATAM
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Fields of study

History and theory of representation, history of construction (SH5_11 Digital humanities; SH8_5 History of art and of architecture)

Requirements (academic background, languages...) needed to apply for this research topic

- Requested academic background: Master's degree in Architecture; Master's degree in Construction/Building Engineering-Architecture.
- Language (minumum requirement): English B2; Italian A2 or Spanish A2 or French A2.
- Expertise in 3D modeling with software as Rhinoceros, Blender, AutoCAD
- Knowledge of, or availability to learn, scripting language such as Python, scripting techniques in Visual Programming Languages environment (Grasshopper, Dynamo), BIM modeling (Revit, ArchiCAD), ontology creation (Protegé), digital survey techniques, basic analysis of stability of structures

5 main KEYWORDS

Digital humanities; stereotomy; ontology; 3D modeling; architectural treatise

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ABSTRACT (250 words max.)

This project addresses the challenge of knowledge transfer in stereotomy, the science of cutting and assembling building stones, which, despite its foundational role in European architecture from Renaissance, is today documented in complex treatises. The research aims to bridge this knowledge gap through the integration of advanced digital methodologies.

I trattati di stereotomia presentano un testo accompagnato da una serie di rappresentazioni tra loro coordinate. Le rappresentazioni sono il risultato di una serie di operazioni grafiche necessarie per scomporre la superficie principale in elementi (voissoirs), e le successive operazioni per tagliare le pietre e appalearle in un unico sistema strutturalmente stabile.

The study has a dual objective. First, it will establish a formal ontology for the classification of surfaces, tools, and stone element arrangements, followed by the semantic transcription of portions of historical treatises in French, Italian, or Spanish. This process will render their contents queryable and semantically accessible. Second, the project will apply scripting and advanced digital modeling to analyze and virtually reconstruct complex masonry vault geometries. This includes the formalization of specific notable surfaces, such as surfaces of revolution and rotation-translation, using a unified language currently lacking in the field.

The theoretical framework will be validated through practical case studies from diverse geographical regions, including France and Spain. The integration of digital surveys and 3D reconstructions with a specific BIM (Building Information Modeling) semantics within a unified platform will allow for a direct correlation between the principles described in historical treatises and their concrete architectural applications.

Research aims and methodology

This project addresses the challenge of knowledge transfer in stereotomy, which, despite its foundational role in European architecture from Renaissance, is today documented in complex treatises. The research aims to bridge this knowledge gap through the integration of advanced digital methodologies. These methodologies are represented by: information management, virtualization of geometry, discretization of vaulting geometries in elements (voissoirs), semantic enrichment of 3D geometries, simulation of structures.

Relevance and added-value of the proposed research in relation to the current state of knowledge

Interdisciplinary nature of the research together with the alignment with the CHORAL programme and complementarity expertise of the teams

Output plan including publication and dissemination activities

Estimated schedule

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