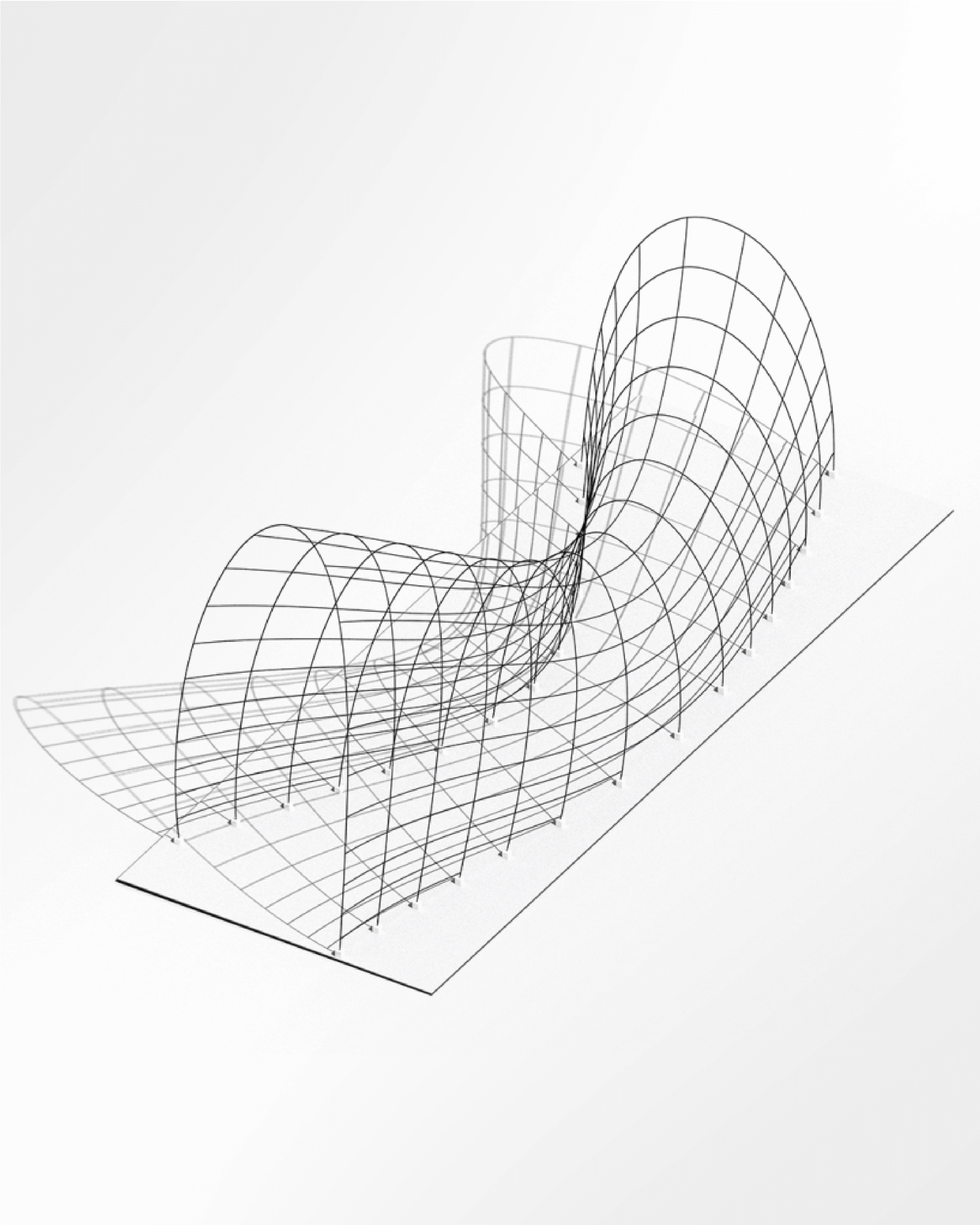
chrYsalis: Building Castles in the Air

Presented as part of the 2025 MUGAK Architecture Biennial in the Basque Country, *chrYsalis* explores the idea of "building castles in the air" through a lightweight architectural installation that exists between drawing and construction, imagination and matter. Developed by researchers from Fab Lab Donostia at the Higher Technical School of Architecture of the University of the Basque Country (UPV/EHU), the pavilion investigates how computational design can transform an intangible geometric concept into a built structure.



The pavilion geometry is derived from a Monge surface and discretized into a network of warped curves generated through a parametric workflow in Rhino and Grasshopper.

The project is rooted in an ongoing line of geometric research focused on Monge surfaces and their architectural applications. This work has been documented in several academic publications, most notably [Monge

Surfaces: Generation, Discretisation and Application in Architecture.

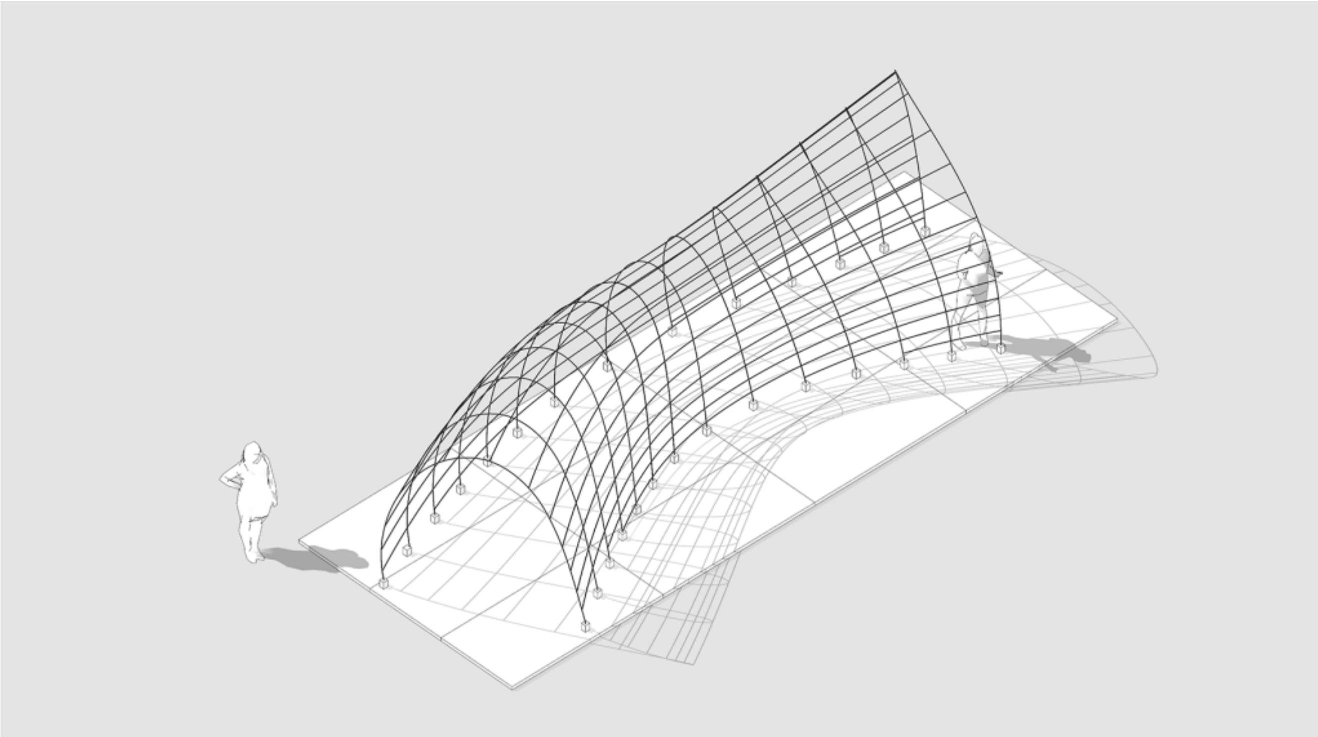
Through algorithmic programming in Grasshopper, based on the geometric principles originally described by Gaspard Monge in the late eighteenth century, the team has developed methods to generate, discretize, and explore the expressive and structural possibilities of these surfaces.

Process documentation illustrating geometric development, robotic fabrication, prototyping, and on-site assembly of the chrYsalis pavilion.

Based on this research, the pavilion generates a path aligned with the axis of the former Franciscan convent church in Donostia–San Sebastián, now home to the city's Anthropological Museum. A double-curvature surface is discretized into a network of warped curves, producing a lightweight spatial framework that visually resonates with the ribs of the historic vaulted nave.

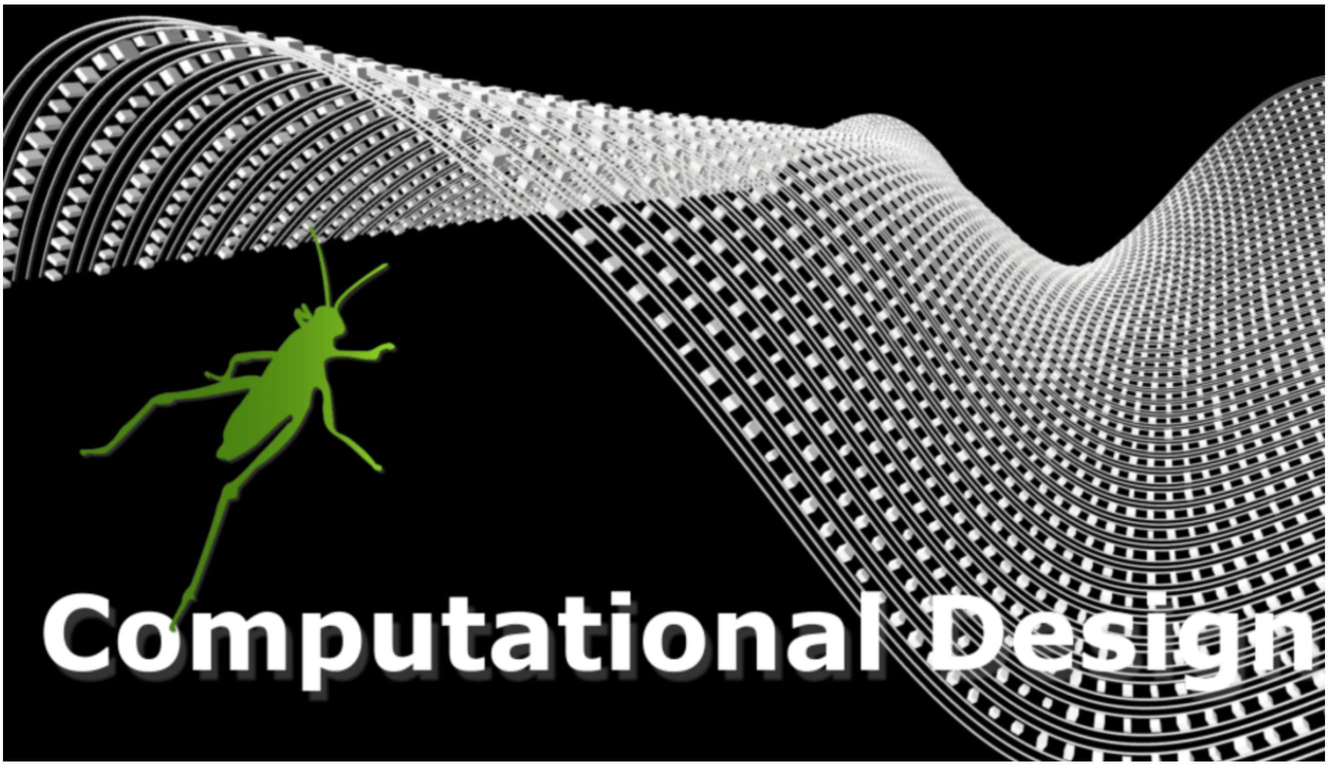
Assembly of the pavilion inside the exhibition space. Augmented reality tools enabled the precise positioning of components without the need for traditional falsework.

[Rhino]() and [Grasshopper]() played a central role throughout the research and design process, enabling the development of a parametric system that controls geometry while remaining adaptable to different spatial conditions. The resulting structure is intentionally reduced to only two basic components: 6 mm steel rods and cylindrical steel joints of a single type. Following the same geometric principles used to generate the surface, the rods are connected orthogonally to create a complex form through a remarkably simple construction logic.



Axonometric diagram illustrating the geometric logic of the system and the spatial organization of the discretized surface.

One of the project’s primary challenges was achieving rapid assembly and dismantling while maintaining the visual lightness central to the concept. Rather than creating a permanent structure, the pavilion was conceived as an ephemeral intervention in which the acts of construction and deconstruction became part of the architectural experience itself.



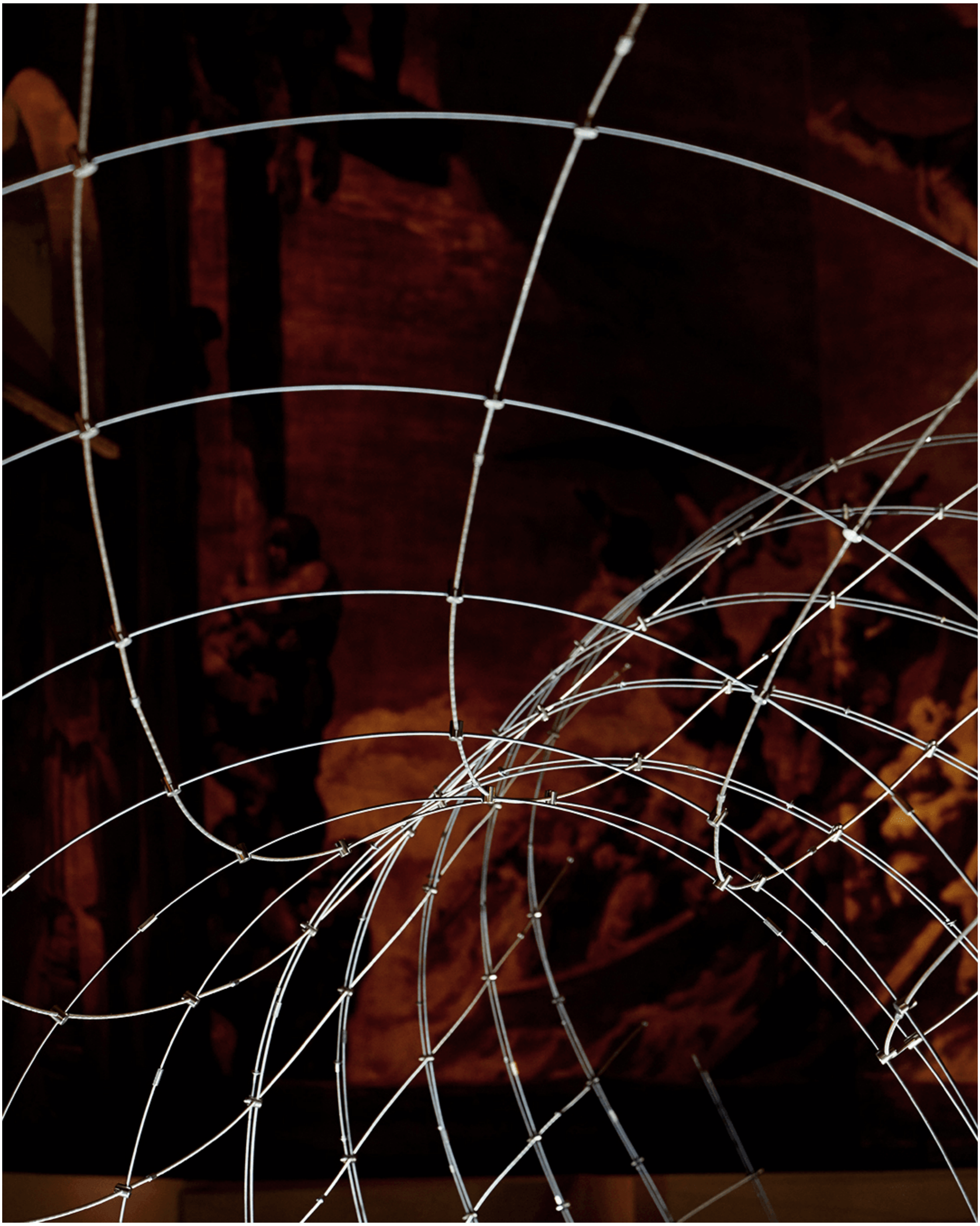
See Also

COMPUTATIONAL DESIGN WITH GRASSHOPPER

The goal was to create an almost ethereal element capable of “drawing” a form in space with the minimum possible material presence.

The construction process formed part of the project concept, emphasizing the idea of “drawing in space” through a lightweight and temporary structure.

Digital tools also played an important role during fabrication and assembly. The [Robots](#) plugin was used for manufacturing control, while [Fologram](#) enabled the use of augmented reality to position and assemble the structure directly from the digital model.

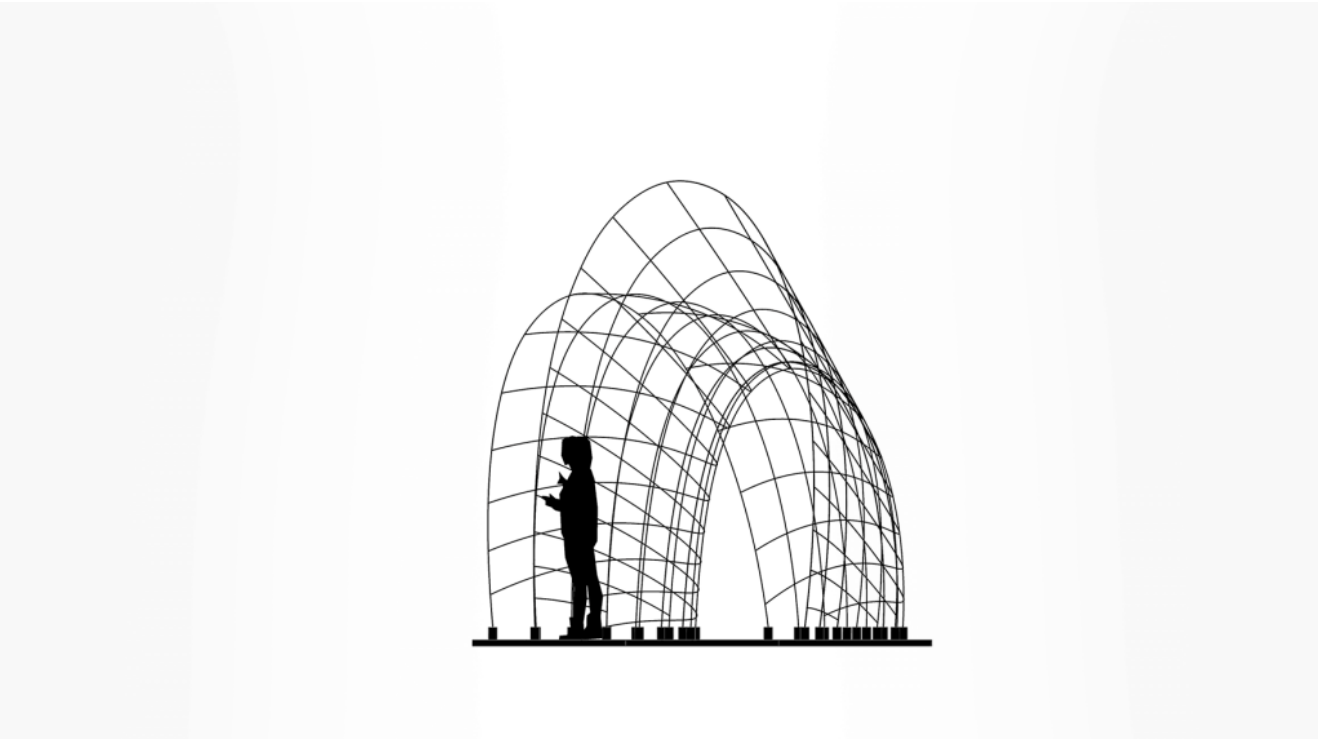


All structural intersections are resolved using a single custom node type, allowing a complex geometry to emerge from a simple and repeatable construction system.

By eliminating the need for falsework and auxiliary support systems, augmented reality simplified the construction process while reinforcing the project’s underlying idea of drawing directly in space.

The lightweight network of steel rods visually overlaps with the existing Gothic vaults, reinforcing the relationship *between digital geometry and architectural heritage.*

Beyond the pavilion itself, *chrYsalis* represents an intermediate milestone within a broader investigation into lightweight construction systems and complex geometries. Because the workflow is based on a parametric framework with a single node type and repeatable assembly logic, the system can be adapted to generate a wide range of forms and spatial configurations. Current research is already extending these principles toward the design and assembly of timber structures using the same geometric and constructive methodology.



Elevation study illustrating the spatial proportions and curvature of the pavilion generated through the discretization of a Monge surface.

Installed within the museum's historic nave, the pavilion creates a dialogue between contemporary computational design and centuries-old architecture. As Rainer Maria Rilke wrote, "Things are nothing but the envelope of the invisible." Through geometry, computation, and augmented reality, *chrYsalis* offers a compelling exploration of that idea.

The completed pavilion demonstrates how a parametrically controlled system can generate complex spatial forms through minimal material means.

CREDITS

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