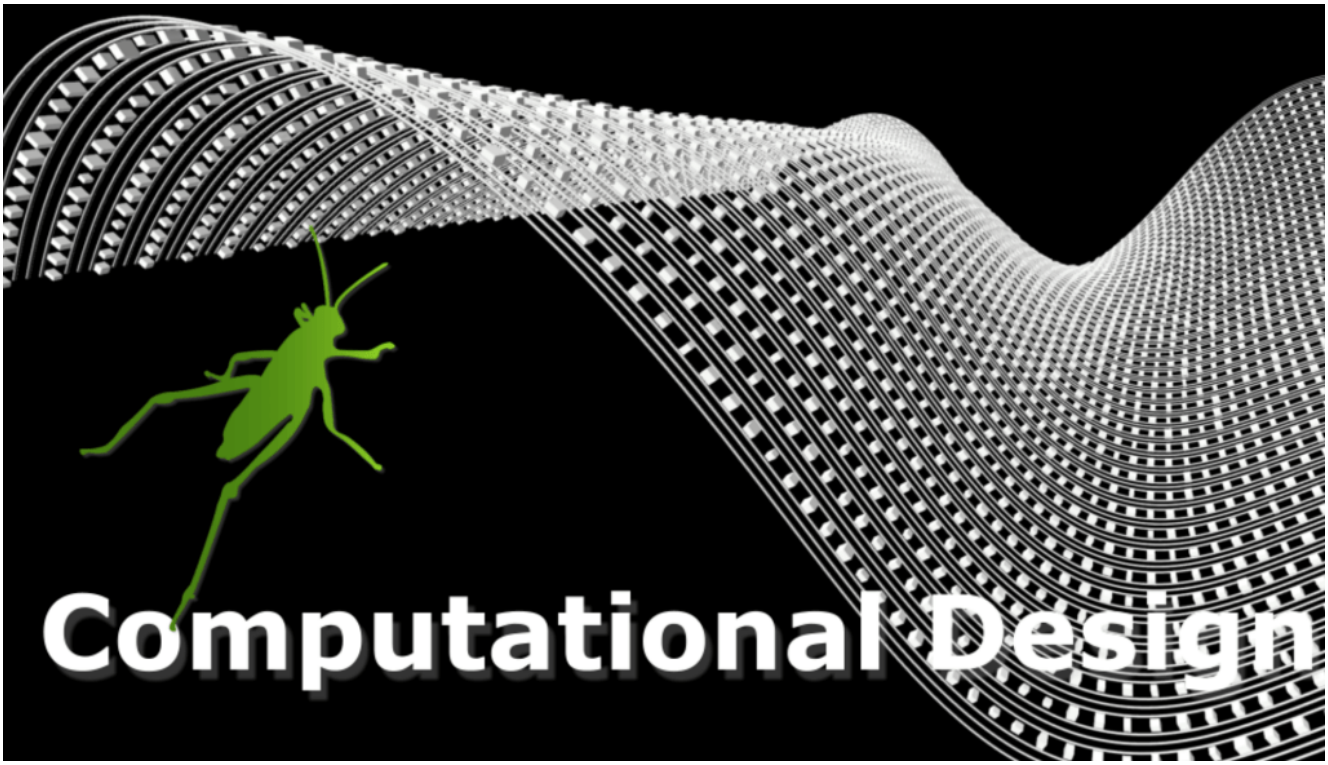
Marquise H.V: Parametric Canopy and Digital Fabrication in Teresina

Marquise H.V is an entrance canopy designed for the Hospital da Visão in Teresina, Brazil. Developed by SELVAGEN in collaboration with Sérvulo Arquitetura, the project demonstrates how algorithmic design can translate complex geometry into a buildable system through a carefully structured digital workflow.

Top view highlighting the geometric logic of the canopy and the distribution of triangular glass panels across the surface.

Covering approximately 106 m², the canopy consists of a steel structure defined by triangular geometry, clad with 210 unique glass panels. These panels are connected through 130 custom metal nodes and supported by over 700 linear meters of steel bars, forming a lightweight yet structurally expressive envelope.

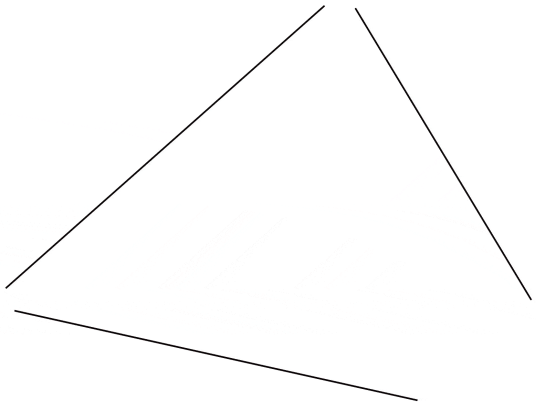
The entire design process was driven by a parametric model built in Rhinoceros 3D and Grasshopper, where geometric relationships were defined and controlled through a flexible algorithmic system.



See Also

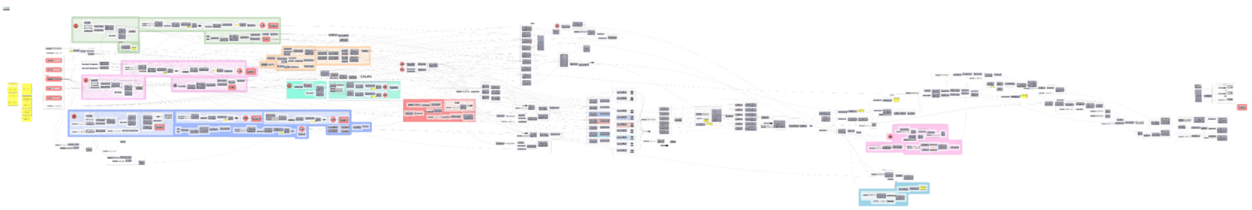
COMPUTATIONAL DESIGN WITH GRASSHOPPER

The canopy’s form originates from three primary arches, each defined by control points that establish both the span and height of the structure. These arches were interpolated and connected through secondary curves, enabling the generation of a continuous surface using a Network Surface approach.



Design logic progression: primary arches define the geometry, followed by the structural truss system and the glass enclosure.

Once the base geometry was defined, the surface was rationalized into a triangular panel system using mesh-based strategies. Tools such as TriRemesh allowed precise control over panel dimensions, ensuring that each element remained within fabrication constraints while preserving the design intent. This approach enabled the production of 210 unique glass panels, each geometrically distinct yet systematically generated.



Grasshopper definition used to control geometric relationships, enabling real-time adjustments and coordination across the entire system.

Grasshopper played a central role not only in generating geometry but also in managing parametric relationships across the entire system. Design variables such as structural height, panel size, and member thickness could be adjusted in real time, allowing the team to respond efficiently to design changes and coordination requirements.

This adaptability proved particularly valuable when integrating the canopy with the existing building geometry, a key technical challenge in the project.

Fabrication of unique glass panels. Each element was digitally indexed, flattened, and cut using CNC processes.

To ensure structural feasibility, the model was coordinated with engineering analysis conducted in Tekla. This integration allowed the design team to refine the structural system while maintaining alignment with the parametric model.

The transition from design to fabrication followed a fully digital workflow. Each panel was indexed and catalogued directly from the parametric model, then flattened using the ***Orient*** component to generate 2D geometries. Nesting optimization was performed using OpenNest to maximize material efficiency within standard glass sheets. The resulting files were exported in CNC-ready formats for precise manufacturing.

Steel components prepared for assembly, following the parametric model’s specifications and structural analysis.

Both the glass panels and steel components were fabricated through CNC cutting processes, ensuring accuracy and consistency across all unique elements. The assembly process was guided by the digital mapping generated in Rhino and Grasshopper, allowing for efficient on-site installation.

Installation of the triangular structural system, where each node and connection aligns with the digital model.

Marquise H.V highlights how computational design can bridge the gap between complexity and constructability. By leveraging parametric logic, digital fabrication, and an integrated workflow, the project transforms geometric variation into a viable architectural strategy.

The canopy’s triangular panel system creates a dynamic envelope that filters light and enhances the entrance experience throughout the day.

CREDITS

Project: Marquise H.V
Design: SELVAGEN + Sérvulo Arquitetura
Lead Architects: Paulo Duca, Maria Sérvulo
Location: Teresina, Piauí, Brazil
Year: 2024

Computational Design: Paulo Duca (SELVAGEN)
Collaboration: Lissa Saruhashi, Helio Ricardo Stefoni, José Guilherme Aceto

Structural Design & Analysis: Tekla workflow integration
Steel Structure: Nova Estruturas
Glass Panels & System: AVEC Design (Ecoglazing System)

Photography: Whill Silva, Marcia Burlamaqui