

Structural bending system. A constructive possibility for geodesic domes.

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Abstract

This article describes a design method based on active bending systems for the configuration of geodesic domes. The analysis and validation of its constructive viability were carried out from a 1:1 scale prototype built in the facilities of the UNA University Center - Brasil. The structure was assembled in twelve hours by the students of postgraduate course in architecture, who learn in practice the real behavior of these typologies.

The project was based on the principles of reciprocal frame structures and on the ability of materials to bend in order to achieve the proposed form. The length, number of bars and the position of the intersection points were defined from the geometry of regular polygons. With a 4.0 meters diameter and maximum free height of 2.7 meters, the dome is composed of 180 wooden bars with five different sizes.

The pavilion carried out as a final activity of the reciprocal structures course, in the second workshop given in Brasil by SMiA (Structural Morphology in Architecture - research group based in the Universidad Polit cnica de Caltalu a). The activities were developed in the discipline of ephemeral structures belonging to the postgraduate program of architecture and interior design promoted by UNA and supported by the AnimaLab (Digital Fabrication Lab).

The objective is to present the processes and results obtained as a way of evaluating the possibilities offered by bending systems in the construction of geodesic domes. The paper intends to explore the coplanar joints used in the construction of reciprocal structures. Finally, it is proposed to highlight the importance of using algorithms systems to assist the architect in making decisions.



Figure 1: Prototype - reciprocal frame structure. Figure 2: Detail - coplanar joints. Figure 3. Configuration - dome topology

References

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- [2] A. Tedeschi. *Algorithms Aided Design: Parametric strategies using Grasshopper*, English edition 2014.