

## Performative shading structures for public spaces applied in San Andrés Cholula, México.

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### Abstract

Cholula, sacred city, is located in the State of Puebla, México. It has been an historical focus point since the beginning of the 12<sup>th</sup> century B.C., it has an average annual temperature of 17 °C, with a maximum temperature of 28 °C in April. There is a diversity of esplanades and parks in Cholula surrounded by local history, commerce and civil architecture. They are part of a complex system of public spaces. Most of them present a lack of shadowed areas although they are necessary to provide comfort and wellness, particularly during the steamy months of summer.

The proposal aims to design shading structures that can protect open public spaces from the sun during the day that also serve aesthetic purposes; at night, they can be closed to enjoy the view to the sky. Therefore, these performative shading structures should be designed as a prototype in parametric architecture and sustainable technology that can be coupled with the local sun trajectory by using specialized climate-based software and simulation tools. Both the opening proportion and the screen axial rotation of these shadings will be optimized through parametrically manipulation in order to be constantly changing through hours of day and seasons of the year. The adequate performance of shadow projections and solar penetration can contribute to reduce excessive solar radiation, as well as creating a visually stimulating environment. In short, this project attempts to integrate and evaluate the formal and parametric design of contemporary architecture with the need to optimize comfort and wellness in outdoor public spaces.

The Cholula Park is a recently created public space located around a patrimonial structure of great cultural value such as the pyramid and the church of Nuestra señora de los Remedios, It will serve as the

Parametric design will be used as an advance simulation tool for proposing a light structure that adapts to different plazas and parks. Rhinoceros, Grasshopper and other parametric tools [2] will be used to conceptualize the geometry and the structure, with the support of plug-ins for exploring mathematical shapes, paneling, structures and parametric finite element programs. In addition, other plug-ins will be used to help to create an environmentally conscious design, for understanding the movement of the sun and generation of shadows, which allow devising an usable and adaptable concept to the various urban spaces that lack structures for generating comfort.

The public space is the structuring element of the urban fabric, the territory that favors the construction of identity derived from its appropriation. As we understand its importance it is mandatory that it is inclusive and have the highest possible degree of comfort.

### References

[1] G. Di Marco, “Simplified Complexity, Método para el modelado NURBS avanzado con Rhinoceros”, *Le Penseur*, 2017.

[2] A. Jakubiec and C.F. Reinhart, “DIVA 2.0: Integrating daylight and thermal simulations using Rhinoceros 3D, Daysim and EnergyPlus”, in *Proceedings of Building Simulation 2011: 12<sup>th</sup> Conference of International Building Performance Simulation Association*, 2011, pp. 2202-2209.