THE MATHEMATICAL POETHICS OF ELADIO DIESTE: THE RULED SURFACES OF THE CHURCH OF CRISTO OBRERO

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ABSTRACT

The design process of thin-shell structures in the 20th century was marked by geometrical shapes of proven performance record [2]. If the recent advances in digital design currently allow for form-finding, structural analysis, and optimization processes to develop new forms, there were a few structural engineers of the 20th century which still managed to do so empirically. Eladio Dieste was a Uruguayan Civil Engineer which designed thin-shell structures in a virtually unexplored construction technique, reinforced masonry, and obtained thinness and resistance through quantitative and qualitative form-awareness [1].

The present research has as its object of study the ruled "surfaces and folded plates" design typology of the Uruguayan Engineer Eladio Dieste, which were experimentally developed in the second half of the 20th century. The framework which led to this study resides in the resurgence of academic and industrial explorations of surface structures in the first decades of the 21st century [2], as well as the ostracism that encompassed Modern Latin American Architectural Heritage during the second half of the 20th century [4]. However, the new digital design and manufacturing technologies which brought back structural surfaces to the drawing boards still faces challenges in terms of construction viability and ruled and developable surfaces play a key role in that sense [3].

The main objective of this research is to demonstrate an exploratory parametrical modelling and analysis of Eladio Dieste's most iconic design in the "ruled surfaces and folded plates typology", the Church of Cristo Obrero, designed and built by Dieste between 1956 and 1958 in Atlántida, Uruguay. This methodological procedure was developed to extract insights regarding the design and construction process of Dieste's thin-shell structures in an analogous PhD thesis currently being developed by the author. What set this demonstration apart is the fact that the interpretation of Dieste's geometry was undertaken by means of 6th degree polynomials, extracted through polynomial regression from the original construction drawings' data.

KEY WORDS: Parametric Architecture, Design Process, Eladio Dieste, Cristo Obrero, Ruled Surfaces, Structural Surfaces.

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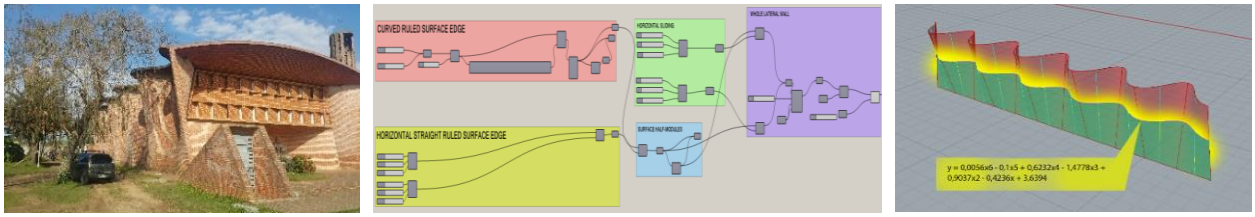

a. b. c.

Figure 1: (a) The Church of Cristo Obrero, design and built by Eladio Dieste between 1956 and 1958 in Atlántida, Uruguay. (b) Algorithm developed in Grasshopper 3D in association with Rhinoceros 3D from 6th degree polynomials (c) extracted from the construction drawings.

References

[1] Anderson, S (ed.) 2004, *Eladio Dieste: Innovation in Structural Art.* New York: Princeton Press.

[2] Bechthold, M 2008, *Innovative Surface Structures: Technologies and Applications*. New York: Taylor & Francis.

[3] Kolarevic, B 2003, *Architecture in the digital age: Design and Manufacturing*. Londres: Taylor & Francis

[4] Rossato, L 2016, 'The sustainability of preservation. Integration of survey and documentation processes with technologies for the conservation of 20th century architectures in Brazil and India', PhD thesis, The University of Ferrara, viewed 23 May 2018.