

Digital Tool for Reciprocal Frame

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Abstract

This paper summarises Arianna Palumbo's Thesis in her Master's in Architecture, titled "Reciprocal frame" and discussed in Naples in 2018 having Sergio Pone as tutor and Daniele Lancia as co-tutor.

The work is based on the idea that reciprocal frames are ruled by three fundamental parameters:

- *eccentricity* which measures the distance between the elements' axis lines;
- *length* which measures the distance between the point where the element supports and the point where it is supported;
- *position* which define if an element is up or down its supported element that is the concavity or convexity of the surface.

The aim is to produce a digital tool able to determinate, using a surface's free form data, a CRFS (complex reciprocal frame structures) made of the aggregation of SRFU (single reciprocal frame units) on a squared grid without changing eccentricity, position and dimensions of the rods and changing only the *length*. This choice allows to design new structures from synclastic surfaces, even if very complex, but equipped with a fundamental technical feature of being made with equal rods that generate different SRFUs. Using different algorithms already known, the new tool creates spherical cap surface CRFS that approximate to wanted surface. The original contribution of this work is based on this last step which uses dynamic relaxation and brings the spherical CRFS to ease down on the desired non-spherical geometry, without losing the reciprocity's bonds between the rods.

Arianna Palumbo, Hangai Prize applicant, is autor of 70% of the work.