



POLITECNICO
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Honors thesis

COURSE OF DEGREE IN SUSTAINABILITY DESIGN

Abstract

**Vanchiglia's new market:
meeting between biomimetic
and parametric architecture.**

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The thesis is the meeting point among different disciplines: the Biomimetic as reference and the Parametric Architecture as projectual development tool.

Thanks to natural sciences and computer technologies evolution, a fertile soil is created for the birth of new relationships between the culture of the project and the natural world: however it is necessary to understand the processes which underlie the nature and then to reinterpret them in useful solutions in order to resolve man's technical problems.

The Radiolaria's skeleton is the element of the nature that I took as a model for the project. The first part of the report is focused on the Radiolaria's structure and on its characteristic elements, it is an analysis that considers the geometric principles and the material configurations of these organic structures. The second part describes, instead, the translation of the model from microorganisms to the great scale of the architectural structure by the use of the parametric software.

The project provides the hypothesis of a market in Vanchiglia, historical district in Turin, where there are notable improvements thanks to the presence of Einaudi campus, inaugurated in 2012.

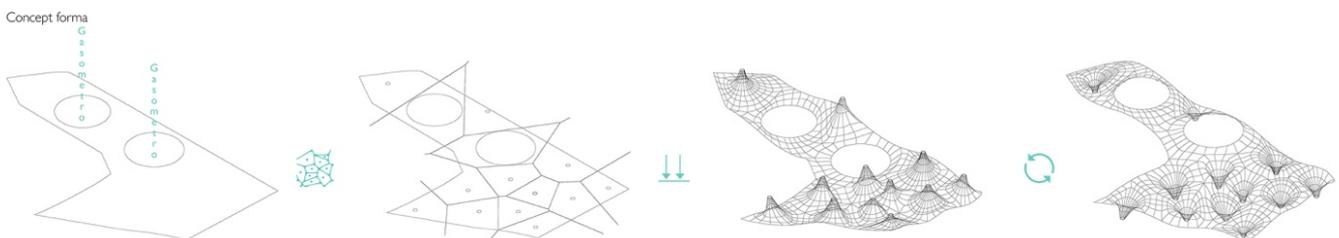
The project for a market is born following the analysis of Piazza Santa Giulia's market: the concept is redefined for the modern age, therefore near to the market stalls "street-food" shops and restaurants have been designed.

After having analysed the characteristics of the coverages for ample spaces, they have been elaborated according to the model of nature.

Taking inspiration from nature an idea is born and thanks to the research it is converted in data inside generative algorithms, which become digital objects.

The analyses of the microorganism show its ability of self-organization related both to the intrinsic characteristics of the matter and to the action of particular external influences. Because of the shortage of silicon, the Radiolaria take the most resistant form as possible with the very little available material.

Equally the project of the coverage is conceived following the model of the inversion of the tense membrane: the material takes so the form that is more able to resist the external forces, adapting itself to the stimuli.

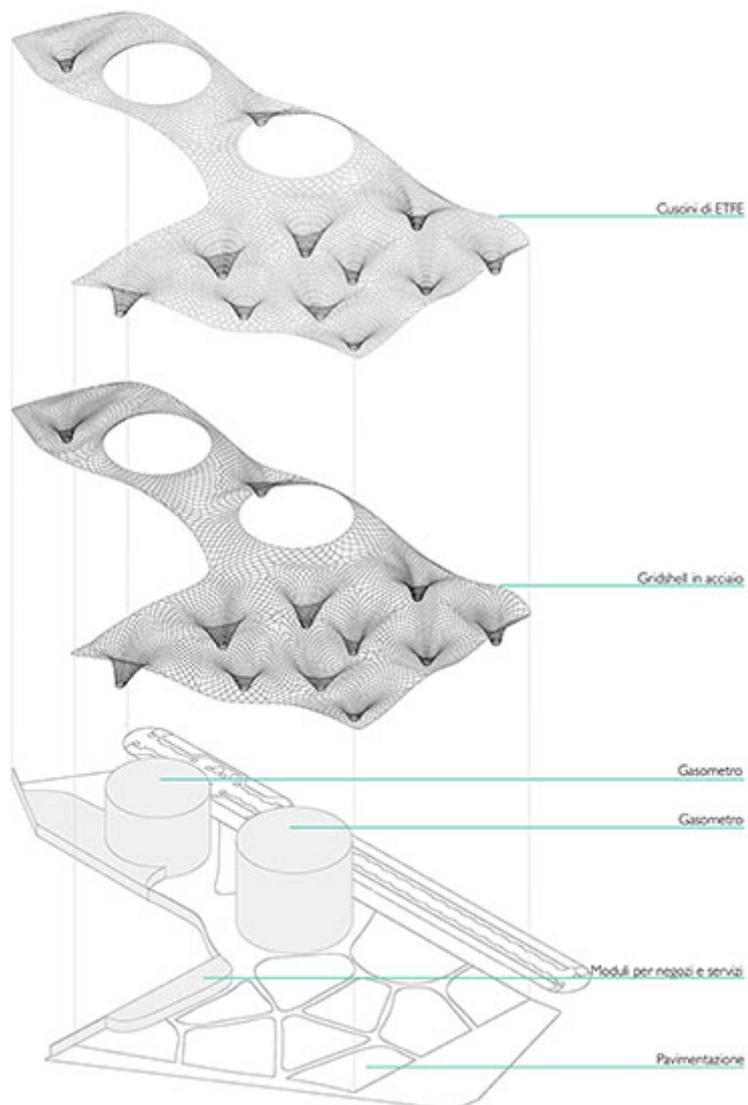


The body of the Radiolaria is characterized by a rigid structure of the skeleton and by the alveoli, as well the project joins a supporting structure of steel to deformable elements in ETFE.

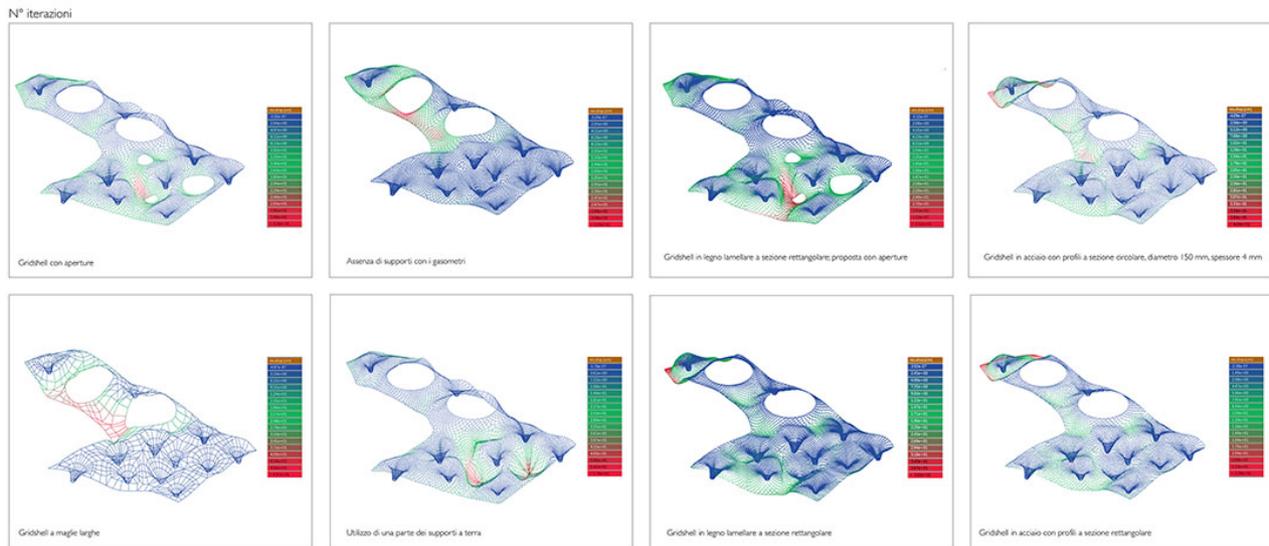
Concept struttura



Spaccato assonometrico



The project includes a “form finding” phase and an elaboration of algorithms with the Grasshopper software, Rhinoceros plug-in, that uses a logical-mathematical approach. Afterward through the use of Karamba program, Grasshopper plug-in, an accurate structural analysis, a dimensioning of every element and an optimization of the parametric model are done.



This program allows an integrated project between form and structure, in fact there is an automatic updating of the results: by changing the geometry's parameters it is possible to see at the same time how the project's parameters change. The project will not be a finite element but a dynamic system, outcome of continuous adjustment.