

POLITECNICO DI TORINO  
FIRST SCHOOL OF ARCHITECTURE  
Master of Science in Architecture (Construction)  
**Honors theses**

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**A GEODESIC GRID SHELL, a temporary exhibition pavilion among form, geometry and structure**

by Carlo Deregibus

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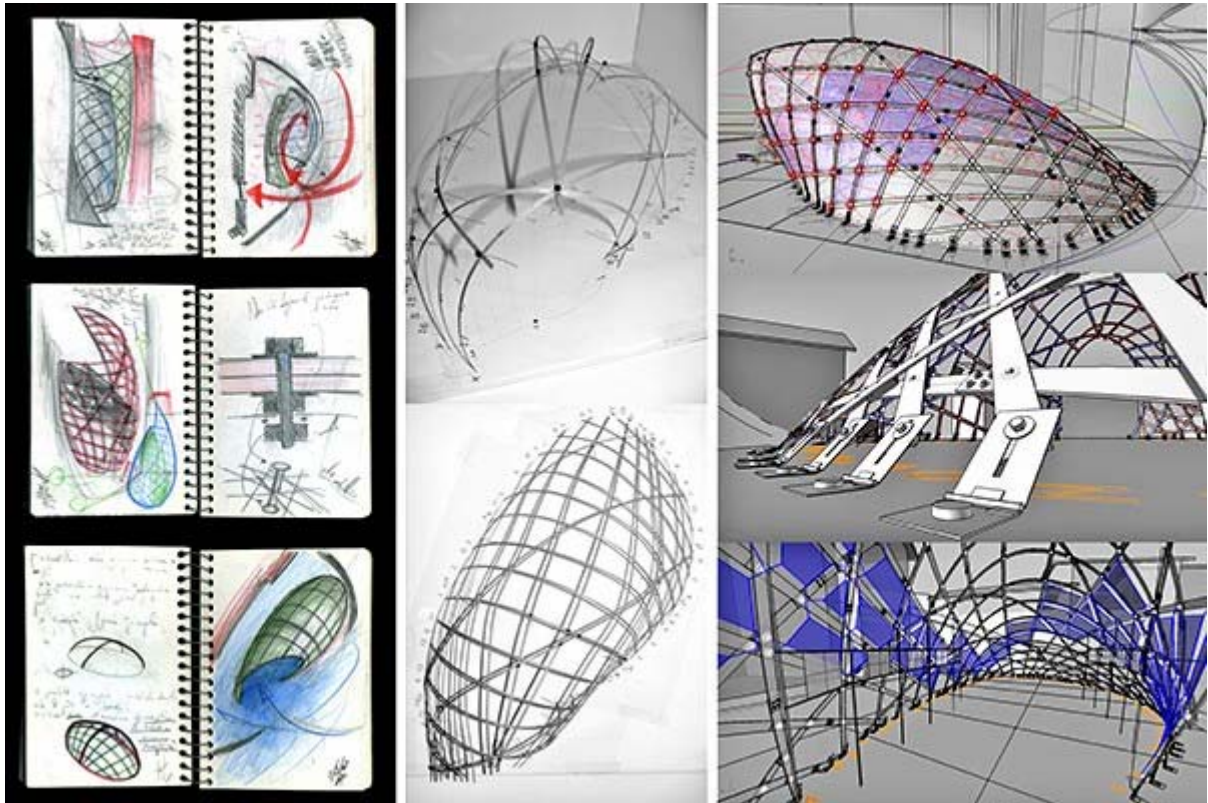
An exhibition project such as a temporary pavilion has intrinsically interesting characteristics: reduced dimensions, usually a short duration, peculiarities such as a limited budget and the need for a swift process of assembling, which make the design an alluring chance for experimentation. Thanks to the cooperation between Turin's Faculty 1 of Architecture and the city council of Baldissero Torinese, I have proposed to design and build a temporary pavilion that could serve both as a showcase for student's projects and, moreover, as an inhabitable - even if transitory - building.

Many are the aspects that make it unique in his kind in a European survey: as a matter of fact, hardly ever a project designed in a degree thesis has been built, least of all by a student-composed construction team. The overlapping of hi-tech architecture and a low-budget are also other characteristics that make it quite unusual: the topic of self-constructed building, generally shaped by the absence of the designer and a low-tech profile, becomes in this case an experimental workshop whose aim is to realize a grid shell, a constructive typology characterized by plan and carry out difficulties, combined with generous budgets.

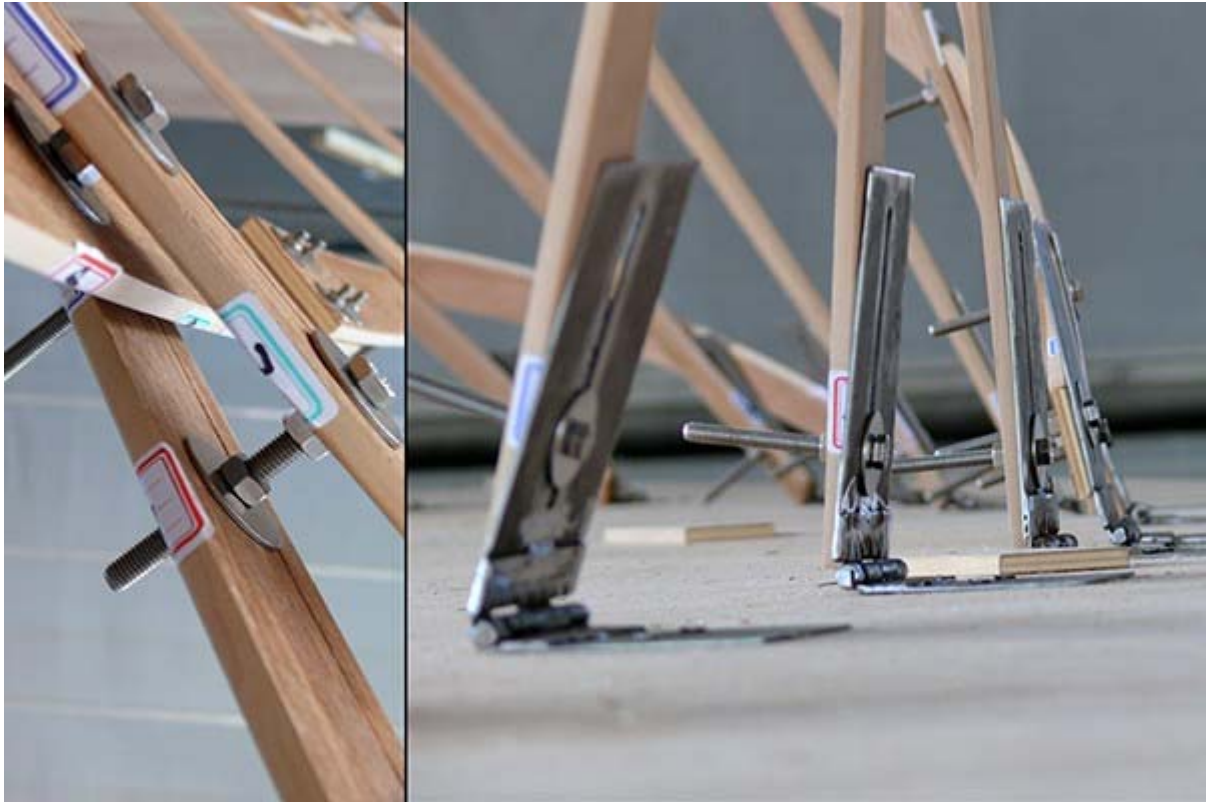
As the project has been conceptualized for a temporary pavilion, explicitly requested to symbolize an example of both potentiality and rupture with the architectural standard, the choice of the location was most of all important for the realization's visibility of the project and not as a source of inspiration: this is the main reason why the genesis of the project's shape is to be searched in the perception that inhabitants, visitors or passers-by would have had of it.

Such experimentation has been developed in different directions: shape's analysis suggested to use peculiar geometric properties to make the construction possible. Geodesic curves, a very controversial topic among math research, have been studied: they can be defined as "the straightest", "the shortest" and "the most right" curves that can be traced on a surface. A comprehensive theory that could manage all the problems related to the limits of such curves' proprieties, its exceptions and several border-line cases has been composed to make possible the passage from mathematical to structural properties, translating their characteristics into terms like "elastic potential energy", "bending stress" and "torsion", and arriving to an optimization not given by a succession of structural checks, but by a deep knowledge of geometry.

By using these curves, it is possible to build the pavilion by using wooden stripes (1 cm. thick, up to 14 mt. long): usually grid shells are built by deforming a plane grid and then bracing it, but the project's grid can be realized by assembling complete strings (in an exact order) that create a continuous evolution in form and growth in resistance, without any brace.



The planning passed through conceptual sketches, physical models and virtual models: mathematical studies were fundamental to control and sidestep limitations and faults of the software: one example is the use of numeric tables, instead of drawings, to define the working plan, that makes the project a true example of “non-standard architecture”, with the implementation of new design and building convention.



To control costs, the prototyping and testing of all building details have been taken on all during the development and the process was applied on every scale, using meta-designing, to attend to simple, effective and smart solutions.



The unveiling of the pavilion - which was prototyped in Lyons in May - took place during the last and most important day of the 54th Grapes Fair, on October 7, 2007, in the presence of authorities from various town councils nearby Baldissero, the council of the Provincia di Torino and of the Piemonte Region council, with large success among critics and public.

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