

EUCEET 2018

4th International Conference on
Civil Engineering Education

CHALLENGES FOR THE THIRD MILLENNIUM

Building freeform: From Design to Fabrication

C. Douthe*, R. Mesnil* and T. Gobin*,†

* Ecole des Ponts ParisTech
6&8 avenue Blaise Pascal 77455, France
Cyril.douthe@enpc.fr – www.thinkshell.fr
† HAL Robotics

ABSTRACT

This yearly intensive workshop dedicated to double curvature structures, also called freeform structures, mixes thirty 5th year architecture and engineering students. The 2017 edition is organized around the construction of a wooden pavilion that provides an innovative response to the main structural constraints of envelope structures: simplicity of connections, flatness of panels and formal freedom. The learning objectives and methods are the following:

- Give an overview of the constraints inherent to any project with curved structures or envelopes, as well as geometrical, mechanical and technological solutions to meet them.
- Introduce the students to detailed engineering, to the specifics of timber construction, to the use of advanced manufacturing tools (robotic machining, laser cutting, digital milling, etc.), and to geometric shape control methods.
- Confront theory and practice by passing from design to fabrication of a structure on a large scale, and introducing by there the notions of tolerance, play and tuning...
- Share the experience of all professionals involved in the construction of innovative structures whose involvement makes such complex realisation possible (in the present case partners were Simonin: manufacturer of complex wooden structures, Würth France: professional tooling and hardware, ABB France & HAL: robotics manufacturing, Laboratoire Navier: construction-aware structural design).



REFERENCES

- [1] Chilton John editor, *Teaching of space structures*, Special Issue of the international journal of space structure, Volume 17, Issue 2-3, June 2002.
- [2] Vrontissi Maria, *The Physical Model as Means of Projective Inquiry in Structural Studies*, PhD thesis ETHZ, 2017.