

Polydon : a dynamic inflatable polyhedron

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Abstract

Inflatable-expandable structures are lightweight, easy to setup and can be made interactive with cables. Diodon pavilion by Dynamorphe [1] has previously investigated interactivity in architecture by the design and fabrication of an inflatable dynamic pavilion using a deployable folded membrane. The Ron Resch's triangular deployable origami pattern used for tessellation linked to a motor-driven cable net allows local control of the surface metric, thus a variety of shapes could be attained.

Prior art by Kovács et al. [2] investigated mechanics of bar-hinge expandable polyhedral structures. Kovács dodecahedron exhibits one finite mechanism, approximating a global homothetic transformation. The present pavilion proposal aims at reinterpreting Kovács expandable dodecahedron into a deployable periodic-folded membrane. It is a mobile inflatable shelter whose shape can be controlled by a cable mechanism linked to membrane and anchors, enabled by human force. The pavilion offers various spatial and lighting conditions, depending on the fold state defined by the user. This new kind of inflatable-expandable structures opens toward exciting applications for the design of interactive building envelopes and scenography.

References

[1] Dynamorphe collective webpage: <http://dynamorphe.fr/projets.html>

[2] F. Kovács, T. Tarnai, P. Fowler and S. Guest, "A class of expandable polyhedral structures", *International Journal of Solids and Structures*, vol. 41, no. 3-4, pp. 1119-1137, 2004. Available: 10.1016/j.ijsolstr.2003.09.046 [Accessed 8 March 2019].