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Tribute to Kenneth Snelson

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Abstract
We present the project of a tensegrity pavilion for the Form and Force exhibition/competion organized by IASS WG21. The pavilion is dedicated to the memory of Kenneth Snelson (1927-2016), the American artist who built tensegrity sculptures/structures worldwide. The pavilion's design is based on the sculpture "x-planar Tower" (1962-88), which in turn is derived from Snelson's tensegrity primary x-Form. As Snelson explained in his picture essay, "Tensegrity, Weaving and the Binary World" [1], x-Modules can be combined together in space-filling assemblies which can be extended to any length in all directions. The shape of the pavilion is that of a 'gate', and it is obtained by laying the x-Form on the top face and the two opposite lateral faces of a cube, so that when walking through such structure, one can observe on the sides and above the transparent tensegrity arrangement of struts and cables. The pavilion is composed by 88 struts, forming 44 x-Modules, and a multitude of cables. The structure is supported on the ground at four pairs of points, corresponding to the sides of four x-Modules.

The materials employed in the construction are square cross-section wooden bars for struts and ropes in synthetic fibers for cables. The connections between elements require no additional fitting. Slits and holes are easily realized at every bar end section to accommodate the ropes. A simple knot realized at each rope's end blocks the rope in place at the slit/hole. A few tensioning devices are applied at designed locations to prestress the structure in a controlled way. The devised construction and assembly procedure maximize simplicity and recyclability of materials.

The design of the pavillion has been perfomed as follows. Once the overall geometry and the x-Form has been decided (structure covering three faces of a cube, relative arrangement of X-Modules), a form-finding procedure has been executed by minimizing the elastic energy of a virtual structure, with fictitious elastic properties, considering very 'soft' elastic cables. The form-finding allowed us to obtain a pattern of forces in space in stable equilibrium with the desired shape, corresponding to a prestress state in the elements. Such prestress state is then rescaled to match material properties and loads of the real structure, verifying that maximum allowed stresses are not exceeded. Finally, fine tuning of geometry and prestress is performed to maximize structural performances.

References

[1] K. Snelson, *Tensegrity, Weaving and the Binary World*, 2014, donwloaded in 2019 from www.kennethsnelson.net.