

An Adaptive Pretension Structure

Jana RIETH BSc, Lorenz KASTNER, Dipl.-Ing. Christoph HOLZINGER BSc, Assoc.Prof. Dipl.-Ing.
Dr.nat.techn. Andreas TRUMMER

Technical University of Graz
Technikerstraße 4 / IV, 8010 Graz, Austria
jana.rieth@tugraz.at

An adaptive structure was chosen for the pavilion design due to its ability to react to variable conditions while increasing the material effectivity, which in turn leads to a weight reduction. The nineteen aligned arches are consisting of fifteen prefabricated modules, which are connected by a pretension cable. The adjustable modules generate the appropriate shape for the internal and external influences. According to the pretension in the cable, the shape, density and rigidity of the modules is adaptable. Each unit consists of two vertical plates, connected by a specially designed joint. The vertical elastic elements act as springs. They are made out of a deformable material with a highly elastic behavior and an adequate reset force. The material properties and dimensions are individualized to the required rigidity. Although the research of adaptive systems is widespread, the application is still minimal. In this research, it has been shown that it is possible to design and develop a practical solution with relatively limited resources, which is lightweight and contains an intelligent, adaptable load-bearing system.

Keywords: conceptual design, form finding, optimization, arch, pretension, adaptive, prototype, spring, actuators, permeability, geometry, deformable, joint, rigidity

References

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