Abstract:
In this paper we present the updated reference strategy for numerical form finding of pre-stressed membranes, which is based on standard finite element discretization. The singularities of the inverse problem are regularized by a homotopy mapping. A projection scheme is proposed where anisotropic pre-stress is defined with respect to an additional reference plane, which reflects the initially developable surface of membrane strips in the production process. Physically problematic combinations of edge geometry and surface stress are solved by a self-adaptive stress correction scheme. The algorithm is based on a local criterion derived from differential geometry. Several examples illustrate the success of each idea and implementation.

Stichworte:
form finding, updated reference strategy, minimal surface, anisotropic pre-stress, pre-stress adaption, membrane structures

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