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Abstract: The cutting pattern plays a major role for the design of structural membranes, since it influences both their aesthetical appearance and structural behavior. A novel approach towards cutting pattern generation is the so-called Variation of Reference Strategy (VaReS) [1], which minimizes the total potential energy arising from the motion of a planar cutting pattern to its corresponding three-dimensional shape. With non-uniform rational B-Splines (NURBS) being the standard tool for geometry description in CAD, it is only consequent to use these for analysis as well. Isogeometric B-Rep Analysis (IBRA) [2] follows up on this idea and enriches the original Isogeometric Analysis (IGA), which was introduced by Hughes et al. [3], by the possibility of analysing trimmed NURBS geometries. This paper presents cutting pattern generation with the Variation of Reference Strategy in the context of IGA/IBRA. With this approach, the whole design of a membrane structure can be represented by NURBS geometries – including blueprint plans. To use the benefits of IBRA for cutting pattern generation, a NURBS-based membrane-element was developed for the VaReS routine. A developable surface serves as a benchmark example, since its analytical cutting pattern is known. Examples of double-curved geometries show the applicability and benefits of the proposed procedure.
for real structures.

Stichworte: Cutting pattern generation, Variation of Reference Strategy, Isogeometric Analysis, Isogeometric B-Rep Analysis, Design cycle of structural membranes

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