Abstract:
structures, in: E. Onate, B. Kröpin (Eds.), Textile Composites and Inflatable Structures (Structural Membranes 2003), CIMNE, 2003; R. Rossi, Light Weight Structures: Structural Analysis and Coupling Issues, Ph.D. Diss., The university of Bologna, 2005] are attractive because their wrinkling models on a coarse grid are simple and intuitive. The basic idea of this model is as follows: whenever compression occurs in a membrane, the corresponding components of the constitutive tensor in the direction of the compressive stress are penalized to weaken the compressive stiffness of the membrane. However, such abrupt change causes inevitably an unphysical oscillation of stress redistribution. Therefore, an algorithm to stabilize this oscillation is required. The first objective of this paper is to give a systematic verification of a wrinkling model based on the material modification approach by means of an analogy between wrinkling and plasticity. The second one is to include this model in a static analysis for both isotropic and orthotropic membranes. This model holds following advantages: it is computationally inexpensive and virtually able to reproduce the exact stress field, caused by wrinkling, on a macroscopic scale. To the author’s knowledge applications of a material modification approach with orthotropic materials are scarcely available. This paper demonstrates the potential of the model by means of numerical examples, compared to ones in literature.

**Stichworte:** Wrinkling model; Membrane structures; Modified material model; Orthotropic material

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