Séminaire LaMCoS Vendredi 19 avril 2013 - 14h

Presentation title： Constitutive Modelling of Woven Composites for Forming

Abstract:

In forming, woven composite fabrics usually undergo large angular variation between fabric yarns during deformations. The reorientation and redistribution of fiber yarns result in a significantly anisotropic material behavior. Two approaches are implemented for the material characterization of woven composites. The first one is based on geometric transformation approach. A convected coordinate system, whose in-plane axes are coincident with the weft and warp yarns of woven fabrics, is used to express the contravariant stress components and covariant strain components. The transformations between the contravariant/covariant components and the Cartesian components of the stress and strain tensors provide an approach for deriving the global non-orthogonal constitutive relations for woven composite fabrics. The second approached is based on strain energy decomposition. A general hyperelastic constitutive framework is developed to characterize the anisotropic material behavior of woven composite fabrics under large deformation. The strain energy function is decomposed into several parts representing matrix deformation, fiber stretches and fiber-fiber interaction (cross-over shearing). The proposed constitutive frameworks are demonstrated on a balanced plain woven fabric. Model validation is carried out by forming simulation and comparison with experimental results.

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