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STABILITY ISSUES OF FINITE ELEMENTS IN NON-LINEAR SOLID MECHANICS

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ABSTRACT

In the past decades much research has been invested to cure the well-known undesirable stiffening effects of low-order finite elements in solid mechanics. A large part of effective concepts against these so-called locking phenomena, e.g. shear and volumetric locking, are based on multi-field variational functionals. The latter lead to mixed finite element formulations and, if further assumptions are applied, to finite elements using reduced or selective reduced integration. Many formulations developed in recent research show highly satisfactory behaviour regarding deformation and stress fields.

Nevertheless, one important issue is usually neglected. On the one hand, in contrast to linear elasticity, the uniqueness of a solution cannot be required in general, since singular solutions such as bifurcation points might become physically relevant and should be displayed by a powerful numerical method. On the other hand, the use of multi-field variational functions introduces additional variables (e.g. the enhanced strain) into the formulation which enormously increases the complexity of the stability issue [1] and eventually leads to artificial bifurcation points [2].

The problem is still unsolved. The present minisymposium aims at gathering new ideas and viewpoints to deal with the stability issue of finite element formulations in *non-linear* solid mechanics which show “locking-free” behaviour. Contributions from both, engineers and mathematicians, are highly well-come.

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