Institute of Thermomechanics Seminar

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Lecture No. 76

Czech Society for Mechanics
and Institute of Thermomechanics, CAS

invite you to a lecture and discussion within
the lecture series **Institute of Thermomechanics Seminar**

the Energy-Sampling Stabilization of Nodally Integrated Continuum Elements for Dynamic Analyses

given by

Prof. Petr Krysl

University of California, San Diego

Nodally integrated elements exhibit spurious modes in dynamic analyses (such as in modal analysis). Previously published methods involved a heuristic stabilization factor, which may not work for a large range of problems, and a uniform amount of stabilization was used over all the finite elements in the mesh. The method proposed here makes use of energy-sampling stabilization. The stabilization factor depends on the shape of the element and appears in the definition of the properties of a stabilization material. The stabilization factor is non-uniform over the mesh, and can be computed to alleviate shear locking, which directly depends on the aspect ratios of the finite elements. The nodal stabilization factor is then computed by volumetric averaging of the element-based stabilization factors. Energy-sampling stabilized nodally integrated elements (ESNICE) tetrahedral and hexahedral are proposed. We demonstrate on examples that the proposed procedure effectively removes spurious (un-physical) modes both at lower and at higher ends of the frequency spectrum. The examples shown demonstrate the reliability of energy-sampling in stabilizing the nodally integrated finite elements in vibration problems, just sufficient to eliminate the spurious modes while imparting minimal excessive stiffness to the structure. We also show by the numerical inf-sup test that the formulation is coercive and locking-free.

The lecture will be held on Tuesday, October 22, 2019 at 12:00 in the building of the Institute of Thermomechanics (lecture room A), Dolejškova 5, 182 00 Prague 8

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