PETHE – Rohit

Variational h-adaptation for strongly coupled problems in thermo-mechanics

Résumé

A mesh adaption approach for strongly coupled problems is proposed, based on a variational principle.
The adaption technique relies on error indicated by an energy-like potential and is hence free from error estimates.
According to the saddle point nature of this variational principle, a staggered solution approach appears more natural and leads to separate mesh adaption for mechanical and thermal fields.
Using different meshes for different phenomena, precise solutions for various fields under consideration are obtained.
Internal variables are considered constant over Voronoi cells, so no complex remapping procedures are necessary to transfer internal variables.
Since the algorithm is based on a set of tolerance parameters, parametric analyses and a study of their respective influence on the mesh adaption is carried out. This detailed analysis is performed on uni-dimensional problems.
The proposed method is shown to be cost effective than uniform meshing, some applications of the proposed approach to various 2D examples including shear bands and friction welding are presented.

Mots-clés : mesh adaption, variational approach, thermo-mechanics; nonlinear coupled problems; multi-physics

Visa du Directeur de Recherche