International Conference on Boundary Element and Meshless Techniques (BeTeq)
3-5 September 2012, Prague, Czech Republic

Krylov solvers and the generic BE subregioning algorithm: application to 3D composites

Francisco C. de Araújo[1] **and Richard Degenhardt**[2,3]

[1]*Dept Civil Eng, UFOP, Ouro Preto, MG, Brazil; fcelio@pq.cnpq.br*
[2]*Inst. Composite Structures and Adaptive Systems, DLR, Braunschweig, Germany*
[3]*PFH, Private University of Applied Sciences Göttingen, Composite Engineering Campus Stade, Germany*

Keywords: 3D standard BE formulations, subregion-by-subregion technique, Krylov solvers, preconditioning techniques.

Abstract. *Subregioning is a necessary technique for solving practical engineering problems via BEM. It may be needed either to deal with particular physical/geometrical characteristics of a problem or simply to decompose its definition domain by computational reasons (e.g. for parallelization). In the past 20 years, many attempts have been made to efficiently devise generic boundary-element subregioning techniques. Crucial points are how to profit from the sparsity of the global matrix, and how to deal with traction discontinuities (mainly for 3D problems). In this work, the most fundamental steps for efficiently devising a reliable generic subregion-by-subregion (SBS) algorithm are discussed. Mainly the preconditioning of the Krylov solver involved is addressed. As the SBS algorithm is based on iterative solvers, the matrix sparsity is perfectly exploited. Besides the BiCG solver, the BiCGSTAB(l) is considered as well. To verify the performance of the code, the 3D microstructural analysis of carbon-nanotube-reinforced composites (CNT composites) is considered. Particularly, mechanical properties of composites are measured. The representative volume elements (RVEs) adopted consist of carbon-nanotubes (shell-like elements) coupled with a polymeric material matrix.*