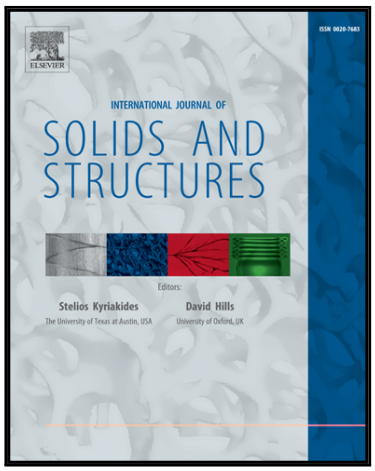

Splitting Method and hybrid-Trefftz formulation for multisite damage analysis in two-dimensional domains

Higor Sérgio Dantas de Argôlo , Sergio Persival Baroncini Proença

PII: S0020-7683(16)30321-3
DOI: 10.1016/j.ijsolstr.2016.10.030
Reference: SAS 9352

To appear in: *International Journal of Solids and Structures*

Received date: 18 July 2016
Revised date: 1 October 2016
Accepted date: 31 October 2016

Please cite this article as: Higor Sérgio Dantas de Argôlo , Sergio Persival Baroncini Proença , Splitting Method and hybrid-Trefftz formulation for multisite damage analysis in two-dimensional domains, *International Journal of Solids and Structures* (2016), doi: 10.1016/j.ijsolstr.2016.10.030

Splitting Method and hybrid-Trefftz formulation for multisite damage analysis in two-dimensional domains

Authors: Argôlo, Higor Sérgio Dantas de[a,b], Proença, Sergio Persival Baroncini[c]

[a]Federal University of Sergipe, Av. Marechal Rondon, s/n, CEP 49100-000, São Cristóvão, Sergipe. Telephone: +557921056700, e-mail: higorsergio@ufs.br

[b]São Carlos School of Engineering, University of São Paulo, Av. Trabalhador São Carlense, 400, CEP 13000-000, São Carlos Brazil. Telephone: +551633739455, e-mail: higorsergio@sc.usp.br

[c]São Carlos School of Engineering, University of São Paulo, Av. Trabalhador São Carlense, 400, CEP 13000-000, São Carlos Brazil. Telephone: +551633739455, e-mail: persival@sc.usp.br

Abstract

The aim of this paper is to present a new strategy for multiple-site damage analysis by combining the splitting method and hybrid-Trefftz stress formulation in a two-dimensional domain. The first is a decomposition method originally conceived to obtain the solution of a cracked solid. Accordingly, the given problem is split into three subproblems: an uncracked global problem ($P_G^{(0)}$), a local problem ($P_L^{(k)}$) considering a single crack located in a reduced domain and a global problem ($P_G^{(k)}$) aiming to account for the relative interaction effects among all the cracks. Most subproblems are independent and the solution results from a non-iterative strategy, which is one of the main benefits of this method. The hybrid-Trefftz stress formulation is a non-conventional finite element method where stresses and displacements are approximated, independently, in the domain and boundary of the element, respectively. The stress fields are hereby approximated by a basis function that solves the Navier equation and includes analytical fracture mechanics functions, so that the values of stress intensity factors are computed from the solution of the linear system. The hybrid-Trefftz formulation is used in the local problem $P_L^{(k)}$ of the splitting method, therefore improving the performance of the method and providing accurate solutions with very coarse meshes. In conclusion, it is shown through the numerical examples that the splitting method and hybrid-Trefftz formulation framework hereby proposed allows conducing accurate analysis. Once exploring a parallel processing, taking advantage of the independence of each subproblem, the framework can be extended to consider different scenarios of multisite cracked solids with a low computation cost.

Keywords: Splitting Method; hybrid-Trefftz formulation; Fracture Mechanics; Multisite damage analysis.