

The 5th Asia Pacific congress on Computational Mechanics and 4th International Symposium on Computational Mechanics. Singapore, 11-14 Dec. 2013

CEPAO, new computational aspects of 3D shakedown of frames

Nguyen-Dang Hung^(a), Hoang Van-Long^(b)

^(a)Senior Advisor, Ton Duc Thang University, Vietnam

^(b) University of Liège, Belgium

Abstract:

Although the application of linear programming in the rigid-plastic analysis and optimization has been investigated for more than fifty years, but this direction has have difficulties solving large-scale structures. A recent development aiming to overcome these difficulties in the cases of three-dimensional framed structures has been carried out at University of Liège, in which the shakedown analysis and optimization modulus are presented in this paper. The finite element method is applied to establish the formulations of beam-column elements while the normality rule is adopted to model 3D plastic-hinges considering two bending moments and axial force through multi-facet polyhedrons. The upper bound and lower bound theorems of the shakedown theory constitute the fundamental bases for the numerical implementation that are then written under linear programming problems. The formula-sizes are reduced by using several computation techniques leading to a considerable time saving in the simplex iteration. The mentioned algorithm was implemented in a united package for plastic-hinge direct analysis and optimization of framed structures, named CEPAO. In the present paper, we try to use CEPAO as a tool, capable of performing a number of numerical examples demonstrating the robustness and efficiency of the proposed algorithm.