11th World Congress on Computational Mechanics (WCCM XI)
5th European Conference on Computational Mechanics (ECCM V)
6th European Conference on Computational Fluid Dynamics (ECFD VI)
July 20 - 25, 2014, Barcelona, Spain

APPLICATION OF ADAPTIVE DYNAMIC RELAXATION TO HIGHLY NONLINEAR GEOTECHNICAL PROBLEMS

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Key Words: *Dynamic Relaxation, Finite Element Method, Computational Geomechanics.*

In this paper, an adaptive dynamic relaxation technique is proposed as an efficient method for large scale nonlinear geotechnical problems. Dynamic relaxation is a numerical method to solve static problems involving highly nonlinear differential equations. Extremely simple implementation and cheap computation resulting from the underlying explicit time integration scheme make this method an attractive candidate for large scale problems.

However, for highly nonlinear problems it may require large number of iterations. As a remedy, an adaptive time stepping approach is proposed to deal with changes in stiffness due to nonlinearity. Moreover, the proposed algorithm is incorporated within a 3D finite element code where analytical solution of the local governing equations, as well as global expression of the strain-displacement matrix, is utilized in order to compensate the slow convergence and optimize the time of computations.

The efficiency of the proposed algorithm is verified by presenting some numerical results from elastoplastic analysis of bearing capacity of square footing with von Mises plasticity model. The results show that apart from a competitive performance for a multiple load increment procedure, this approach is capable of providing a quite good approximation of the failure load in a single load step.

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