Asociación Argentina de Mecánica Computacional

Mecánica Computacional Vol XXVII, págs. 2701-2701 (resumen)
Alberto Cardona, Mario Storti, Carlos Zuppa. (Eds.)
San Luis, Argentina, 10-13 Noviembre 2008

A NUMERICAL ALGORITHM FOR LARGE SCALE ENGINEERING OPTIMIZATION

José Herskovits and José M. Aroztegui

OptimizE - Engineering Optimization Lab, COPPE/UFRJ Caixa Postal 68503. CEP 21045-970 Rio de Janeiro, Brasil, jose@optimize.ufrj.br, http://www.optimize.ufrj.br

Keywords: Large Scale Optimization, Nonlinear optimization, Structural Optimization.

Abstract. This paper is concerned with engineering optimization problems involving a large number of design variables and constraints. We employ a quasi-Newton version of FAIPA, the Feasible Arc Interior Point Algorithm for nonlinear constrained optimization. At each point, FAIPA defines a "feasible descent arc" and finds on this arc a new interior point with a lower objective. To compute the arc, three linear systems with the same matrix must be solved. This matrix includes the quasi-Newton and the constraints derivatives matrices. One of the mains difficulties comes from the large memory requirements to store the quasi Newton matrix and constraints derivatives. The linear systems are solved iteratively and a limited memory quasi Newton formulation is employed, in such a way to avoid the storage of the systems matrix, of the quasi-Newton matrix and of the constraints derivatives. Only the calculus and storage of a directional derivative vector of the constraints and of a gradient of a linear combination of the constraints is required. Numerical experiments with very large structural optimization problems show that the present approach is strong and efficient, requiring relatively modest computer resources. As an application we consider the free material optimization problem that minimizes the weight of a structure subject to mechanical constraints, such as displacement or stress. For planar structures the design variable are the thickness and the six components of the elasticity tensor.