LARGE SCALE PDE-CONSTRAINED OPTIMIZATION

J. Herskovits,
J. M. Aroztegui

OptimizE - Engineering Optimization Lab
COPPE / Federal University of Rio de Janeiro
Caixa Postal 68503
CEP 21945-970 Rio de Janeiro, Brazil
Email: jose@optimize.ufrj.br
http://www.optimize.ufrj.br

Abstract

This paper is concerned with the solution of large scale optimization problems with constraints governed by partial differential equations. We present an algorithm based on 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 a new interior point with a lower objective on this arc. 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. We solve the linear systems iteratively, 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 results show that the present approach is strong and efficient for large scale applications in structural optimization and requires very small data storage.