Linearly constrained optimization without derivatives

M.J.D. Powell
University of Cambridge, England
mjdp@cam.ac.uk

The author has supplied the NEWUOA and BOBYQA packages for optimization without derivatives, when there are no constraints and simple bounds on the variables, respectively. They employ trust regions, quadratic models, and the symmetric Broyden method for updating the second derivatives of the models. They have calculated the solutions of many problems to high accuracy, even when the number of variables, n say, is in the hundreds. Further, when n is large, the total number of evaluations of the objective function seems to be about a multiple of n, instead of being of magnitude n squared. At present the author is trying to develop an extension of these packages that allows general linear constraints on the variables. In order to construct good models in the full space of the variables, it is assumed that the objective function can be calculated at infeasible points, but trust region steps have to satisfy the constraints. The techniques that are under consideration will be described, including a version of truncated conjugate gradients for efficiency when n is large. The progress so far will be reported, but the conference may be too soon for numerical results.