The Hong Kong Polytechnic University
Department of Applied Mathematics

Colloquium

On

The BOBYQA algorithm for bound constrained minimization without derivatives

by

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Abstract

Many successful minimization algorithms employ quadratic models of the objective function that are updated automatically as the iterations proceed. The variables that minimize the current model may be close to those that minimize the given objective function even if the model is highly inaccurate. Further, the updating techniques can capture the information that is important to the position of the minimum without providing good overall accuracy in the model. Thus many functions of n variables can be minimized using only of magnitude n function values when n is large, although a quadratic model has $(n+1)(n+2)/2$ degrees of freedom. This achievement is illustrated well by the performance in practice of the author's software NEWUOA for unconstrained minimization without the calculation of any derivatives. Because of that success, the new algorithm BOBYQA has been developed from NEWUOA. The name denotes Bound Optimization BY Quadratic Approximation, all the variables being constrained by prescribed lower and upper bounds that are satisfied at every point where the objective function is calculated. Thus the trust region subproblems of NEWUOA and BOBYQA are different, as are the choices of extra interpolation points that help the conditioning of the equations that define the changes to the model. Another difference is the response to some consequences of computer rounding errors, which are serious not only in pathological cases but also when very high accuracy is required. These topics are addressed briefly. Then the usefulness of BOBYQA is demonstrated by some numerical examples.

Date	**:**	**6 February, 2009 (Friday)**
Time	**:**	**3:00 – 4:00 p.m.**
Venue	**:**	**Departmental Conference Room HJ610** **The Hong Kong Polytechnic University**

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