MULTI-STEP QUASI-NEWTON METHODS FOR OPTIMIZATION

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Abstract

Quasi-Newton methods update, at each iteration, the existing Hessian approximation (or its inverse) by means of data deriving from the step just completed. We show how "multi-step" methods (employing, in addition, data from previous iterations) may be constructed by means of interpolating polynomials, leading to a generalization of the "secant" (or "quasi-Newton") equation. The issue of positive-definiteness in the Hessian approximations is addressed and shown to depend on a generalized version of the condition which is required to hold in the original "single-step" methods. The results of extensive numerical experimentation indicate strongly that computational advantages can accrue from such an approach (by comparison with "single-step" methods), particularly as the dimension of the problem increases.

Abbreviated Title: Multi-step quasi-Newton methods

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