Preconditioning sequences of linear systems with generalizations of quasi-Newton formulas

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Abstract:

At the heart of Newton based optimization methods is a sequence of symmetric linear systems. Each consecutive system in this sequence is similar to the next, so solving them separately is a waste of computational effort. Here we describe automatic preconditioning techniques for iterative methods for solving such sequences of systems by maintaining an estimate of the inverse system matrix. We update the estimate of the inverse system matrix with quasi-Newton type formulas based on what we call an action constraint instead of the secant equation.