

Comparison of Methods for the Large-Scale Trust-Region Subproblem

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The trust-region subproblem of minimizing a quadratic function subject to a norm constraint arises in optimization when trust regions are used to enforce global convergence of locally-convergent algorithms such as Newton's method. Trust regions can also be used for the regularization of ill-posed problems. Large-scale problems are of special interests in many applications in both optimization and regularization. Until recently, there was essentially one efficient approach available for large-scale problems, namely, the Steihaug-Toint method, which is based on Conjugate Gradients. In recent years, several new methods have been proposed for the solution of this problem.

We have developed a MATLAB implementation of one of the more recent techniques, the LSTRS method. We have compared the method with the following state-of-the-art techniques for the large-scale trust-region subproblem: the Generalized Lanczos Trust Region (GLTR) method of Gould, Lucidi, Roma and Toint, the Sequential Subspace Method (SSM) of Hager, and the Semidefinite Programming (SDP) approach of Fortin and Wolkowicz. We present a brief description of these methods and preliminary results of our comparisons on general trust-region problems and on regularization problems.