ON PROJECTION METHODS FOR ESTIMATING THE DIAGONAL OF A MATRIX INVERSE

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The estimation of the diagonal of the inverse of a symmetric matrix, A, is an important problem in many applications. Following the statistical estimation approach of Hutschinson, several methods for this task (e.g. [1, 3]) depend on presence of an effective method for computing $z^\top A^{-1} z$ for a suite of suitably selected vectors z. Recently, some of these techniques were combined with conjugate gradients, iterative refinement and parallel processing to produce a method that for large matrices gave substantially better performance than previous approaches ([2]). In this paper we propose solvers based on projections that exploit the multiple right-hand sides. We discuss the design of these algorithms and show that they further improve the performance of diagonal matrix inverse estimators.

References

[1] H. Avron and S. Toledo. Randomized algorithms for estimating the trace of an implicit symmetric positive semi-definite matrix. *J. ACM*, 58(2):8, 2011.

[2] C Bekas, A Curioni, and I. Fedulova. Low Cost High Performance Uncertainty Quantification. In *Worskhop on High Performance Computational Finance, Supercomputing'09, Portland*, Oregon, 2009.

[3] C. Bekas, E. Kokiopoulou, and Y. Saad. An estimator for the diagonal of a matrix. *Appl. Numer. Math.*, 57(11-12):1214–1229, Nov. 2007.