

Efficient Preconditioned Methods for Dense Ill-conditioned Linear Systems

Takeshi Ogita
Tokyo Woman's Christian University
ogita@lab.twcu.ac.jp

Abstract

This talk is concerned with accurate numerical solutions of ill-conditioned linear systems whose coefficient matrices are dense. Recently, we have developed some preconditioned methods for this purpose. Using such preconditioned methods, the condition number of the coefficient matrix can be reduced sufficiently. Then we can obtain an accurate solution of the linear system. However, the computational cost for such preconditioned methods is considerably larger than the standard numerical algorithm such as LU factorization, since some matrix multiplication in higher-precision arithmetic is required. In this talk, we modify this point by exploiting the structure of the coefficient matrix, and develop efficient algorithms for solving ill-conditioned linear systems in high accuracy. As a result, the computational cost for the preconditioning can significantly be reduced with similar quality to the previous methods. Numerical results will be presented showing the performance of the algorithms.

References

1. Y. KOBAYASHI AND T. OGITA. A fast and efficient algorithm for solving ill-conditioned linear systems. *JSIAM Letters*, 7 (2015), 1-4.
2. Y. KOBAYASHI AND T. OGITA. Accurate and efficient algorithm for solving ill-conditioned linear systems by preconditioned methods. submitted for publication.