

Accepted Manuscript

A single-step iteration method for non-Hermitian positive definite linear systems

Xiang Wang, Xiao-Yong Xiao, Qing-Qing Zheng

PII: S0377-0427(18)30441-2
DOI: <https://doi.org/10.1016/j.cam.2018.07.021>
Reference: CAM 11807

To appear in: *Journal of Computational and Applied Mathematics*

Received date : 24 September 2017
Revised date : 5 July 2018

Please cite this article as: X. Wang, X.-Y. Xiao, Q.-Q. Zheng, A single-step iteration method for non-Hermitian positive definite linear systems, *Journal of Computational and Applied Mathematics* (2018), <https://doi.org/10.1016/j.cam.2018.07.021>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



A single-step iteration method for non-Hermitian positive definite linear systems *

Xiang Wang[†] Xiao-Yong Xiao[‡] Qing-Qing Zheng[§]

Abstract. An efficient single-step iteration method is presented for solving the large sparse non-Hermitian positive definite linear systems. We theoretically prove that this method converges to the unique solution of the system of linear equations under suitable restrictions. Moreover, we derive an upper bound for the spectral radius of the new iteration matrix. Furthermore, we consider acceleration of the new iteration by Krylov subspace methods and some special properties of the new preconditioned matrix are proposed. Numerical experiments on a few model problems are presented to further examine the effectiveness of our new method.

Key words. Non-Hermitian matrix; convergence theory; matrix splitting; preconditioner; numerical experiment

AMS subject classifications. 65F10, 65F50

1 Introduction

In this paper, we consider the following linear system

$$Ax = b, \tag{1}$$

where $A \in C^{m \times n}$ is a non-Hermitian positive definite matrix (that is, the Hermitian part of A is positive definite), and $x \in C^n$ is an unknown vector and $b \in C^n$ is a given vector. Many problems in scientific computing result in a system of linear equations as (1). For example, molecular scattering, lattice quantum chromodynamics, quantum chemistry, diffuse optical tomography, FFT-based solution of certain time-dependent PDEs, eddy current problem and so on; see [1, 2, 11, 14, 15, 19–24, 29, 31, 38, 42] and references therein.

*Supported by NNSF of China with No.11461046, NSF of Jiangxi Province with No. 20161ACB21005 and No. 20151BAB201009 and the Scientific Research Foundation of Graduate School of Nanchang University with No.YC2016-S040.

[†]Corresponding author, Department of Mathematics, Nanchang University, Nanchang 330031, P. R. China & Numerical Simulation and High-Performance Computing Laboratory, Nanchang University, Nanchang 330031, P. R. China.

[‡]Department of Mathematics, Nanchang University, Nanchang 330031, P. R. China

[§]School of Mathematical Science, Xiamen University, China.

Download English Version:

<https://daneshyari.com/en/article/8901641>

Download Persian Version:

<https://daneshyari.com/article/8901641>

[Daneshyari.com](https://daneshyari.com)