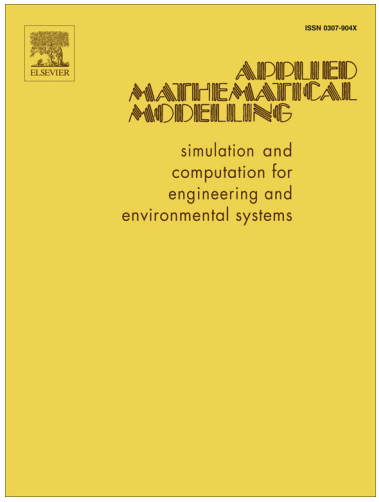

The comparisons of two special Hermitian and skew-Hermitian splitting methods for image restoration

Guang-Hui Cheng, Xi Rao, Xiao-Guang Lv

PII: S0307-904X(14)00392-8
DOI: http://dx.doi.org/10.1016/j.apm.2014.08.002
Reference: APM 10106

To appear in: *Appl. Math. Modelling*

Please cite this article as: G-H. Cheng, X. Rao, X-G. Lv, The comparisons of two special Hermitian and skew-Hermitian splitting methods for image restoration, *Appl. Math. Modelling* (2014), doi: http://dx.doi.org/10.1016/j.apm.2014.08.002

The comparisons of two special Hermitian and skew-Hermitian splitting methods for image restoration

Guang-Hui Cheng[1]*, Xi Rao[1], Xiao-Guang Lv[2]

1. School of Mathematical Sciences,University of Electronic Science and Technology of China, Chengdu, Sichuan, 611731, P. R. China

2. School of Science, Huaihai Institute of Technology, Lianyungang, Jiangsu, 222005, P. R. China

Abstract

In this paper, on the basis of an augmented linear system we propose a new special Hermitian and skew-Hermitian splitting iteration method for solving the linear systems which come from image restoration. The convergence analysis and some comparisons are also shown.

Key words: Hermitian and skew-Hermitian splitting; alternating iteration method; image restoration

AMSC: 65F10; 65F22

1 Introduction

We consider the following data production model for image restoration [1, 2]:

$$g = Af + \eta, \tag{1}$$

where $A \in R^{n^2 \times n^2}$ is a system matrix, $\eta \in R^{n^2}$, $f \in R^{n^2}$ and $g \in R^{n^2}$ represent the noise, the original image, and the blurred and noisy image, respectively. In general, A is a large and ill-conditioned matrix. The Tikhonov regularization method [3, 4] is used to solve the system (1). So, we transform (1) into an equivalent system as follows:

$$\min_f \|Af - g\|_2^2 + \mu^2 \|Lf\|_2^2, \tag{2}$$

*Corresponding author. E-mail: ghcheng@126.com