

On Preconditioned Iterative Methods For Burgers Equations

Zhong-Zhi Bai

ACADEMY OF MATHEMATICS AND SYSTEMS SCIENCE, CHINESE ACADEMY OF
SCIENCES, CHINA
bzz@lsec.cc.ac.cn

Yu-Mei Huang and Michael K. Ng

DEPARTMENT OF MATHEMATICS, HONG KONG BAPTIST UNIVERSITY, HONG
KONG
ymhuang@math.hkbu.edu.hk, mng@hkbu.edu.hk

We study the Newton method and a fixed-point method for solving the system of nonlinear equations arising from the Sinc-Galerkin discretization of the Burgers equations. In each step of the Newton method or the fixed-point method, a structured subsystem of linear equations is obtained and needs to be solved numerically. In this paper, preconditioning techniques are applied to solve such linear subsystems. The bounds for eigenvalues of the preconditioned matrices are derived and numerical examples are given to illustrate the effectiveness of the proposed methods. We also find that a combination of the Newton/fixed-point iterative with the preconditioned GMRES method is quite efficient for the Sinc-Galerkin discretization of the Burgers equations.