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A New Nonstandard Finite Difference Scheme for Burger Equation

Mehdi Zeinadini*
Vali-e-Asr University of Rafsanjan

Sadegh Zibaei
Vali–e–Asr University of Rafsanjan

Mehran Namjoo
Vali-e-Asr University of Rafsanjan

Abstract

In this paper for the numerical solution of Burger equation, a nonstandard finite difference (NSFD) scheme is constructed. In continuation the main properties of NSFD schemes, i.e., positivity and boundedness, are established for proposed NSFD scheme. The efficiency of our scheme are demonstrated by presenting some numerical results.

Keywords: Boundedness, Burger equation, Nonstandard finite difference scheme, Positivity.
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1 Introduction

The non-linear partial differential equation plays an important role in physical science and engineering. Recently, the non-linear equations have attracted much attention of researchers. There are various powerful mathematical methods, including the first integral method, the variational iteration method, the homotopic mapping method, the tanh method and the other methods have been proposed to obtain exact or approximate analytic solutions for the non-linear equations [1, 3]. In this paper we consider Burger equation of the form

$$u_t + uu_x = \mu u_{xx}, \tag{1}$$

where μ is the diffusion coefficient. Analytical solution of this equation is given by

$$u(x,t) = \frac{1}{1 + e^{\frac{1}{2\mu}(x-\frac{1}{2}t)}}. \tag{2}$$

In order to solve Burger equation numerically, many researchers have proposed various numerical methods. Among various techniques for solving partial differential equations, the NSFD schemes have been proved to be one of the most efficient approaches in recent years.

*Speaker