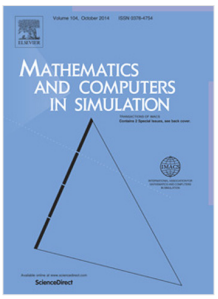
Accepted Manuscript



A stability analysis for a generalized finite-difference scheme applied to the pure advection equation

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PII: S0378-4754(17)30215-X
DOI: http://dx.doi.org/10.1016/j.matcom.2017.06.001
Reference: MATCOM 4469

To appear in: *Mathematics and Computers in Simulation*

Received date : 19 February 2016
Revised date : 6 June 2017
Accepted date : 16 June 2017

Please cite this article as: G. Tinoco-Guerrero, F.J. Domínguez-Mota, A. Gaona-Arias, M.L. Ruiz-Zavala, J.G. Tinoco-Ruiz, A stability analysis for a generalized finite-difference scheme applied to the pure advection equation, *Math. Comput. Simulation* (2017), http://dx.doi.org/10.1016/j.matcom.2017.06.001

A stability analysis for a generalized finite-difference scheme applied to the pure advection equation

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Abstract

This paper deals with a stability analysis for a finite-difference approximation of the pure advection equation which is solved on non-rectangular regions using convex and logically rectangular grids. The analysis is derived as a natural extension to that of the Lax-Wendroff and Lax-Friedrichs schemes for the same kind of regions.

Keywords: stability analysis, finite-difference, advection equation, irregular regions, numerical solution of EDP's
2016 MSC: 65M06, 65M22

1. Introduction

The general problem of this article is to discuss the stability of a finite-difference approximation to the solution of the well posed problem

$$\frac{\partial u}{\partial t} + a\frac{\partial u}{\partial x} + b\frac{\partial u}{\partial y} = 0 \qquad \Omega \times [0,T] \qquad a, b \in I\!R,$$

$$u(x,y,0) = g(x,y) \qquad (x,y) \in \Omega,$$
$$u(x,y,t)|_{S_1} = h(x,y,t) \qquad (x,y) \in \Omega \quad t \in [0,T],$$

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