Some notes on the article [MOH 11]"Solvability of Discrete Two-point Boundary Value Problems"

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Last update: Monday 8th August, 2011. My hope I come back again to learn more...

Abstract: The aim of the article is to study the discrete first-order system of difference equations that arise when one applies the trapezoidal rule to approximate solutions of the non linear second-order scalar ordinary differential equation. Under some conditions on the data and the assumption that the non linear second-order problem has strict lower and strict upper solutions, an existence of the discrete solution is proved for sufficiently small grid size. A convienient homotopy is used to compute the solutions of the discrete approximation.

Key words and phrases: non linear second-order scalar ordinary differential equation; finite difference method; trapezoidal; strict lower and strict upper solutions; existence of the discrete solution; homotopy

Subject Classification: 65L10

1 some remarks...

1. there is a nice review desserves to read in the article
2. nice background of analysis used in the article
3. what about finite element and finite volume approximation of the system [3]–[4]?

2 Problem setting

The problem under consideration is

$$y'' = f(y', y, t), \ t \in (0, 1), \tag{1}$$

with boundary conditions

$$G(y(0), y'(0), y(1), y'(1)) = 0. \tag{2}$$

Problem [1] can be written as

$$y' = z, \tag{3}$$

and

$$z' = f(z, y, t). \quad [4]$$

The discretization of system [3]–[4] can be written as

$$Dy_k = (z_k + z_{k-1})/2, \quad [5]$$

and

$$Dz_k = (f(z_k, y_k, t_k) + f(z_{k-1}, y_{k-1}, t_{k-1}))/2. \quad [6]$$

3 aim....

The aim of the article under review is to:

1. existence for [5]–[6]
2. how to compute the solution of [5]–[6]

References

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