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Convergence of difference methods for boundary value problems of ODE's with discontinuities. (English) Zbl 0708.65060

Demonstr. Math. 22, No. 1, 51-65 (1989).

The author considers the numerical solution of boundary value problems of the form

$$y''(t) = f(t, y(t)), \quad t \in [a, b], \quad y(a) = y_0, \quad y(b) = y_1,$$

with $f: [a, b] \times B \rightarrow B$, where B is a real Banach space. He provides results for the convergence of the quasilinear nonstationary difference method

$$y_h(t+h) - 2y_h(t) + y_h(t-h) = h^2 F(t, h, y_h), \quad y_h(a) = y_0, \quad y_h(b) = y_1,$$
$$F(t, h, y_h) = F(t+h, t, t-h, h, y_h(t+h), y_h(t), y_h(t-h))$$

where the mapping F is related to f . The convergence is shown under the condition of consistency and of Lipschitz-continuity of F with respect to the grid functions.

Reviewer: [Helmut Weber \(Wiesbaden\)](#)

MSC:

- [65J15](#) Numerical solutions to equations with nonlinear operators
- [65L10](#) Numerical solution of boundary value problems involving ordinary differential equations
- [34G20](#) Nonlinear differential equations in abstract spaces
- [34B15](#) Nonlinear boundary value problems for ordinary differential equations

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Keywords:

[boundary value problems](#); [Banach space](#); [convergence](#); [quasilinear nonstationary difference method](#)

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