

Kuo, Hung-Ju; Trudinger, Neil S.

Discrete methods for fully nonlinear elliptic equations. (English) Zbl 0745.65058
SIAM J. Numer. Anal. 29, No. 1, 123-135 (1992).

This work considers fully nonlinear elliptic equations satisfying structure conditions modelled on linear uniformly elliptic equations. Thus, the stability analysis depends on estimates for nonlinear difference equations of positive type which are consequences of earlier work of the authors [Math. Comp. 55, 37-53 (1990; [Zbl 0716.39005](#))] concerned with linear difference equations with random coefficients. Further, when classical solutions do not exist, the concept of a weak solution becomes important for both existence and approximation considerations.

Here the resulting solutions are characterized in the viscosity sense of *M. G. Crandall* and *P.-L. Lions* [Trans. Amer. Math. Soc. 277, 1-42 (1983; [Zbl 0599.35024](#))]. Developing elliptic difference schemes which are consistent with the nonlinear equation, treating the relationship between consistent difference schemes and viscosity solutions, thereby proving the stability of direct approximations, finally providing iterative schemes for solving the approximating difference equations, the authors emphasize that these works are intended as preliminary theoretical thrusts at the numerical approximation of nonclassical solutions of fully nonlinear equations.

Reviewer: [E.Lanckau \(Chemnitz\)](#)

MSC:

- [65N06](#) Finite difference methods for boundary value problems involving PDEs
- [65N12](#) Stability and convergence of numerical methods for boundary value problems involving PDEs
- [35J65](#) Nonlinear boundary value problems for linear elliptic equations

Cited in 1 Review
Cited in 28 Documents

Keywords:

discrete approximation; Dirichlet problem; positive type; consistent scheme; fully nonlinear elliptic equations; stability; nonlinear difference equations; random coefficients; weak solution; viscosity solutions; iterative schemes; nonclassical solutions

Full Text: [DOI](#)