
Zbl 1209.65128

Böhmer, Klaus

Numerical methods for nonlinear elliptic differential equations. (English)

Numerical Mathematics and Scientific Computation. Oxford: Oxford University Press. xxvii, 746 p. £ 79.50 (2010). ISBN 978-0-19-957704-0/hbk

<http://dx.doi.org/10.1093/acprof:oso/9780199577040.001.0001>

A first part of the book treats in a short glance the theory of linear and nonlinear partial differential equations and systems of these equations as far as this knowledge is necessary for the understanding of the numerical ideas.

In view of the many different types of numerical procedures developed in order to solve nonlinear elliptic differential equations approximately, results of a general theory of discretizations algorithms are presented in a special chapter and are later used in order to prove the existence of unique numerical solutions and their convergence to the solution of the original problem.

Together with co-authors, fundamental chapters on adaptive finite element methods (FEMs), discontinuous Galerkin methods and variational methods for wavelets and adaptive wavelet methods were written besides detailed chapters on conformal and non-conformal FEMs.

Classic finite difference methods are also described and investigated in an excellent but comparatively not as detailed way.

The book is really impressive due to consequently kept standardized designations and by the clearness concerning the theoretical analysis of the different procedures. It is far away from being only a pure synopsis of methods as indicated by the subtitle.

Moreover, it includes a very detailed index and a list of nearly 700 references which reads as a Who Is Who in modern theoretical numerical analysis.

To read this book is really an enjoyment and goldmine for every expert as well as for every well-interested and well-educated student. The design of the book by the publisher is also excellent.

Rainer Ansorge (Hamburg)

Keywords : nonlinear elliptic differential equations; stability; convergence; monograph; algorithms; finite element methods; discontinuous Galerkin methods; variational methods; adaptive wavelet; finite difference methods

Classification :

- *65N30 Finite numerical methods (BVP of PDE)
- 65N06 Finite difference methods (BVP of PDE)
- 65T60 Wavelets
- 35J60 Nonlinear elliptic equations
- 65-02 Research monographs (numerical analysis)
- 76M10 Finite element methods
- 76M20 Finite difference methods
- 76M25 Other numerical methods
- 65N12 Stability and convergence of numerical methods (BVP of PDE)