Serre, Denis

Systems of conservation laws. II: Geometric structures, oscillations and mixed problems. (Systèmes de lois de conservation. II: Structures géométriques, oscillations et problèmes mixtes.) (French) Zbl 0930.35003

Fondations. Paris: Diderot Editeur. iii, 306 p. (1996).

This book is the second volume of a comprehensive work on the theory of the systems of hyperbolic and parabolic conservation laws (for Vol. I see Zbl 0930.35002 above).

The eight chapters of the volume can be read almost independently as an introduction - sometimes, a very advanced one – to some of the more uptodate research topics in the field.

The following topics are discussed: the theory of invariant domains for parabolic regularizations of systems; the application to hyperbolic conservation laws of the methods of compensated compactness (following the original work by Tartar, DiPerna and the author himself); the propagation of oscillations with large amplitude in entropy solutions of scalar equations and systems; the weakly nonlinear geometric optics; the rich systems and the Temple's systems; the formulation of boundary conditions and boundary layers, which is studied both for scalar equations and for systems; the Lopatinskij condition for well-posedness, as well as the problem of the stability of shock waves in multi-dimensional gas dynamics. Finally, the last chapter is devoted to the theory of boundary layers for parabolic problems, reporting some important results, partially due to the author himself.

Some of the above topics can be regarded as monographic research topics, in the general framework of a graduated course on conservation laws and nonlinear waves.

It can be observed that, in spite of a great generality in the presentation, the work does not present a few very important topics in the theory, like the Bressan's uniqueness and stability semigroup theory, relaxation phenomena, generalized characteristics, the N-waves asymptotic behavior of solutions or the kinetic formulation. Nevertheless, it is an indispensable reference book for both young and expert researchers in this exciting field.

Reviewer: Alberto Tesei (Roma)

MSC:

35-01	Introductory exposition (textbooks, tutorial papers, etc.) pertaining to partial differential equations	Cited in **2** Reviews Cited in **28** Documents
35L65	Hyperbolic conservation laws	
35L67	Shocks and singularities for hyperbolic equations	
35L40	First-order hyperbolic systems	

Keywords:

invariant domains for parabolic regularizations; compensated compactness; entropy solutions; nonlinear geometric optics; multi-dimensional gas dynamics; boundary layers for parabolic problems