Numerical Solution of Hyperbolic Partial Differential Equations is a new type of graduate textbook, with both print and interactive electronic components (on CD). It is a comprehensive presentation of modern shock-capturing methods, including both finite volume and finite element methods, covering the theory of hyperbolic conservation laws and the theory of the numerical methods.

Classical techniques for judging the qualitative performance of the schemes, such as modified equation analysis and Fourier analysis, are used to motivate the development of classical higher-order methods (the Lax–Wendroff process) and to prove results such as the Lax Equivalence Theorem.

The range of applications (shallow water, compressible gas dynamics, magnetohydrodynamics, finite deformation in solids, plasticity, polymer flooding and water/gas injection in oil recovery) is broad enough to engage most engineering disciplines and many areas of applied mathematics.

The solution of the Riemann problems for these applications is developed, so that the reader can use the theory to develop test problems for the methods, especially to measure errors for comparisons of accuracy and efficiency. The numerical methods involve a variety of important approaches, such as MUSCL and PPM, TVD, wave propagation, Lax–Friedrichs (aka central schemes), ENO, and discontinuous Galerkin; all of these are discussed in one and multiple spatial dimensions. Since many of these methods depend on Riemann solvers, there is extensive discussion of the basic design principles of approximate Riemann solvers, and several computationally useful techniques. The final chapter contains a discussion adaptive mesh refinement via structured grids.

The accompanying CD contains a hyperlinked version of the text, which provides access to computer codes for all of the text figures. Through this electronic text students can:

- See the codes and run them, choosing their own input parameters interactively
- View the online numerical results as movies
- Gain an appreciation for both the dynamics of the problem application, and the growth of numerical errors
- Download and modify the code for use with other applications
- Study the code to learn how to structure their programs for modularity and ease of debugging

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