There are just a few, easily corrected, typographical errors in the displayed equations of this book. More numerous, though perhaps no more numerous than is the norm nowadays, are the misspelled English words. The book does not claim to be a comprehensive account of the numerical solution of the Euler equations, nor of upwind methods for the Euler equations (central differences and the competitors to Osher's scheme are not discussed). Statements like "Nowadays, finite volume schemes are almost universally used for shock capturing codes" could be misleading to a novice. There are many working codes which are based on finite difference methods and which produce very good results for problems with shocks. The expert reader who has had trouble with convergence to steady state may look at the convergence plots in Chapter 4 of this book and wonder if the algorithm would produce solutions accurate to machine zero if iterated indefinitely. One who wanted to play the devil's advocate could look at some of the plots in Chapter 3 and claim they showed a convergence rate which is not independent of grid size (the method converging slower on finer grids).

These caveats noted, this book is the best single reference for a person trying to construct a multigrid code for the steady Euler equations. In this reviewer's opinion, a novice in the field of computational fluid dynamics, armed only with this book, could produce a working code. This is a tribute to the book's completeness and clarity.

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24[65–02, 65N30].—D. LEGUILLON & E. SANCHEZ-PALENCIA, *Computation of Singular Solutions in Elliptic Problems and Elasticity*, Wiley, Chichester, 1987, 200 pp., 24 cm. Price $42.95.

The monograph is focused on the explicit computation of the singular solutions near corners and interfaces in plane elasticity theory for multimaterials.

These problems are governed by the elasticity system with piecewise constant coefficients. Indeed, the constitutive law is different in each component of the material under consideration. The jumps in the coefficients are across the interfaces between the different components. These interfaces are usually assumed to be straight, or polygonal, lines. One can also view these problems as transmission problems across these interfaces.

The general theory shows that the solutions to these problems behave as

$$r^{\alpha}u(\theta) + \text{more regular terms}$$

in polar coordinates, where r is the distance to the singular point under consideration, which is either one corner of the boundary, or a corner of an interface, or even a point where an interface meets the boundary.

The corresponding stresses behave as $r^{\alpha-1}$ and therefore may become infinite as r goes to 0 when $\operatorname{Re}\alpha < 1$. Although this is in clear contradiction with the assumption that the strains remain small, which legitimizes the linear theory, it turns out in practice that it provides a good hint of where damage may occur. The smaller α is, the likelier is the damage.

The general theory of singular solutions is not provided in this monograph. However, assuming that the data, volume loads and surface loads, vanish in the vicinity of the corner or singular point under consideration, the authors give a very straightforward and illuminating analysis that shows the form of the singular solution there.

The analysis of the case of one single material shows that α is the solution of a rather complicated transcendental equation. The corresponding transcendental equations for multimaterials seem quite out of reach by classical analysis. This is why it is sensible to rely on numerical computation for producing approximate values of the corresponding α.

Two approaches to the actual calculation of α are described. They are based on the fact that the above u is the solution of a second-order boundary value problem for a system of two ordinary differential equations that depend quadratically on α.

In the first approach, the boundary value problem is discretized directly by the finite element method using piecewise linear functions. The approximate problem reduces to finding the zeros of a determinant $D(\alpha)$ that depends analytically on α. The method is quite cheap, yet accurate.

In the second approach, one performs a preliminary reduction of the order with respect to α, by writing the boundary value problem as a first-order system. Then one faces the more common problem of finding eigenvalues and eigenvectors to a boundary value problem for a system of ordinary differential equations. Again, this is approximated by piecewise linear elements. One is left with the problem of finding the eigenelements for a large matrix that is nonsymmetric in most cases. This method is more expensive and requires heavier equipment, but it also allows one to calculate u approximately.

The whole monograph is very clearly written. Many illustrative examples are provided. It will certainly be very helpful to engineers.

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25[49–01, 49H05].—M. J. SEWELL, *Maximum and Minimum Principles—A Unified Approach, with Applications*, Cambridge Univ. Press, Cambridge, 1987, xvi+468 pp., 23 $\frac{1}{2}$ cm. Price \$79.50 hardcover, \$34.50 paperback.

This is a text on operational variational methods. It concentrates on how to associate extremum principles with differential equations and applied problems. The book requires a minimal mathematical background and provides a large number of examples. The book has many exercises, so it could be used as a text in a mathematical methods course.