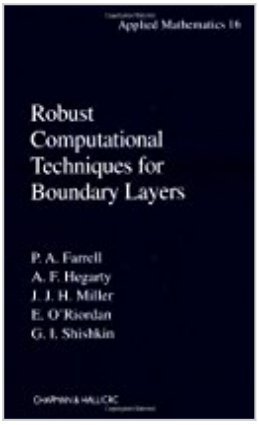

Robust Computational Techniques for Boundary Layers (Applied Mathematics)

By Paul Farrell, Alan Hegarty, John M. Miller, Eugene O'Riordan, Grigory I. Shishkin

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Current standard numerical methods are of little use in solving mathematical problems involving boundary layers. In Robust Computational Techniques for Boundary Layers, the authors construct numerical methods for solving problems involving differential equations that have non-smooth solutions with singularities related to boundary layers. They present a new numerical technique that provides precise results in the boundary layer regions for the problems discussed in the book. They show that this technique can be adapted in a natural way to a real flow problem, and that it can be used to construct benchmark solutions for comparison with solutions found using other numerical techniques.

Focusing on robustness, simplicity, and wide applicability rather than on optimality, Robust Computational Techniques for Boundary Layers provides readers with an understanding of the underlying principles and the essential components needed for the construction of numerical methods for boundary layer problems. It explains the fundamental ideas through physical insight, model problems, and computational experiments and gives details of the linear solvers used in the computations so that readers can implement the methods and reproduce the numerical results.

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Editorial Review

Review
"In summary I think the early sections of the book give a very nice picture of the difficulties associated with singularly perturbed convection-diffusion problems. The insight gained from the structure of the uniform convergence proofs could be used to analyze different discretizations and mesh adaptations strategies. The extensive number of two-dimensional examples could also serve as a great source of benchmark solutions to test other approaches." -SIAM Review vol. 43, no.3 (549-581)

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