Adaptive Finite Element Methods for Differential Equations

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著者:Rannacher, Rolf

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The key issues are a posteriori error estimation and it automatic mesh adaptation. Besides the traditional approach of energy-norm error control, a new duality-based technique, the Dual Weighted Residual method for goal-oriented error estimation, is discussed in detail. This method aims at economical computation of arbitrary quantities of physical interest by properly adapting the computational mesh. This is typically required in the design cycles of technical applications. For example, the drag coefficient of a body immersed in a viscous flow is computed, then it is minimized by varying certain control parameters, and finally the stability of the resulting flow is investigated by solving an eigenvalue problem. Goal-oriented' adaptivity is designed to achieve these tasks with minimal cost.At the end of each chapter some exercises are posed in order to assist the interested reader in better understanding the concepts presented. Solutions and accompanying remarks are given in the Appendix.

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