



# Higher-Order Finite Element Methods (Studies in Advanced Mathematics)

*Pavel Solin, Karel Segeth, Ivo Dolezel*

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The finite element method has always been a mainstay for solving engineering problems numerically. The most recent developments in the field clearly indicate that its future lies in higher-order methods, particularly in higher-order *hp*-adaptive schemes. These techniques respond well to the increasing complexity of engineering simulations and satisfy the overall trend of simultaneous resolution of phenomena with multiple scales.

**Higher-Order Finite Element Methods** provides an thorough survey of intrinsic techniques and the practical know-how needed to implement higher-order finite element schemes. It presents the basic principles of higher-order finite element methods and the technology of conforming discretizations based on hierarchic elements in spaces  $\mathbf{H}^1$ ,  $\mathbf{H}(\text{curl})$  and  $\mathbf{H}(\text{div})$ . The final chapter provides an example of an efficient and robust strategy for automatic goal-oriented *hp*-adaptivity.

Although it will still take some time for fully automatic *hp*-adaptive finite element methods to become standard engineering tools, their advantages are clear. In straightforward prose that avoids mathematical jargon whenever possible, this book paves the way for fully realizing the potential of these techniques and putting them at the disposal of practicing engineers.

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