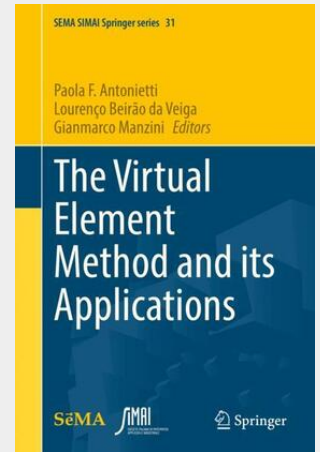


The Virtual Element Method and its Applications

The purpose of this book is to present the current state of the art of the Virtual Element Method (VEM) by collecting contributions from many of the most active researchers in this field and covering a broad range of topics: from the mathematical foundation to real life computational applications. The book is naturally divided into three parts. The first part of the book presents recent advances in theoretical and computational aspects of VEMs, discussing the generality of the meshes suitable to the VEM, the implementation of the VEM for linear and nonlinear PDEs, and the construction of discrete hessian complexes. The second part of the volume discusses Virtual Element discretization of paradigmatic linear and non-linear partial differential problems from computational mechanics, fluid dynamics, and wave propagation phenomena. Finally, the third part contains challenging applications such as the modeling of materials with fractures, magneto-hydrodynamics phenomena and contact solid mechanics. The book is intended for graduate students and researchers in mathematics and engineering fields, interested in learning novel numerical techniques for the solution of partial differential equations. It may as well serve as useful reference material for numerical analysts practitioners of the field.

The virtual element method (VEM) is a recent Galerkin finite element method suited to the numerical discretization of partial differential equations on unstructured meshes with polygonal and polyhedral elements. The VEM was proposed to the scientific community in 2013, but despite its youthness, it has now reached a high maturity level. Indeed, a huge amount of work in this decade has been carried out to develop, analyse and apply the method and its many variants to a wide range of applications. The purpose of this book is to present the current state of the art of the VEM by collecting contributions from many of the most active researchers in this field and covering a broad range of topics: from the mathematical foundation to real life computational applications.



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