Modulbeschreibung für Vertiefungsmodule des Wahlpflichtbereiches

Titel des Moduls	Adaptive Finite Element Methods
In englischer Sprache	Adaptive Finite Element Methods

R	
A	x

	Vorlesung	Übung
Umfang	4	2

Inhalt

This lecture aims at an introduction to modern adaptive finite element methods for conforming and nonstandard versions in theory and practice following the seminal papers of Dörfler (1994) and Stevenson (2007) followed by many others. Although the lecture does not assume particular knowledge on finite element methods at the beginning, the goal is to guide the students towards the level of international research in this strikingly relevant area of cognitive algorithms in computational sciences.

Syllabus in key words

Finite Element Method (FEM), regular triangulation, adaptive mesh-refining, closure algorithm, overhead control, plain convergence, reliable and efficient a posteriori error control, guaranteed error control, inexact solve, error reduction property, estimator reduction property, contraction property, linear convergence, approximation classes, discrete reliability, optimal convergence rates, software realisation, AFEM matlab code, Crouzeix-Raviart nonconforming FEM, Raviart-Thomas mixed FEM, discrete Helmholtz decomposition, quasi-orthogonality, quasi-optimal convergence rates, iterative solvers, Stokes equations, Navier-Lame equations, nonlinear problems, eigenvalue problems, convex minimisation problems, variational inequalities.

Reference:

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[4] R. Stevenson: Optimality of a standard adaptive finite element method. Foundations of Computational Mathematics, 7(2):245–269, 2007

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Voraussetzungen	Grundvorlesung zur Numerik, Grundkenntnisse zu partiellen Differentialgleichungen

Regelsemester	Ab Vordiplom, Bachelor 4. Semester Master (PhD-Studenten)

Abschluss	Prüfung

Prüfungszulassungsvoraussetzung	Teilnahme an den Übungen sowie ein Projekt

Studienpunkte	10

R = Reine Mathematik
A = Angewandte Mathematik