6th European Conference on Computational Mechanics (ECCM VI)
7th European Conference on Computational Fluid Dynamics (ECFD VII)
June 11–15, 2014, Glasgow, Scotland

FULLY-NESTED INTERPOLATORY QUADRATURES FOR 1D AND ND UNCERTAINTY QUANTIFICATION

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Key words: *Uncertainty quantification, Leja sequences, interpolatory quadrature, Smolyak's sparse grids*

ONERA has been involved in both practical studies in Uncertainty Quantification (UQ) [2, 3] and theoretical improvement of computational methods for (UQ) [4]. In this work, Leja-type fully nested sets of points are considered in order to derive interpolatory quadratures for 1D integration. Extension to nD integration is then carried out using Smolyak's sparse grids.
It has often been observed that successive minimization of a scalar criterion (max of Leja product, Lebesgue constant, max of squared sum of Lagrange interpolants...) to define a sequence of nested sets of points, leads to high peaks in Lebesgue constants [1]. This is the reason why, on top of sequences of this type (classical Leja, sequence minimizing Lebesgue constant and integral of Lebesgue function) sequences defined by a global minimization of these criteria for all cardinals are derived.
The effectiveness of corresponding 1D interpolatory quadratures and Smolyak sparse grids is discussed for mathematical test functions and simple aerodynamic (UQ) problems.

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