

Regularization of rough linear functionals and adaptivity

Felipe Millar¹, Ignacio Muga¹, Sergio Rojas¹ and Kristoffer G. Van der Zee²

¹ Instituto de Matemáticas, Pontificia Universidad Católica de Valparaíso, Chile,
ignacio.muga@pucv.cl

² School of Mathematics, The University of Nottingham, UK,
Kg.Vanderzee@nottingham.ac.uk

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Rough linear functionals (such as Dirac Delta distributions) often appear on the right-hand side of variational formulations of PDEs. As they live in negative Sobolev spaces, they dramatically affect adaptive finite element procedures to approximate the solution of a given PDE. To overcome this drawback, we propose an alternative that, in a first step, computes a projection of the rough functional over piecewise polynomial spaces, up to a desired precision in a negative norm sense. The projection (being L^p -regular) is then used as the right-hand side of a regularized problem for which adaptive Galerkin methods performs better. An error analysis of the proposed methodology will be shown, together with numerical experiments.