A phase field approach for an elliptic inverse problem with discontinuous coefficients

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The talk is concerned with the inverse problem of recovering interfaces along which the piecewise constant diffusion coefficient in an elliptic PDE has jump discontinuities. The reconstruction of the interfaces is based on a least squares approach together with a perimeter regularization. A suitable relaxation of the perimeter leads to a sequence of Cahn-Hilliard type functionals for which we obtain a Γ-convergence result. Using a finite element discretization of the elliptic PDE and a suitable adjoint problem we derive an iterative method in order to approximate discrete critical points.

We prove convergence of the iteration and present results of numerical tests.

This is joint work with Charlie Elliott (Warwick) and Vanessa Styles (Sussex).