

Numerical analysis of linearised hybrid inverse problems

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Hybrid inverse problems describe novel imaging methods that make use of coupled physical phenomena to provide images with high contrast and high resolution. We consider two such problems where the mathematical formulation is given by a system of generalised Laplace problems augmented with additional internal data. When the magnitude of the internal current density vector field is known the method is called Current Density Impedance Imaging (CDII) and when the internal power density is known the method is called Ultrasound Modulated Electrical Impedance Tomography (UMEIT). The simplest way of treating such inverse problems is to analyse the corresponding linearisations. For both methods, a theoretical analysis can tell whether or not the linearised problem is elliptic and thereby provide information about when to expect a well-posed reconstruction with optimal stability. A numerical implementation of the two linearised problems has been made in order to analyse and verify these theoretical results.