

Direct 3D reconstruction for the Calderón problem

Kim Knudsen, Technical University of Denmark

k.knudsen@mat.dtu.dk

The Calderón problem asks for the determination and stable reconstruction of a conductivity distribution in a domain from knowledge of Cauchy data on the boundary of the domain. The problem models the imaging technology known as Electrical Impedance Tomography. There is a rich theory for the problem, and several reconstruction methods have been suggested. Among them is the scattering transform method, which is based on the so-called complex geometrical optics solutions to the governing equations. Even though the approach is based on the use of highly oscillatory boundary fields and hence quite unstable, the method has great advantages. Indeed it is direct (no iterations required) and globally convergent.

The theory for the scattering transform method in 3D was established in 1987-88, but only recently the theory was realized as a numerical algorithm. In this talk we will present this numerical algorithm and evaluate the performance on several 3D examples. We will discuss the benefits and challenges of the method, and finally we will show that the method has an interpretation as a rigorous regularization method.

This work is joint with Fabrice Delbary and Per Christian Hansen, Technical University of Denmark.