Convergence of the Linear Sampling Method

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Abstract

The Linear Sampling Method is one in a new class of methods for the reconstruction of domains in inverse scattering problems. In this class of methods, the reconstruction is obtained directly from spectral properties of a linear integral operator defined by the data. In particular, no solutions of direct problems are necessary for the reconstruction. In a number of papers, the Linear Sampling Method has also recently been extended to electromagnetic scattering problems.

A drawback of the method is that many aspects of the mathematical theory remain open. First results in this direction have been published some years ago [1]. In this talk, some new results in this direction will be presented. On the one hand, regularization strategies can be formulated, that preserve the convergence properties proven in [1] in the presence of noisy data. On the other hand it is proved that the reconstruction of a domain using the Linear Sampling Method can be obtained solely by pointwise evaluations of certain Herglotz wave functions.

These new results form an important step towards a solid mathematical basis for the Linear Sampling Method. In particular, some aspects of the ususal application of Linear Sampling are shown to be problematic while some numerical observations on improving the method are confirmed theoretically.

References

[1] T. Arens, Why Linear Sampling works! *Inverse Problems*, *20*, 163–173 (2004).