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Optimal design of optical analog solvers of linear systems. (English) Zbl 07451772
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Summary: In this paper, given a linear system of equations $\mathbf{A} \mathbf{x} = \mathbf{b}$, we are finding locations in the plane to place objects such that sending waves from the source points and gathering them at the receiving points solves that linear system of equations. The ultimate goal is to have a fast physical method for solving linear systems. The issue discussed in this paper is to apply a fast and accurate algorithm to find the optimal locations of the scattering objects. We tackle this issue by using asymptotic expansions for the solution of the underlying partial differential equation. This also yields a potentially faster algorithm than the classical BEM for finding solutions to the Helmholtz equation.

MSC:

65-XX Numerical analysis

35C20 Asymptotic expansions of solutions to PDEs

78A46 Inverse problems (including inverse scattering) in optics and electromagnetic theory

Keywords:

optical solver of linear systems; scattering of waves; Neumann functions

Full Text: [DOI](#) [arXiv](#)

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