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Discrete Green functions

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ABSTRACT

The purpose of this work is to construct explicit expressions of the Green functions for the self-adjoint boundary value problems on finite networks. The method consists in reducing each boundary value problem either to a Dirichlet problem or to a Poisson equation on a new network closely related with the former boundary value problem. We express the Green function in terms of equilibrium measures solely, which can be obtained as the unique solution of linear programming problems. When the network has a high degree of symmetry, the equilibrium measures can be computed by hand and so are the Green functions. In particular, we construct the Green function for the Poisson equation on a distance-regular graph and the Green function for the Neumann problem on a ball of an homogeneous tree.

Keywords: *Green functions, networks, equilibrium problems*

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