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Using Kronecker products to construct mimetic gradients

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Abstract

This paper describes how discrete versions of the derivative on the real line induce discrete version of the gradient and divergence in higher dimensions. This is geometrically motivated by results in algebraic graph theory since the grid in *n* dimensions is the graph Kronecker product of the path on *n* vertices. The resulting technique relies heavily on the matrix Kronecker product, and is an analogue of a derivation in multilinear algebra.

Keywords: Higher order mimetic discretizations, Staggered one-dimensional grid, Toeplitz, algebraic graph theory, Laplacian matrix

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