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Numerical methods for optimal mass transport

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Optimal Mass Transport is an important problem that appears in wide range of disciplines. Its applicability has been demonstrated in image processing tasks such as registration and morphing where it has been shown that the mass transport model fits a variety of images such as fluid flow, flame propagation, clouds and more.

Recently, a mathematical framework was proposed to solve this problem. Within this framework, the problem is converted to a time dependent PDE with a trajectory that converges to the solution of the optimization problem. In the current work we explore a numerically efficient method for the solution of the reformulated problem. We show that by combining a consistent discretization, an appropriate conservative iteration and multilevel/multigrid methods for the solution of the problem we can dramatically reduce the computational cost associated with its solution. This makes the use of this approach on 3D grids and other large bodies of data feasible and furthers the applicability of OMT for image processing tasks.