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Efficient methods for image registration with volume constraints

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Image registration is a highly ill posed problem. We present a mathematically sound formulation that explicitly controls the deformation in terms of the determinant of the Jacobian of the transformation. This approach guaranties grid regularity and prevent folding.

To solve the large-scale inequality constrained optimization problem, we present a numerical approach based on a multilevel primal dual SQP method. We demonstrate its efficiency on a few model problems.