Variational Models for Restoring Manifold-Valued Images

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We introduce new non-smooth variational models for the restoration of manifold-valued images which also include second order differences in the regularization term. The approach requires a combination of techniques from numerical analysis, convex optimization and differential geometry. In order to minimize the corresponding functionals, we generalize three kind of algorithms:

- i) inexact cyclic proximal point algorithm,
- ii) half-quadratic minimization,
- iii) Douglas Rachford splitting.

We propose an efficient strategy for the computation of the corresponding proximal mappings in symmetric spaces. For the first algorithm we utilizing the machinery of Jacobi fields. We demonstrate the performance of our algorithms in particular for the *n*-sphere, the rotation group SO(3) and the manifold of symmetric positive definite matrices We prove the convergence of the proposed algorithms in Hadamard spaces.

Finally, we introduce a nonlocal denoising model which utilizes second order statistics.

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