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Research Article

Total Variation Regularization of Matrix-Valued Images

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Abstract

We generalize the total variation restoration model, introduced by Rudin, Osher, and Fatemi in 1992, to matrix-valued data, in particular, to diffusion tensor images (DTIs). Our model is a natural extension of the color total variation model proposed by Blomgren and Chan in 1998. We treat the diffusion matrix D implicitly as the product $D=LL^T$, and work with the elements of L as variables, instead of working directly on the elements of D . This ensures positive definiteness of the tensor during the regularization flow, which is essential when regularizing DTI. We perform numerical experiments on both synthetical data and 3D human brain DTI, and measure the quantitative behavior of the proposed model.

Abstract

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