WAVELETS AND GENERALIZED SPLINES FOR RADON TRANSFORM ON COMPACT LIE GROUPS WITH APPLICATIONS TO CRYSTALLOGRAPHY

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The Radon transform $\mathcal{R}f$ of functions f on $SO(3)$ has recently been applied extensively in texture analysis, i.e. the analysis of preferred crystallographic orientation. In practice one has to determine the orientation probability density function $f \in L_2(SO(3))$ from $\mathcal{R}f \in L_2(S^2 \times S^2)$ which is known only on a discrete set of points. Since one has only partial information about $\mathcal{R}f$ the inversion of the Radon transform becomes an ill-posed inverse problem. Motivated by this problem we define a new notion of the Radon transform $\mathcal{R}f$ of functions f on general compact Lie groups and introduce two approximate inversion algorithms which utilize our previously developed generalized variational splines on manifolds. Our new algorithms fit very well to the application of Radon transform on $SO(3)$ to texture analysis. Alternatively an approach by continuous diffusive wavelets will be highlighted.