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Images as Manifolds Embedded in a Spatial–Feature Non-Euclidean Space

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Abstract

In image analysis, processing and understanding, it is highly desirable to be able to process images and feature domains by methods that are specific to these domains. We show how the geometrical framework of scale-space flows is most convenient for this purpose, and demonstrate, as an example, how different models of color perception can be interpreted as different geometries of the color space and result in a variety of processing schemes. We go beyond these models and show how one can switch locally between the L_1 and L_2 norms for different processing flows of spatial and color domains. The parameter that interpolates between the norms is the magnitude of contrast/luminance, taken here as a local function of the image embedding space. The resulting spatial and grey level/luminance preserving flow, can be used for conditional denoising and segmentation. These examples demonstrate that the proposed framework can incorporate context or task-related data, furnished by either the human user or an active vision subsystem in a coherent and convenient way.