Public Abstract

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Title: Adaptive Bilateral Extensor for Image Interpolation

Large archives of digital images exist that have been captured at a low resolution. It is desirable to improve the resolution of these images to leverage the advantages of current state-of-the-art applications. Performing image interpolation will increase the resolution by a specified zoom factor. For example, performing interpolation by a zoom factor of two on the source image will double the resolution of the resulting image. Numerous applications exist to utilize the resulting interpolated images including forensic sciences, commercial and consumer photo restoration, scientific visualization, remote sensing, and defense applications.

A novel algorithm for image interpolation, referred to as adaptive bilateral extensor interpolation, is proposed in this thesis. It creates a mapping between the distance and intensity of pixel values. The accuracy of the mapping is enhanced by methods of edge detection and orientation estimation with an edge-preserving image filter to accurately interpolate along rather than across edge boundaries.

Results show the adaptive bilateral extensor to be qualitatively and quantitatively superior to current state-of-the-art interpolation algorithms. The adaptive bilateral extensor is particularly advantageous since it is able to supersample an image without producing aliasing or artifacts in the interpolated result. The proposed algorithm is also applied to pan-sharpen remote sensing images.