Abstract

Radiometric degradation is a common problem in the image restoration part of many applications. The degradation may involve blurring, information loss due to sampling, quantization effects and various sources of noise. The purpose of image restoration is to estimate the original image from the degraded image. There is much research carried out in an effort to deblur such images. To tackle this problem, different blur invariants had existed so far. Wavelet domain blurs invariants are used only for discrete 2D signals in spatial domain where it is concentrated in centrally symmetric blurs and also in the wavelet domain, directional prediction is so hard to find smoother contours. In this paper, the Contourlet Transform was proposed to address the lack of geometrical structure in the separable 2D Wavelet Transform. Because of its filter bank structure, the Contourlet Transform is not Shift invariant. Contourlet not only possess the features of wavelet (namely multiscale and time frequency localization), but also offer a high degree of directionality and anisotropy. The Contourlet domain invariant is proposed for both 2D and 3D signals based on frequency domain. By using disc and motion filter, the blur images are produced and are divided into equal pixels and also the dependent terms are discarded in blur invariants which reduce correlation, simplifies computation and also...
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reduces noise using a Wiener filter in order to get the deblurred image. It is also proved that frequency domain blur invariants are a special version of the proposed invariants and numerical experiments on an image deblurring show that the proposed new Contourlet Transform can significantly outperform in terms of PSNR (by several DB's). It is widely used in various fields of applications, such as medical imaging, astronomical imaging, remote sensing, microscopy imaging, photography imaging, photography deblurring and forensic

References

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M. N. Do and M. Vetterli, *The contourlet transform: An efficient directional

**Index Terms**

Computer Science  
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**Keywords**

Blur moment invariants  
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