PublisherInfo		
PublisherName	:	Springer International Publishing
PublisherLocation	:	Cham
PublisherImprintName	:	Springer

Single-Frame Image Super-resolution through Contourlet Learning

ArticleInfo		
ArticleID	:	1777
ArticleDOI	:	10.1155/ASP/2006/73767
ArticleCitationID	:	073767
ArticleSequenceNumber	:	180
ArticleCategory	:	Research Article
ArticleCollection	:	Super-Resolution Imaging: Analysis, Algorithms, and Applications
ArticleFirstPage	:	1
ArticleHistory	:	RegistrationDate : 2004–11–26 Received : 2004–11–26 Revised : 2005–3–22 Accepted : 2005–4–5 OnlineDate : 2006–2–9

ArticleCopyright	:	Jiji and Chaudhuri2006
ArticleGrants	:	
ArticleContext	:	136342006200611

CV Jiji,[Aff1]
Corresponding Affiliation: Aff1

Subhasis Chaudhuri,[Aff1]

Aff1 Department of Electrical Engineering, Indian Institute of Technology Bombay, Mumbai 400076, India

Abstract

We propose a learning-based, single-image super-resolution reconstruction technique using the contourlet transform, which is capable of capturing the smoothness along contours making use of directional decompositions. The contourlet coefficients at finer scales of the unknown high-resolution image are learned locally from a set of high-resolution training images, the inverse contourlet transform of which recovers the super-resolved image. In effect, we learn the high-resolution representation of an oriented edge primitive from the training data. Our experiments show that the proposed approach outperforms standard interpolation techniques as well as a standard (Cartesian) wavelet-based learning both visually and in terms of the PSNR values, especially for images with arbitrarily oriented edges.

BodyRef		
FileRef	:	BodyRef/PDF/13634_2004_Article_1777.pdf
TargetType	:	OnlinePDF

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