4-9-2014

Blur Processing Using Double Discrete Wavelet Transform

Yi Zhang
University of Dayton, stander@udayton.edu

Follow this and additional works at: http://ecommons.udayton.edu/stander_posters

Part of the Arts and Humanities Commons, Business Commons, Education Commons, Engineering Commons, Life Sciences Commons, Medicine and Health Sciences Commons, Physical Sciences and Mathematics Commons, and the Social and Behavioral Sciences Commons

Recommended Citation
http://ecommons.udayton.edu/stander_posters/402

This Book is brought to you for free and open access by the Stander Symposium at eCommons. It has been accepted for inclusion in Stander Symposium Posters by an authorized administrator of eCommons. For more information, please contact frice1@udayton.edu, mschlangen1@udayton.edu.
1. Abstract

- We propose double discrete wavelet transform (DDWT)
- DDWT sparsifies blurred image and blur kernel simultaneously
- Applications/advantages of DDWT:
  – blur kernel estimation (spatially varying or global blur)
  – image deblurring (single pass/non-iterative)
  – near-blur invariant feature extraction

2. Double Discrete Wavelet Transform

- Blurred image: $y[n] = x \star h[n]$
- Discrete wavelet transform (DWT): $w_j[n] = \{d_j \star y\}[n]$
- Double DWT (DDWT): $v_{ij}[n] = \{d_i \star d_j \star y\}[n] = \{d_i \star w_j\}[n]$

3. Object Motion Blur

- Input DWT DDWT
- sharp image blur blurry image

- blur estimation: DDWT coefficients $k$ pixels apart are correlated!
- Deblur: Recover sharp DWT: $\hat{u}[n] = kv[n + k/2]$ or $-kv[n - k/2]$

4. Optical Defocus Blur

- Idea: use circularly symmetric autocorrelation

5. Near-Blur Invariant Feature Extraction

- DDWT is near-blur-invariant representation of $x$
- Recognition tasks can be trained to work with DDWT.

This work was funded in part by Texas Instrument and University of Dayton Graduate School Summer Fellowship program.