Image processing using singular value decomposition and wavelet

Ryuichi Ashino[*], Akira Morimoto[†], Michihiro Nagase[‡], Weibin Qi[§], Yuichi Shimano[¶], Rémi Vaillancourt[‖]

Singular value decomposition (SVD) is a non-linear algorithm and depends on data. The authors are studying image processing using SVD. Today's topics are image denoising and image compression. Denoising image data is considered as a perturbation theory of matrix whose low frequency components are dominant. In image compression, SVD has a disadvantage that it needs to keep transformed matrices in memory, because transformed matrices depend on data.

Denoising image date has been an active area of research with several different approaches using techniques such as wavelet thresholding, bilateral filtering and non-linear filtering based on singular value decomposition [6]. A spline block singular value denoising method has been proposed in [5], as an improved version of the block singular value denoising found in [4]. A hybrid method combining the discrete wavelet transform and the spline block singular value denoising is proposed.

Digital image compression with singular value decomposition multiresolution analysis (SVD MRA) [1] is compared with discrete cosine transform (DCT), Karhunen–Loève transform (KTL), discrete 9/7 biorthogonal wavelet transform, and a hybrid wavelet-SVD transform proposed in [3]. Compression uses Set Partitioning in Hierarchical Trees (SPIHT) [2] and run-length with Huffmann coding. The performances of these methods differ little from

[*]Osaka Kyoiku University, ashino@cc.osaka-kyoiku.ac.jp
[†]Osaka Kyoiku University, morimoto@cc.osaka-kyoiku.ac.jp
[‡]Osaka University, Deceased
[§]University of Ottawa
[¶]Osaka Kyoiku University
[‖]University of Ottawa, remi@uottawa.ca

each other. Generally, the discrete 9/7 biorthogonal wavelet transform is superior for most images that were tested for given compression rates. But for certain block transforms and certain images other methods are slightly superior.

References

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