A NOVEL TECHNIQUE TO REDUCE THE IMAGE NOISE USING IMAGE FUSION

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Abstract

A novel higher order singular value decomposition (HOSVD) - based image fusion algorithm is proposed. The key points are given as follows. Since image fusion depends on local information of source images, the proposed algorithm picks out informative image patches of source images to constitute the fused image by processing the divided sub tensors rather than the whole tensor the sum of absolute values of the coefficients (SAVC) from HOSVD of sub tensors is employed for activity-level measurement to evaluate the quality of the related image patch. A novel sigmoid-function-like coefficient-combining scheme is applied to construct the fused result.

Keywords: *Sum of Absolute Values of Co-efficient (SAVC), Higher Order Singular Value Decomposition (HOSVD), Sigmoid Function (SF), and Image Fusion (IF).*

1. Introduction

Image fusion is the process of combining informati on From Two or more images of the same scene so that resulting image will be more suitable for human and machine perception or further image processing tasks such as segmentation, feature extraction, and target recognition. It is widely applied into many fields such as computer vision, medical imaging, and remote sensing.

Tensors (multi way arrays) are generalizations of scalars, vectors, and matrices to an arbitrary number of indices. Tensor-based information processing methods are more suitable for representing high-dimensional data and extracting relevant information than vector- and matrix based methods and thus receives lots of attention. As one of most efficient tensor decomposition techniques, higher order singular value decomposition (HOSVD) has been widely applied into many areas such as multidimensional harmonic retrieval, face recognition Telecommunications, magnetic resonance imaging, electrocardiograph, World Wide Web search, handwritten digit classification, color image restoration, and texture synthesis.

2. Existing System

Discrete Wavelet Transform (Dwt)

In the case of wavelet transform fusion, all respective wavelet coefficients from the input images are combined using the fusion rule.

Since wavelet coefficients having large absolute values contain the information about the salient features of the images such as edges and lines, a good fusion rule plays an important role in the fusion process.

B. Disadvantages

This fusion method has the effect of blurring such textures, Image information loss occurs in edge.

C. Literature survey

C. S. XYDEAS AND V. PETROVIC**.,** A measure for objectively assessing pixel level fusion performance is defined. The proposed metric reflects the quality of visual information obtained from the fusion of input images and can be used to compare the performance of different image fusion algorithms. Experimental results clearly indicate that this metric is perceptually meaningful

D. LETEXIER AND S. BOURENNANE., This paper presents a new multi-way filtering method for multidimensional images corrupted by white Gaussian noise. Images are considered as multi-way arrays instead of matrices or vectors, which enables to keep relations between each index. The presented filtering method is based on multi linear algebra principles and it improves the multi-way Wiener filtering (MWF). The originality of the method relies on the flattening directions of multi-way arrays and on a block approach to keep local characteristics of images. Experiments on color images and hyper spectral images have been computed to illustrate the improvement of MWF by the analysis of image characteristics.

A. RAJWADE, A. BANERIEE, AND A. RANGARAIAN. We present a new method for compact representation of large image datasets. Our method is based on treating small patches from a 2D image as matrices as opposed to the conventional vectorial representation, and encoding these patches as sparse projections onto a set of exemplar ortho normal bases, which are learned a priori from a training set. The end result is a low-error, highly compact image/patch representation that has significant theoretical merits and compares favorably with existing techniques (including JPEG) on experiments involving the compression of ORL and Yale face databases, as well as two databases of miscellaneous natural images. In the context of learning multiple orthonormal bases, we show the easy tunability of our method to efficiently represent patches of different complexities Furthermore, we show that our method is extensible in a theoretically sound manner to higher-order matrices ('tensors'). We demonstrate applications of this theory to the compression of well-known color image datasets such as the Ga.

Tech and CMU-PIE face databases and show performance competitive with JPEG. Lastly, we also analyze the effect of image noise on the performance of our compression schemes.

H. LI, S. MANJUNATH, AND S. MITRA**, .**In the image fusion scheme presented in this paper, wavelet transformation of the input images are appropriate combined, and the image is obtained by taking the inverse wavelet transform of the fused wavelet coefficients. An area-based maximum selection rule and a consistency verification step are used for feature selection. A performance using specially generated is also suggested.

T. G. KOLDA AND B. W. BADER**.,** This survey provides an overview of higher-order tensor decompositions, their applications, and available software. A tensor is a multidimensional or N-way array. Decompositions of higher-order tensors have applications in psychometrics, chemometrics, signal processing, numerical linear algebra, computer vision, numerical analysis, elsewhere. Two particular tensor decompositions can be considered to be higher-order extensions of the matrix singular value decomposition.

3. Proposed System

This paper proposes a novel Higher Order Single Value Decomposition (HOSVD) based image fusion algorithm

A. Advantages

Satellite images, Medical images such as MRI, CT, etc.., It doesn't produce the blurring effects

4. Modules

Description of the Proposed Algorithm Discussion of the Sigmoid Function, Activity-Level Measurement, Performance Evaluation of the Proposed Fusion Algorithm, Effect of Patch Size on the Proposed Algorithm, Effect of Sliding Window Size on the Proposed Algorithm, Main Computational Complexity

A. Description of the proposed algorithm

Generally, a transform-domain fusion algorithm consists of the following three steps: 1) obtain the decomposition coefficients using some transform; 2) construct the activity-level measurement from these coefficients; and 3) merge these coefficients to construct the fused result in line with the measurements

A1. Discussion of the sigmoid function

First, we consider one of two limit cases, i.e., If , then

$$\frac{1}{1+\exp(-K\ln(e_i(1)/e_i(2)))} = 1$$

$$\frac{\exp(-K\ln(e_i(1)/e_i(2)))}{1+\exp(-K\ln(e_i(1)/e_i(2)))} = 0$$

Otherwise,if $(e_i(1)/e_i(2))<1$,then

$$\frac{1}{1+\exp(-K\ln(e_i(1)/e_i(2)))} = 0$$

$$\frac{\exp(-K\ln(e_i(1)/e_i(2)))}{1+\exp(-K\ln(e_i(1)/e_i(2)))} = 1$$

In this experiment, the performance of the proposed activity-level Measurement (i.e., SAVC) is evaluated. A pair of source images (classical images for fusion, named "book").There is a

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"focused" book in the distance (clear in vision, far-focused) but with another book out of "focus" (blurred). On the contrary, in the nearby book is in "focus" (near-focused), but another is out of "focus." We divide the clear part (marked in a white rectangle) into 413 242 patches with patch size 88 and sliding window size.

B. Performance evaluation of the proposed fusion algorithm

In this paper, six objective evaluation measures are computed to quantitatively evaluate the fusion performance. Image Quality Metric (IQM)-based metric: The larger the IQM value, the better the fused result. Condition Entropy (CEN) of fused results: The larger the absolute CEN value, the better the fused result. Signal-to-Noise Ratio (SNR): The fused image is looked upon as the ideal image (signal) plus the noise image (difference between the ideal image and the fused image). The larger the SNR value, the better the fused result. Entropy (EN): It reflects the amount of information in the fused mage. The larger the EN is, the more information the image carries. Overall Cross Entropy (OCE): It can reflect the difference between the two source images and the fused image. The smaller the OCE is, the better fusion result that is obtained

C. Effect of patch size on the proposed algorithm

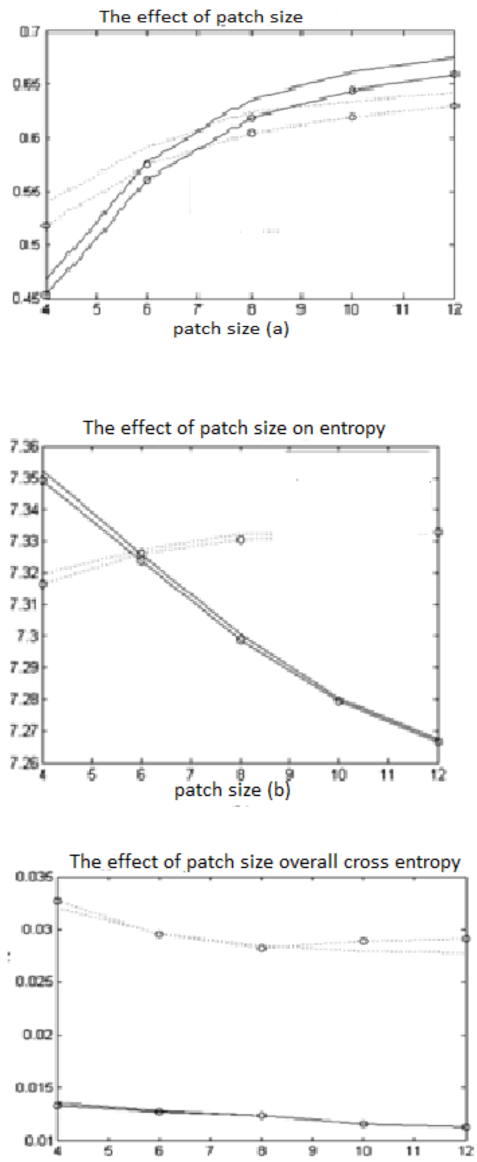
In this experiment, the effect of patch size on the performance of the proposed algorithm is investigated (take "book" and "clock" for examples).When the patch size varies from 4 to 12, the related, EN, and OCE performance metrics respectively. This demonstrates that, for "book" and "clock" images, 1) the value increases as the patch size increases, and in the case of, the value is slightly larger than that of, 2) as the patch size increases, the EN value for "book" drops, but the EN performance for "clock" increases size.

5. Main computational complexity

In this experiment, the effect of patch size on the performance of the proposed algorithm is investigated (take "book" and "clock" for examples). When the patch size varies from 4 to 12, the related, EN, and OCE performance metrics are given in Fig. (a)–(c), respectively. This demonstrates that, for "book" and "clock" images, 1) the value increases as the patch size increases, and in the case of, the value is slightly larger than that of 2) as the patch size increases, the EN value for "book" drops, but the EN performance for "clock" increases; 3) in the case of, the OCE value is close to that of, and both of them decrease with the increase in patch size.

A. Discussions

In this experiment, the effect of patch size on the performance of the proposed algorithm is investigated (take "book" and "clock" for examples). When the patch size varies from 4 to 12, the related, and OCE performance metrics are given



Effect of patch size onthe proposed algorithm

Fig. 1: (a),(b),(c) Comparison of Patch Size between Proposed and Existing Systems

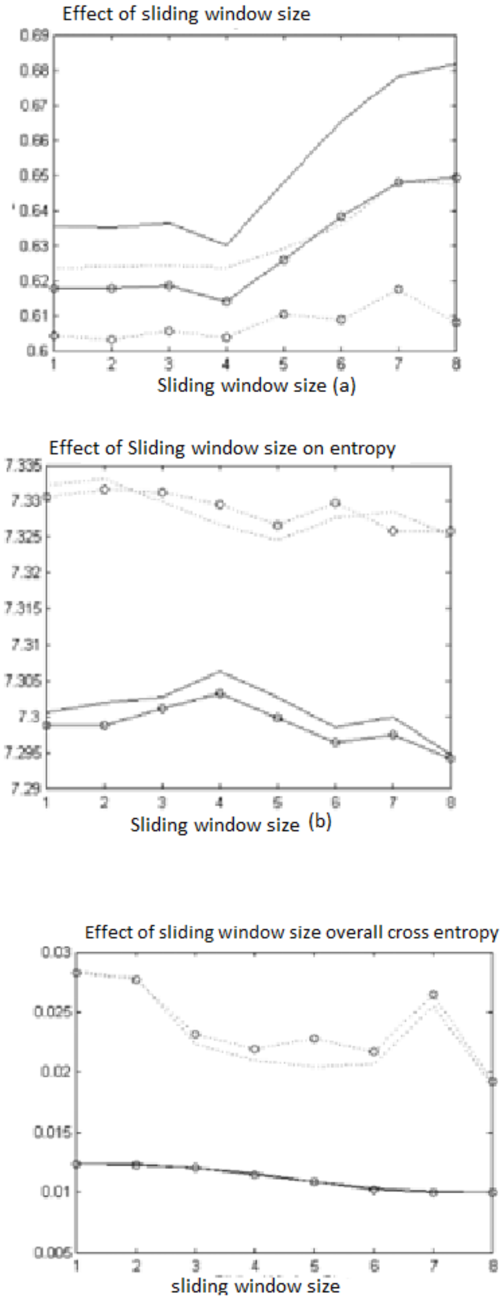


Fig. 2: (a),(b),(c) Comparison of Sliding Window Size between Proposed and Existing Systems

6. Result

This experiment explores the effect of sliding window size on the performance of the proposed algorithm. The same parameters as those in section iv-c are used, except that the sliding window size varies from 1 to 8. The related q, en, and once performance are given in fig. (a)–(c), respectively this shows that, for "book" and "clock" images, the value increases with the increase in sliding window size, but the en and once values decrease with the increase in window size. To facilitate the following discussion, it is assumed that the patch size is 8 * 8 in the remainder of this section. When and there are no overlapped pixels between adjacent patches, and thus, the adjacent patch gap in the fused result will be discontinuous. For example. There is a discontinuous pixel gap in the "11" area.

Table 1 Comparison between Proposed and Existing Systems

Systems	EN	OCE	SNR	IQM
Proposed	7.4	0.69	30.84	0.94
Existing	3.2	0.03	10.2	0.36

Fig. 3: Normal and Proposed Image Fusion

7. Conclusion

A novel HOSVD-based image fusion algorithm has been proposed .It constructed multiple input images as a tensor and can evaluate the quality of image patches using HOSVD of sub tensors. Then, it employed a novel sigmoid-function-like coefficient-combining scheme to obtain the fused result. Finally, experimental results show that the proposed transform domain algorithm is an alternative image fusion approach.

Future enhancement

In future we obtain the better quality of the image by change the fusion rules.

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