Available Online at www.ijcsmc.com

International Journal of Computer Science and Mobile Computing

A Monthly Journal of Computer Science and Information Technology

ISSN 2320–088X

IJCSMC, Vol. 4, Issue. 6, June 2015, pg.1081 – 1085

RESEARCH ARTICLE

Fusion of Image Using Higher Order Singular Value Decomposition

P.T.Kohok[#1], S.Patil[*2]

[#]Student, Department Of Computer Engineering, University of Pune, GHRCOEM, Ahmednagar, Maharashtra, India

[1] pooja9125@gmail.com

[*]Asst. Professor, Department Of Computer Engineering, University of Pune, GHRCOEM, Pune, Maharashtra, India

[2] sachin.3400@gmail.com

Abstract— Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Usually Image processing system includes treating images as two dimensional signals while applying already set signal processing methods to them. Image fusion is the process by which the information from two or more images are combined together to make resulting image more appropriate and effective. In this work important visual information with the "edge" information which is present in each pixel of an image is associated. Human visual system supports this visual to edge information and uses it in image analysis and compression systems.

Keywords— Tensor, Higher Order Singular Value Decomposition, Sigmoid.

I. INTRODUCTION

The recent availability of multi-sensor systems in key image application areas, such as remote and Airborne sensing, motivated researchers to work on image fusion in general and pixel level image Fusion in particular. Thus a plethora of pixel level fusion algorithms have been developed with Different performance and complexity characteristics. Fusion performance is mainly assessed using informal subjective preference tests and, so far, little if any effort has been directed towards the development of objective image fusion performance metrics. In this work we associate important visual information with the edge information that is present in each pixel of an image. Notice that this visual to edge information association is supported by Human Visual System studies and is extensively used in image analysis and compression systems. Furthermore, by evaluating the amount of edge information that is transferred from input images to the fused image, a measure of fusion performance can be obtained.

II. LITERATURE SURVEY

R. Costantini, L. Sbaiz, and S. Susstrunk implemented the technique which is well suited to dynamic texture synthesis on devices limited by memory and computational power such as PDAs or mobile phones[6]. Damien Letexier and Salah Bourennane presented filtering method based on multilinear algebra principles and it improves the multi-way Wiener filtering [2]. H. Li, S.

Manjunath, and S. Mitra combined Wavelet transformation of the input images, and they obtained the image by taking the inverse wavelet transform of the fused wavelet coefficients[3]. Jinshan Tang studies image fusion technique in the discrete cosine transform (DCT) domain[4]. G. Bergqvist and E. G. Larsson stated thatTensor modeling and algorithms for computing various tensor constitute a very active research area in mathematics[5].

A quad tree partitioning is adapted by D. Letexier and S. Bourennane in order to split tensors into homogeneous sub-tensors to keep local characteristics[7] Proposed method is based on the estimation of main directions in multidimensional data. For this purpose, they extend the straight line detection algorithm. Multidimensional filtering method HOSVD - (K1,..., KN) is applied along the estimated directions[7].Z.Wang and A. Bovik propose new universal objective image quality index,which is easy to calculate and applicable to various image[8]. A measure for objectively assessing pixel level fusion performance is defined by C. S. Xydeas and V. Petrovic in year 2000 [1].In that the proposed metric reflects the quality information obtained from the fusion of input images and can be used to compare the performance of different image fusion algorithms[1]. Damien Letexier and Salah Bourennane presents a new multi-way filtering method for multidimensional images corrupted by white Gaussian noise[2]. A number of previous researchers have proposed techniques for image fusion one of them is 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 edge and lines, a good fusion rule plays an important role in fusion process.

III. EXISTING SYSTEM

Existing system describes an approach to image fusion using the wavelet transform. When images are merged in wavelet space, we have to process different frequency ranges differently. For example, high frequency information from one image can be combined with lower frequency information from another, for performing edge enhancement. Hence we have built a prototype system that allows experimentation with various wavelet array combination and manipulation methods for image fusion, using a set of basic operations on wavelet frequency blocks.

IV. SYSTEM ARCHITECTURE

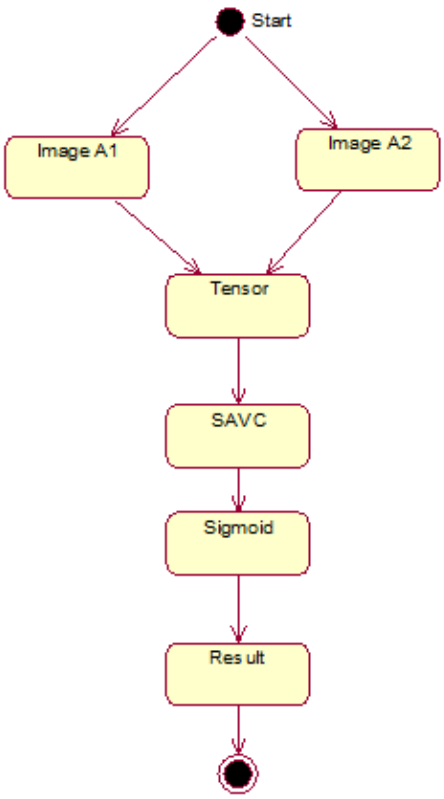

Fig.(a)

The state diagram shows the each states of our project. Fusion is nothing but we just combine two object value into single entity. Like that here we are going to fusion the images .In our state diagram represent, we have two images need to the high resolution area of the two state need fusion. Tensor state for the matrix calculation to get frequency rate of the input images. SAVC (sum of absolute value) for retrieve the high frequency part of the tensor. Sigmoid state for the fusion

System Modules

1. Initialization
2. Implementing MDBUTMF approaches
3. Obtain the Tensor
4. Discussion of the sigmoid function
5. Result

Module Description:

1. Initialization:

In this we are going to take two images the first one far focused image and second is near focused image and we are going to concatenate the two images and after that we are going to construct in to form of tensor with (M x N x 2) by using tensor tool box with is special tool box available for tensor based application to avoid the discontinuous gaps above, the consecutive sub tensors are partly share data by applying a sliding window technique is applied here to divide the tensor into dimensional sub tensors with moving step size P.

2. Implementing MDBUTMF approaches:

Each and every pixel of the image is checked for the presence of salt and pepper noise. If the processing pixel is not noisy pixel and its value lies between 0 and 255. If the selected window contains salt/pepper noise as processing pixel. We apply these approaches to remove the noisy area which is occurred in the Selected image. Now eliminate the salt and pepper noise from the selected window. That is, elimination of 0 s and 255 s. After elimination of 0 s and 255 s the pixel values in the selected window. Replace the processing pixel by median value.

3. Obtain the Tensor:

In this module we taken the two images , one is the fair focus image and second image near focus image . In it fair focus image the background area of the image is look like such clarity while compared the object , the near focus image is look like such clarity while compare the background. we need both same like clarity .we applying tensor, tensor is the matrix calculation of calculating the images frequency. We get high frequency using tensor and applying the SAVC.

4. Discussion of the sigmoid function:

1)As k increase Approaches Where sgn(.) the sign function .in particular, then k = +^a

2)When K = 0, the proposed algorithm is equivalent to the average fusion method.

3)For the same (e (1) / e (2)): if larger k is applied, the coe_cient combining strategy plays the selection role. However, if smaller k is applied, the coefficient combining scheme plays the average or smoothing function.

4)The same k: We e (1)1 is even larger or smaller then e(2) ,the coefficient a combining scheme plays the selection role .How ever when e (1) is closer to e (2), the coefficient a combining strategy plays the weighted average role.

5. Result:

In final we are going to verify the proposed method, it is tested on computer vision ,medical and remote sensing images finally, experimental results shows that the proposed transform domain algorithm is an alternative image

V. IMPLEMENTATION DETAILS

Fig.(h)[Near focused image]

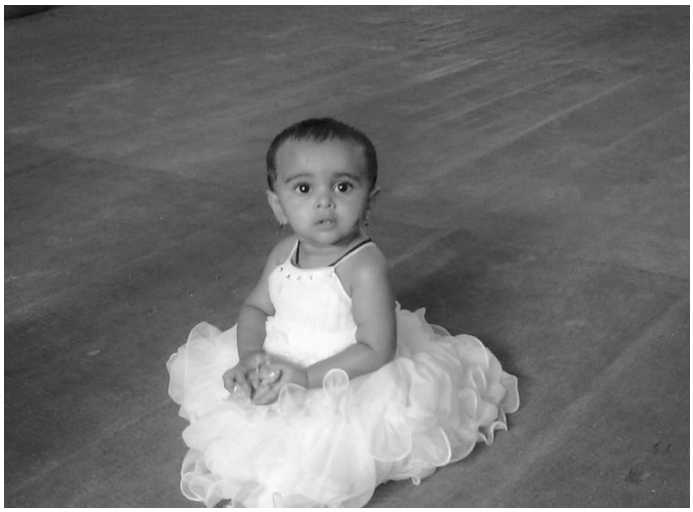

Fig.(i)[Far_focused image]

Fig.(i)[Result image]

VI. 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 subtensors. 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.

Acknowledgement

I would like to take this opportunity to express my profound gratitude and deep regards to my Project Guide Prof. Sachin Patil, for his exemplary guidance, valuable feedback and constant encouragement throughout the duration of the project work. His perceptive criticism kept me working to make this project in a much better way. Working under him was an extremely knowledgeable experience for me.

References

[1] C. S. Xydeas and V. Petrovic, "Objective image fusion performance measure", Electron. Lett., vol. 36, no. 4, pp. 308–309, Feb. 2000.
[2] Damien Letexier and Salah Bourennane, "Adaptive multi-way analysis of images".
[3] H. Li, S. Manjunath, and S. Mitra, "Multi-sensor image fusion using the wavelet transformation",1995.
[4] Jinshan Tang, "A contrast based image fusion technique in the DCT domain",2004

[5] G. Bergqvist and E. G. Larsson, "The higher-order singular value decomposition Theory and application," IEEE Signal Process. Mag., vol. 27, no. 3, pp. 151–154, May 2010.
[6] R. Costantini, L. Sbaiz, and S. Susstrunk, "Higher order SVD analysis for dynamic texture synthesis," IEEE Trans. Image Process., vol. 17, no. 1, pp. 42–52, Jan. 2008.
[7] D. Letexier and S. Bourennane, "Adaptive flattening for multidimensional image restoration," IEEE Signal Process. Lett., vol. 15, pp. 229–232, 2008.
[8] Z.Wang and A. Bovik, "A universal image quality index," IEEE Signal Process. Lett., vol. 9, no. 3, pp. 81–84, Mar. 2002.
[9] . G. Kolda and B. W. Bader, "Tensor decompositions and applications," SIAM Rev., vol. 51, no. 3, pp. 455–500, Sep. 2009.
[10] L. De Lathauwer, B. De Moor, and J. Vandewalle, "A multilinear singular value decomposition," SIAM J. Matrix Anal. Appl., vol. 21, no. 4, pp. 1253–1278, Mar.–May 2000.
[11] M. Haardt, F. Roemer, and G. Del Galdo, "Higher-order SVD-based subspace estimation to improve the parameter estimation accuracy i multidimensional harmonic retrieval problems," IEEE Trans. Signal Process., vol. 56, no. 7, pt. 2, pp. 3198–3213, Jul. 2008.
[12] K. S. Gurumoorthy, A. Rajwade, A. Baneriee, and A. Rangaraian, "A method for compact image representation using sparse matrix and tensor projections onto exemplar orthonormal bases," IEEE Trans. Image Process., vol. 19, no. 2, pp. 322–334, Feb. 2010.
[13] B. Savas and L. Elden, "Handwritten digit classification using higher order singular value decomposition," Pattern Recognit., vol. 40, no. 3, pp. 993–1003, Mar. 2007.
[14] K.S.Gurumoorthy,A.Rajwade,A. Baneriee, and A. Rangaraian, "A method for compact image representation using sparse matrix and tensor projections onto exemplar orthonormal bases,2010.

