

REVIEW ON OPTIMAL IMAGE FUSION TECHNIQUES AND HYBRID TECHNIQUE

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Abstract - Picture combination is a strategy of melding two or more pictures of same scene to shape single combined picture which shows fundamental data in the intertwined picture. Picture combination procedure is utilized for evacuating clamor from the pictures. Clamor is an undesirable material which falls apart the nature of a picture influencing the clarity of a picture. Clamor can be of different sorts such as Gaussian clamor, drive commotion, uniform clamor and so on. Pictures degenerate once in a while amid procurement or transmission or because of blame memory areas in the equipment. Picture combination should be possible at three levels such as pixel level combination, highlight level combination and choice level combination. There are principally two sorts of picture combination strategies which are spatial space combination methods and fleeting space combination procedures. Normal strategy, PCA combination, high pass separating are spatial space strategies and techniques which incorporate change, for example, Discrete Cosine Transform, Discrete wavelet change are worldly space combination strategies. There are different strategies for picture combination which have many points of interest and disservices. Numerous systems experience the ill effects of the issue of shading ancient rarities that comes in the melded picture shaped. In this paper diverse systems have been inspected and the primary target is to increase picture quality and reduce the error.

Key Words: Set Partitioning in Hierarchical Trees (SPIHT), PSNR, RMSE, SOMA (Self-Organizing Migrating Algorithm).

1. INTRODUCTION

Picture combination is a strategy in which various pictures of same scene from visual sensor systems are melded to shape single intertwined picture. It separates the significant data from information pictures and highlights the helpful data and critical elements in the intertwined picture without presenting irregularities in this picture. Visual sensor system is a system shaped of spatially appropriated cameras which are procedures and melded numerous pictures of scene from various perspectives into a solitary picture. The system likewise contains focal PCs

which are fit for handling and combining the picture information got from numerous cameras.

A solitary picture can't concentrate on every one of the items in a scene as a rule subsequently multi-center picture combination method is utilized which melds a few pictures of scene caught with focus on different articles utilizing diverse sensors and after that these pictures are intertwined to form a subsequent picture which concentrate every one of the items in the scene. In fig. 1, camera has concentrated on bottom half of picture and its top side has been demonstrated obscured. In fig. 2, camera has concentrated on top half of picture and its bottom side has been demonstrated obscured. Both these pictures are melded to shape resultant picture as appeared in figure 3 which contain more data than the single source picture.



Fig. 1 Image focused on bottom



Fig. 2 Image focused on top



Fig. 3 Fused Image

2. RELATED WORK

Ganesh et al. (2007) [1] has talked about methods of picture combination to expel commotion from computerized pictures. Remote detecting assumes an extremely basic part in satellite correspondence. Satellite produces pictures in advanced organization which are debased amid obtaining, transmission or because of wrong memory areas in equipment. The thickness of commotion fluctuates relying upon different variables, for example, climatic varieties and clamor correspondence channels and so forth. It is vital to expel the commotion from pictures for further handling. Pictures caught by various sensors deliver distinctive motivation clamor pictures and for evacuation of drive commotion, middle channels are utilized. Firstly loud pictures are sifted utilizing different sorts of vector middle channels and afterward these separated pictures are consolidated to shape single picture by picture combination strategy depending on the quality appraisal in spatial space. At that point melded picture shaped is again separated utilizing supreme induction vector middle which gives more clamor free picture.

V.P.S. Naidu (2011) [2] entails that image registration and fusion had awesome significance in barrier and non-military personnel segments, perceiving a ground/flying corps vehicle and remedial imaging. Pixel-level image fusion utilizing wavelets and central part investigation has been actualized and shown in PC MATLAB. Distinctive execution measurements with reference image and without the reference image were actualized to assess the execution of the image fusion calculations. The direct average fusion calculation indicated the execution of the degradation. The ringing tone displayed in the fused picture might be abstained by using a wavelet with shift-invariant properties. It has been presumed that image fusion using wavelets with larger amount of deterioration demonstrated good execution in a few measurements and in different measurements, analysis of principal components indicated good execution.

Petr KADLEC (2011) [3] introduced a new random multi-purpose self-organization migration algorithm (MOSOMA)

in his article. To find the optimal, SOMA used the migration method that is utilized in the same goal of the "self-organizing migration algorithm (SOMA)". To achieve a constant distribution of Pareto optimal solutions, the new method considered the Euclidean distance between the injected solutions.

Li and Dong (2013) [4] has talked about pixel level picture combination. Pixel level picture combination portrays the specific preparing alongside synergistic blend of data gathered originating from source pictures which offers enhanced impression of a scene. The interest for critical and spatial right blend of all accessible picture datasets emerges with the advancement of sensors. Pixel level picture combination system can be connected in numerous application zones, for example, in machine vision, airborne and space borne remote detecting and medicinal imaging and so forth.

V.P.S. Naidu (2013) [5] depicted six diverse novel image fusion methods utilizing Discrete Cosine Transform. It is observed from the study that DTMDCT (Dual tree multi-resolution discrete Cosine transform) gave good combination results, took after by Laplacian pyramid based on image fusion strategy. DTMDCT was basic and computational productive calculation. For these calculations MATLAB code was given. He also discussed about image fusion algorithm in light of Fast DCT with various fusion rules. This paper discussed the constraints of DWT because it did not give better results in the fusion of curved images. A 7 quality measurement parameter was used for the factual investigation of restorative images.

Liu et al. (2013) [6] has demonstrated that multi-center picture combination system based around the lifting plan of wavelets gives considerable data in the melded picture. This strategy is quick in speed which takes less memory and is simpler to execute. In this method input pictures are deteriorated into four sub-groups LL, LH, HL and HH. Sub-groups LL, HL and HH are incorporated to have a few rules with respect to high-recurrence subtle elements of pictures. Weighted region vitality is typically decided with the Gaussian piece in view of the high recurrence points of interest.

Prakash et al. (2013) [7] has demonstrated that pixel level picture combination conspire utilizing multi determination bi-orthogonal wave change (BWT) improves combination includes by lessening loss of important data accessible in singular pictures. Spatial area strategies for combination produce spatial mutilations in the melded picture. Wavelet change based techniques can deal with these bends. In BWT, Wavelet coefficients at different decomposition levels are melded utilizing outright most extreme combination run the show. Wavelet symmetry and straight period of BWT are the two properties of channels utilized as a part of combination which safeguards the edge arrangement, lines, bends and

limits in the melded picture and subsequently lessen mutilations in the combined picture.

Wang et al. (2013) [8] has clarified multi-ghostly picture combination calculation. Multi-ghostly and panchromatic pictures are intertwined to shape melded picture. Non subsample contourlet change technique for separating space detail data of panchromatic picture is joined with infusion model of panchromatic picture to shape melded picture with multi ghostly combination calculation. By this technique unearthly attributes of multi phantom picture are held and unearthly contortion issue is additionally lessened.

Jasmeet and Rajdavinder (2014) [9] has talked about distinctive picture combination procedures. Picture combination is the procedure of fusing the points of interest through various pictures of a solitary scene into single picture which is more proper for human perception and extra picture handling. Picture combination procedures in view of Discrete cosine change (DCT) space are fit to give important data in combined picture and is time moderating in genuine time frameworks for still pictures or recordings

Malhotra and Chopra (2014) [10] has demonstrated that multi- center picture combination utilizing AC-DCT (Alternating coefficient discrete cosine change) procedure can save edges of the melded picture and it will likewise expel the uneven light up issue which happens in combination of pictures. DCT based combination requires less vitality as look at to DWT strategies and are more reasonable for asset compelled gadgets.

Garg et al. (2014) [11] has talked about multi-center picture combination calculations which unites unmistakable pictures procuring particular components all through core interest.. It has been observed that pixel based picture combination calculations has a few issues like obscuring impacts and clamor in the melded picture. Locale based picture combination approaches explain these issues however are more unpredictable than pixel based picture combination calculations. Spatial area strategies are move invariant and does not bring about loss of data as contrast with recurrence space strategies.

Fan et al. (2014) [12] has talked about the nonlinear weighted multiband combination calculation. The conventional strategy for picture combination has substantial measure of estimation also, poor continuous execution. As contrast with customary technique nonlinear weighted calculation of picture combination enhances the impact of picture combination and furthermore upgrades the productivity of picture combination.

Rajesh Kumar Kakerda (2015) [13] et al. proposed a paper that exhibits a fuzzy sort image fusion system utilizing half discrete Cosine transform (DCT) – Fast Fourier Transform (FFT) based on Laplacian pyramid. It was presumed that fusion with more elevated amount of pyramid gives superior fusion quality. This procedure might be utilized for the fusion of fluffy pictures and also for the fusion of multi model pictures. The suggested algorithm was simple, exceptionally straightforward, and could be utilized for constant applications. The presented paper shows a comparative study amongst suggested system and the system existed in past and the approval of PSNR, RMSE and CORR of the proposed algorithm.

Reema Jain et.al (2015) [14] conferred about the issue showed up in customary image embedding procedure for watermarking which applies DCT to the host image. In this strategy the measure of the host picture ought to be more prominent than the mark picture, accordingly diminishing the sign to SNR and debases the framework execution. At the fundamental two mark pictures were intertwined. Both noteworthy and unimportant pixels of two pictures were transmitted. This task could combine diverse sorts of images like RGB pictures, Gray scale pictures (medicinal, satellite), ordinary photograph images. The proposed framework talked about is a User Interactive Model. In this sense, the user interaction, simply four different pressure systems could be reproduced, and the implementation of measures might be possible. The user could pick his/her pressure systems in view of the particulars they require. Security with two levels was being implanted with pictures. The orientation of pictures was not an imperative in the framework because of the calculations in the exhibition array editor. Differed measurement pictures could likewise be used. Melding numerous pictures up to 8 has been proposed in this framework. The simulation procedure was finished by MATLAB software keeping in mind the goal to increase the effectiveness of undertaking, memory dispensed for the project, elapsed time for the pressure to run and pressure proportion for fused image and compacted picture was detailed.

M. Kumar (2016) [15] proposed a fuzzy method for the fusion image type using a set partitioning (SPIHT) in a hierarchical tree. The conclusion was that the combination with the higher level of the individual provides a better weld quality. This method could be applied to the synthesis of fuzzy image and multi-image fusion model. SPIHT is very fast and is one of the best known image compression algorithms. Binary coding output stream is a simple and effective method which is combined with Huffman coding for further compression and transformation. As the rapid development of mathematical branches in the time domain and frequency domain, we can analyze any size and frequency of the detail making is superior to DCT and Fourier. It was mostly used in development, image processing and compression. The suggested algorithm has various advantages like it is

easier to implement and can be utilized in real-time applications.

3. PROBLEM FORMULATION

Picture combination is the strategy that blends data from various pictures of indistinguishable scene. These pictures might be caught from very surprising sensors, gained at completely distinctive circumstances, or having very surprising spacial and phantom attributes. There are different kinds of techniques for picture combination, prior the picture was intertwined specifically by brushing the pixels of the picture however that prompt to obscuring of the combined picture. In direct pixel consolidating technique, the source picture and the neighbor pictures are consolidated with the comparing pixels of each of the pictures. The characterized weights of the pictures are incorporated into a picture. The pixels of the new picture are created on the possibility of the regular weight of pixels of that picture. HSI is another technique utilized for picture combination however the impediment of this strategy is that the association of just 3 groups. At that point, the DWT technique is also alluded to as discrete wavelet transform. The DWT gave enhanced outcomes than the routine procedures like it had great phantom protection, anyway it also had certain disadvantages that confined its utilization in picture combination. Discrete Wavelet Change was poor and it had high move invariance that decreased the strength of the framework. Picture process needs high spacial and high phantom determination in a solitary picture. Wavelet combination strategy furthermore incites little contortion. However, these techniques weren't proficient.

A conservative procedure must be executed for picture combination that is more conservative than the standard strategies and a high spacial and high ghostly determination picture ought to be gotten after combination

4. SOLUTION METHODOLOGY

To overcome this problem, a region-based averaging selection rule and a conformity check step for feature selection are proposed and a better visual and quantitative fusion result has been achieved that is based on the suggested performance measure using the transformation.

Hybrid SPIHT and SOMA technique improved the values of PSNR and also improved the ability of fusion process. On applying the hybrid SPIHT and SOMA method, better results at higher values of pyramid level are obtained. It also produces more naturally fused images if the input images to be combined are very different.

The better fusion result are found both visually and quantitatively based on performance measures by using

Hybrid SPIHT transform and SOMA algorithm. It is easier to implement and can be utilized in real-time applications. In Fig.4 an algorithm is shown by which good picture quality is obtained.

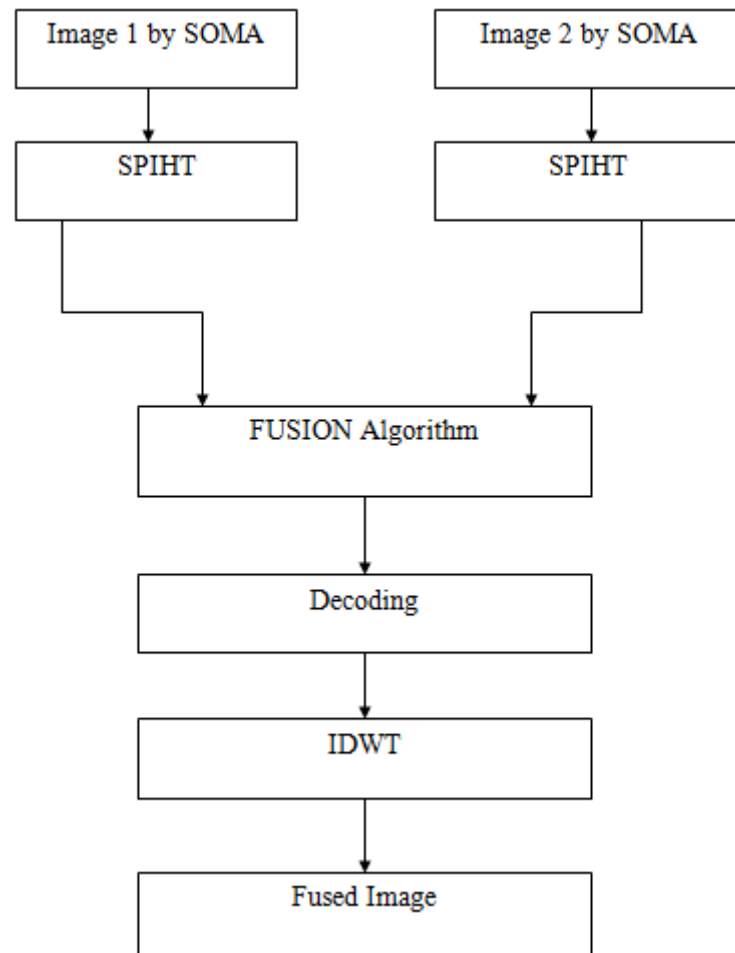


Fig-4: Process of applying technique for obtaining a final fused image

5. CONCLUSION

In this paper, image fusion concept, some of the image fusion techniques are discussed and a creative picture combination method utilizing SPIHT and SOMA is reviewed and its execution is assessed. We understood better combination quality by combined use of SPIHT and SOMA. In this review work, an outline of picture combination method is given and the outcome from various combination plans is thought about. Plot that consolidates SPIHT and SOMA system deliver preferred outcomes over either standard techniques or SPIHT alone. In this paper, a review is done on picture combination utilizing two methods combine. It is a hybrid procedure of SPIHT and SOMA system. This technique can be proficiently utilized for combination of pictures with multi ghostly pictures moreover. The anticipated calculation is

less demanding and proficient to execute for continuous applications.

6. REFERENCES

1. L Ganesh, S P Krishna Chaitanya, J Durga Rao and M N V S S Kumar. "Development of Image Fusion Algorithm for Impulse Noise Removal in Digital Images using the quality Assessment in Spatial Domain" In International Journal of Engineering Research and Applications (IJERA) Vol. 1, Issue 3,2007.
2. VPS Naidu, "Discrete Cosine Transform-based Image Fusion", Special Issue on Mobile Intelligent Autonomous System, Defence Science Journal, Vol. 60, No.1, pp.48-54, Jan. 2010.
3. Petr Kadlec,"A Novel Multi-Objective Self Organizing Migrating Algorithm" Radio engineering, Vol. 20, NO. 4, December 2011
4. Mingjing Li and Yubing Dong. "Review on technology of pixel-level image fusion." In International Information and Control (ICMIC),vol. 1, IEEE,2013.
5. VPS Naidu, "A Novel Image Fusion Technique using DCT based Laplacian Pyramid", International Journal of Inventive Engineering and Sciences (IJIES) ISSN: 2319-9598, Volume-1, Issue-2, January, 2013.
6. Lixin Liu, Hongyu Bian and Guofeng Shao. "An Effective Wavelet-based Scheme for Multi-focus Image Fusion" In IEEE International Conference on Mechatronics and Automation (ICMA), 2013.
7. Om Prakash, Richa Srivastava¹, Ashish Khare¹ "Bi-orthogonal wavelet transform based image fusion using absolute maximum fusion rule" In Proceedings of 2013 IEEE Conference on Information and Communication Technologies (ICT) 2013.
8. Jinling Wang, Kefei Song and Xiaojun He, "Multi-spectral image fusion based on the characteristic of imaging system" In Proceeding of the International Conference on Information and Automation Yinchuan, China, IEEE, 2013.
9. Jasmeet kaur and Er. Rajdavinder Singh Boparai. "An evaluation on different image fusion techniques" IPASJ International Journal of Computer Science (IJCS) Volume 2, Issue 4, April 2014.
10. Gazal Malhotra and Dr. Vinay Chopra. "Improved multi-focus image fusion using ac-dct, edge preserving smoothing & DRSHE" In Proceedings of International Conference on Computer Science ,Cloud Computing and Applications July 24-25,2014.
11. Rishu Garg, Preeti Gupta and Harvinder Kaur "Survey on Multi-focus Image fusion algorithms". In Proceedings of RA ECS UIET, Panjab University, Chandigarh, IEEE, 2014.
12. Rong Fan. Qiufen Yang and Guanqun Liu, "Nonlinear Weighted Multiband Fusion Algorithm" In IEEE Workshop on Electronics, Computer and Applications, IEEE, 2014.
13. Rajesh Kumar Kakerda et.al, "Fuzzy type Image Fusion using hybrid DCT-FFT based Laplacian Pyramid Transform", 4th IEEE International Conference on Communication and Signal Processing (ICCSP 2015) 02-04 April 2015 - Melmaruvathur, TN, IND.
14. Reema Jain et. Al., "Digital Image Watermarking using Hybrid DWT - FFT Technique with Different Attacks", 4th IEEE International Conference on Communication and Signal Processing (ICCSP 2015) 02-04 April 2015 - Melmaruvathur, TN, IND.
15. M. Kumar et. al. "Fuzzy type Image Fusion using SPIHT Image compression technique", International Journal of Engineering Research and Applications (IJERA), ISSN: 2248-9622, Vol. 5, Issue 9, (Part - 3), pp.55-58 September 2015.