

A Review of different Contrast Improvement Methods of Remote Sensing Images

Shraddha Gupta¹, Sanjay Sharma²

¹(Research scholar, M.tech in CS, OIST, RGPV, India)

²(HOD, dept. Of Computer Science, OIST, RGPV, India)

Abstract - *Satellite image have low contrast and not a good quality. There are dissimilar techniques are existing for improvement of however fusion based technique plays a significant role in image enhancement. Because image fusion applicable in numerous fields like computer vision, remote sensing, intelligent robots and totally different defense operation in air, earth and additionally on beneath water operations. Image Fusion plays a crucial role for luminance correction, contrast adjustment additionally sensor or multiple sensors so as to enhance its visual appearance. During this literature survey concentrate on the HIS (Intensity Hue Saturation) transform, Principle Component Analysis (PCA), Pyramid technique –Laplacian and Gaussian techniques.*

Keywords: *Fusion, Contrast, PCA, HIS, Remote sensing.*

I. INTRODUCTION

In the field of image processing remote sensing is extremely necessary topic for satellite image enhancement. We perceive the surrounding world through our 5 senses. Some senses (touch and taste) would like contact of our sensing organs with the objects. However, we acquire abundant data regarding our surrounding through the senses of sight and hearing that do not need close contact between the sensing organs and the external objects. In another word, we are playing Remote Sensing all the time. Remote sensing images are typically in the sort of digital images. So as to extract useful information from the images, image processing techniques is additionally utilized to spice up the image to help visual interpretation, and to correct or restore the image if the image has been subjected to geometric distortion, blurring or degradation by different factors. There are numerous image analysis techniques accessible and the ways that used rely upon the requirements of the actual problem involved.

These are many researches are targeted on image fusion with totally different techniques. An excellent deal on image fusion based contrast enhancement techniques has been done. It will be useful to analysis the prevailing methodology for each gray scale and color images. That facilitates to do future research? An image is typically corrupted throughout its acquisition or transmission. Many images like medical images, remote sensing images, and electron-microscopy images even real world photographic

picture suffer from poor contrast. Thus it is necessary to boost the contrast. Histogram of images provides a global description of the appearance of an image. There is too much work that already done over the topic like image enhancement.

The term fusion normally means that, an approach to extract information that is in many domains. The image fusion technique is to integrate multisensory or multi-view or multi-focus data into a new image that contains higher quality options and is further informative of all the individual input data. Based on the processing levels, image fusion techniques are also divided into totally different categories. These are picture element level, feature level and image level/decision level. Pixel level technique is the simplest and widely used methodology. This technique processes pixels among the source image and retains most of the initial image data. Compared to alternative two ways that picture element level image fusion provides more accurate results. Feature level methodology processes the characteristics of the source image. This technique could also be used with the decision level methodology to fuse images effectively. Owing to the reduced data size, it is easier to compress and transmit the information. The highest level of image fusion is decision making level.

II. BACK GROUND

Image improvement ways are basically a group of techniques that evoke to enhance the interpretability or perception of images for the human viewers and providing higher input for the automated image process techniques. The principal aim of the image improvement technique is to vary the attributes in an image to type it further applicable for the given task and specific purpose. Throughout the advance methodology the quantity of attributes to be modified varies from one to many. Digital image improvement techniques give the excellent selection of selections for up the visual quality of image. The suitable alternative of the technique to be applied is influenced by the image equipment's, task in hand and viewing Merging of diverse data image is finished to boost the visual and analytical quality of the data.

III. FUSION

The main motive behind the developed here is to use image fusion to combine the impotent properties and suppress the disadvantages of the different local and international contrast (brightness) improvement techniques. The fusion-based distinction improvement schemes are summarized in next session below. Image fusion normally involves detecting the foremost informative areas from the provision images and mixing these local (front end pixels) areas to urge the fused output images.

The foremost necessary issue relating to image fusion is to doing a job out the way to combine the detector images. In recent years, several image fusion techniques are planned [13]. The primitive fusion schemes perform the fusion right the initial images. One in every of the only of those image fusion ways in which easily takes the pixel-by-pixel grey level average of the provision images. This simplistic approach generally has serious aspect effects like reducing the excellence.

IV. FAMILY OF FUSION

In order to understand optimum fusion results, different wavelet-based fusion schemes had been tested by many researchers. Throughout this review, some of latest concepts/algorithms of the upper than methods are mentioned.

A. Intensity-hue-saturation (IHS) Tran- type primarily based fusion

It is an improved Intensity-Hue-Saturation methodology for IKONOS Image Fusion. This technique is used in many applications of remote sensing involves the fusion of panchromatic (Pan) and multispectral (MS) satellite images. The fusion of a panchromatic (Pan) image with a high special and low spectral resolution or multispectral (MS) images with an occasional special and high spectral resolution has become a sturdy tool in many remote sensing applications that require every high spatial and high spectral resolution, like feature detection, modification looking, urban analysis, land cowl classification, and recently GIS-based applications.

In general, the IHS fusion based mostly converts a color image from the red, green, and blue (RGB) space into the IHS color area. The intensity (I) band inside the IHS space is replaced by a high-resolution Pan image thus remodelled back to the primary RGB area at the aspect of the previous hue (H) band and thus the saturation (S) band, resulting in an IHS coalesced image. however the IHS methodology are usually merely enforced by the procedure throughout that the fused footage are usually

obtained by adding the distinction image between Pan and that i images to the MS images, severally. This technique is termed the short IHS fusion methodology.

Steps for obtaining IHS work fusion image:

- The IHS fusion for each part is usually developed.
- The intensity part I is replaced by the Pan image.
- The coalesced image [F (R); F (G); F (B)] T are usually merely obtained from the primary image [R; G; B] T simply by exploitation addition operations.

B. Principal Component Analysis (PCA) based fusion

PCA might be a mathematical tool that transforms type of connected variables into type of unrelated variables. The PCA is utilized extensively in compression and image classification. The PCA involves a mathematical procedure that transforms kind of connected variables into selection of unrelated variables referred to as principal components. It computes a compact and optimum description of the information set. In [7], exploitation PCA algorithmic program, color parts are thought of as choices from that a representative set springs. This method is used to chop back selection the number of parts to slightly number of parts supported the individual weights of the corresponding Eigen values. Associate elliptical model classifier is used for classification of skin and non-skin pixels for skin detection. For face recognition, the mandatory step is to choose the choices [8]. The foremost extensively used classifier is principal half analysis that serves two purposes: feature extraction and classification or recognition. It's one in each of the extensively used classifiers that has low time quality. Feature extraction from human faces exploitation PCA [9], proposes facial feature extraction step before taking part in PCA analysis that helps to handle a pair of desires for this method. Firstly, seek for faces does not have to be compelled to be disbursed at every part location inside the image since slightly search space are usually obtained exploitation the detected facial feature points. Secondly, the face detection methodology is usually disbursed in one cycle over a normalized search space, thereby avoiding the necessity of method the image at multiple scales.

C. Multi Scale transform based mostly Fusion Brovey transform

Pixel level image fusion is finished by exploitation Brovey transform. Brovey per-forms a change part three multispectral and thus the panchromatic satellite image scene channels. Brovey process is additionally referred to as the colour standardisation work as a result of it involves a red-green- blue (RGB) color transform methodology.

The Brovey transformation was developed to avoid the disadvantages of the increasing methodology. It's a straightforward methodology for combining info from utterly completely different sensors. It a mixture of arithmetic operations and normalizes the spectral bands before they are redoubled with the panchromatic image. It retains the corresponding spectral feature of each part, and transforms all the luminousness info into a panchromatic image of high resolution.

D. High-Pass Filtering

High-pass and low-pass filters are used in digital image method to perform image modifications, enhancements, noise reduction, etc., exploitation designs exhausted either the spatial domain or the frequency domain. A high-pass filter, if the imaging package does not have, one are usually done by duplicating the layer, putting a Gaussian blur, inverting, therefore combination with the primary layer exploitation capability (say 50%). The unsharp masking, or sharpening, operation used in image writing computer code may be a high-boost filter, a generalization of high-pass filtering theme.

E. Image Pyramid Approaches

An image pyramid consists of a collection of low pass or band pass copies of an image, each copy representing pattern information of a unique scale. Typically, in an image pyramid every level may be an issue a pair of smaller as its predecessor, and thus the upper levels will target the lower spatial frequencies. An image pyramid can contain all the information needed to reconstruct the primary image.

1. Gaussian Pyramid

The scientist pyramid consists of low-pass filtered, reduced density (i.e., down sampled) mathematician of the preceding level of the pyramid, where very cheap level is defined as a result of the first image. The technique involves creating a series of images that are full employing a mathematician average and scaled down. Once this method is used multiple times, it creates a stack of successively smaller images, with each part containing a neighbourhood average that corresponds to a part neighbourhood on a lower level of the pyramid.

2. Laplacian Pyramid Fusion

Laplacian pyramid (fundamental tool in image processing) of an image might be a collection of band pass images; throughout that everyone could be a band pass filtered copy of its precursor. Band pass copies are usually obtained by calculative the excellence between low pass images at serial levels of a Gaussian pyramids. Throughout this approach, the Laplacian pyramids for

each image part (IR and Visible) are used. A strength live is used to work out from that provide what pixels contribute at each specific sample location. Take the common of the two pyramids like each level and add them. The following image is simple average of two low resolution images at each level. Secret writing of a picture is finished by increasing, then summing all the degree of the fused pyramid that's obtained by straightforward averaging. The Laplacian pyramid comes from the Gaussian pyramid illustration, that's for the most part a sequence of additional and additional filtered and down-sampled versions of a picture. The strategy of face detection is accomplished by exploitation straightforward and economical algorithmic program for multi-focus image fusion called Laplacian pyramid algorithmic program. Multi-resolution signal decomposition theme is efficiently used for any applications like gestures, texture, produce and lighting conditions whereas taking a picture [1]. A kind of fusion approach is very helpful for applications like Hand Gesture. Hand gestures play a significant role in Human computer Interaction. They functions primary interaction tools for gesture primarily based laptop management [2].

F. Fusion in Wavelet Domain

Wavelet transform is considered as an alternate to the short time Fourier transforms. It's advantageous over Fourier transform during this it provides desired resolution in time domain nevertheless as in frequency domain whereas Fourier work offers an honest resolution in only frequency domain. In Fourier transform, the signal is decomposed into sine waves of varied frequencies whereas the wavelet transform decomposes the signal into scaled and shifted varieties of the mother wavelet or function. At intervals the image fusion exploitation ripple work, the input images are rotten into approximate and informative coefficients exploitation DWT at some specific level. A fusion rule is applied to combine these two coefficients and so the resultant image is obtained by taking the inverse wavelet work [10]

G. Distinct Trigonometric Function Wave Transform Fusion

Discrete trigonometric function transform has found importance for the compressed images within the variety of MPEG, JVT etc. By taking distinct trigonometric function transform, the spatial domain image is converted into the frequency domain image. Chu-Hui Lee and Zheng-Wei Zhou dynasty have divided the images into three parts as low frequency, medium frequency and high frequency. Average illumination is diagrammatic by the DC value and thus the AC values are the coefficients of high frequency. The RGB image is split into the blocks of with the dimensions of 8×8 pixels. The image is then

sorted by the matrices of red, inexperienced and blue and remodelled to the greyscale image.

The two Dimensional distinct trigonometric function second transform is then applied on the greyscale image. The frequency of the greyscale block is regenerate from the spatial domain to frequency domain. Once the DCT coefficients are calculated, fused DCT coefficients are obtained by applying the fusion rule. By taking inverse DCT, the fused image is obtained. DCT primarily based ways in which are additional reliable in terms of your time and thence they are useful in real time systems. DCT coefficients show energy compactness as a result of all DCT coefficients are brought on inside the low frequency zone. It provides real results once the run time info is given as an input [9].

V. CONCLUSION

It has been found that the quality fusion ways perform well spatially however typically introduce spectral distortion. To beat this downside, varied multi-scale transform based fusion schemes are planned. Attributable to the various multi-scale rework, completely different fusion rules are planned for various functions and applications. For methods like HIS, PCA and Brovey rework that have lower completeness and quicker time interval, the foremost important downside is color distortion. Wavelet-based mostly schemes perform higher than those ways in terms of minimizing color distortion. The event of more refined wavelet-based fusion algorithms (such as Curve let, and Contour let transformation) may improve performance result, however they typically cause larger completeness in computation and parameters setting.

Image quality are often evaluated by suggests that of quantitative measures like Root mean square error (RMSE) Entropy, peak signal to noise magnitude relation then on. It's necessary to judge matrices for combining images without introducing some form of distortion.

REFERENCES

- [1] Swathy Nair¹, Bindu Elias² and VPS Naidu, " Pixel level image fusion using fuzzylet fusion algorithm" IJAREEIE An ISO 3297: 2007 Certified Organization, Vol. 2, Special Issue 1, December 2013.
- [2] Deepak Kumar Sahu, M.P. Parsai, "Different Image fusion Techniques-A critical review, "International Journal of Modern Engineering Research (IJMER) Vol. 2, Issue. 5, pp-4298-4301 ISSN: 2249-6645, Sep.-Oct. 2012.
- [3] Zhijun Wang, Djemel Ziou, Costas Armenakis, Deren Li, and Qingquan Li, "A comparative Analysis of image fusion

methods" IEEE Trans. Geosci. Remote Sens., vol. 43, no. 6, pp. 1391–1402, Jun. 2005.

[4] B. Aiazzi, L. Alporone, S. Baronti and A. Garzelli, "Context driven fusion of high spatial and spectral resolution images based on oversampled multiresolution analysis" IEEE Transaction Geosci. Remote Sens., vol. 40, no. 10, pp. 2300-2312, Oct 2002.

[5] Shutao Li, James T. Kwok, Yaonan Wang, "Multifocus Image fusion using artificial neural networks" 0167-8655/02/\$ - 2002 Elsevier Science, Pattern Recognition Letters 23 (2002) 985–997., Received 30 March 2001; received in revised form 21 June 2001.

[6] Anish .T. Jemima Jebaseeli, "A survey on multifoocus image fusion methods" International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 1, Issue 8, ISSN: 2278-1323, October 2012.

[7] P. S. Chavez and A. Y. Kwarteng, "Extracting spectral contrast in Landsat Thematic Mapper image data using selective principal component analysis," Photogramm. Eng. Remote Sens., vol. 55, no. 3, pp.339–348, 1989.

[8] M. Pradeep, "Implementation of Image Fusion algorithm using MATLAB (Laplacian Pyramid)" 978-1-4673-5090-7/13/\$31.00 ©2013 IEEE

[9] Jagdeep Singh, Vijay kumar Banga, "An Enhanced DCT based Image Fusion using Adaptive Histogram Equalization" International Journal of Computer Applications (0975 – 8887) Volume 87 – No.12, February 2014.

[10] V.P.S. Naidu and J.R. Raol, " Pixel level Image Fusion using wavelets and Principal Component Analysis" Defense Science Journal, Vol. 58, No. 3, pp. 338-352, May 2008.