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# Framelet Transform based Satellite Image Enhancement

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**Abstract:** The drawback of losing high-frequency components suffers the resolution enhancement. In this project, the wavelet domain based image resolution enhancement technique using Framelet Transform (FT) proposed for resolution enhancement of the satellite images. Input images decomposed by using FT in this proposed enhancement method. Inverse FT is used to generate a new resolution enhanced image from the interpolation of high-frequency subband images and low-resolution image from the input. Intermediate stage has proposed for estimating the high-frequency subbands to achieve a sharper image. It has tested on benchmark images from the public database. Peak Signal to Noise Ratio (PSNR) shows the preeminence of the proposed technique over the expected and state-of-art image resolution enhancement technologies.

**Key words:** Satellite image, enhancement, framelet transform, PSNR, high-frequency, database

## INTRODUCTION

Gamma corrected adaptive knee transformation based on beta wavelet for satellite image enhancement explained by Singh and Kumar (2016). The input image decomposed into sub-band images, i.e., Low-Low (LL), Low-High (LH), High-Low (HL) and High-High (HH). Then input image with LL band coefficients is changed to get enhanced LL-a group using adaptive knee transformation.

Advanced block based DWT technique for contrast enhancement of satellite images presented by Coumar and Rosario (2016). Flexible radiant transfiguration and preeminent glaze levels utilized in this method. Inverse Discrete Wavelet Transform (IDWT) is used to enhance the image finally and DWT based on the advanced block is used to improve each block. Inverse DWT is used to fuse the improved blocks to obtain emanated image. The picture is decayed into sub-bands using Haar wavelet transform.

Fusion and Morphological Gradient-based on DWT-Principal Component Analysis (PCA) for edge-preserving satellite image enhancement described by Thriveni (2015). The input image is decomposed into various sub-bands using DWT. Fusion is applied on the LL subband using PCA. Then enhanced the image is reconstructed using IDWT. Excellent detail subbands are required to achieve sharp boundary. Satellite image enhancement using an effective method discussed by Jadhav and Patil (2015). DWT with high-frequency subbands and the low-resolution input image is used to obtain the sharp image by high-frequency subband estimation. The resultant image is reconstructed using IDWT. Singular Value Decomposition (SVD) and DWT based on Gamma Correction for satellite image enhancement explained by Sharma and Verma (2014). Intensity transformation based low contrast satellite images are enhanced. There are four various sub-bands are included while decomposes the input image, i.e., LL, LH, HL and HH. Edge information preserved by applying gamma correction. LL sub-band information of gamma passed via SVD and IDWT is used to reconstruct the enhanced image.

Plateau histogram equalization based satellite image contrast enhancement algorithm presented by Aedla (2014). Input image decomposition is done using bi-histogram equalization with plateau and threshold calculation using self-adaptive plateau histogram equalization. Minimum mean brightness error bi-histogram equalization, histogram equalization, dynamic histogram equalization, self-adaptive plateau histogram equalization compared with existing methods.

Discrete and stationary wavelet decomposition based image resolution enhancement discussed by Demirel and Anbarjafari (2011). High-frequency subband image interpolation based resolution enhancement obtained by Discrete Wavelet Transform (DWT). Edge is enhanced using the technique of Stationary Wavelet Transform (SWT). Then, an image is decomposed into sub-bands using DWT scheme. Interpolation is done from an input image and expected high-frequency sub-bands are changed through SWT using high-frequency subband obtained. Finally, inverse DWT is used to generate a high-resolution image from all these sub groups (Upadhyay *et al*., 2016a).

Reviewed study expose similarities of traditional image transforms, land use and land cover classification of LISS-III satellite image using KNN and decision tree (Upadhyay *et al*., 2016b) disputes the remote information from the satellite and execute random transform techniques to use land cover classification. Combine technique for classification of IRS P6 LISS-III satellite images (Upadhyay *et al.*, 2016a) express the glaciers mountain of Himalaya producing the enormous amount of snow and ice which captures via satellite later then transforming it with remote sensing techniques. Removal of herringbone effects from AEM data maps using the Radon transform (Sykes and Das, 1998) aggregates airborne data to result in distortions of asymmetric measuring systems.

## MATERIALS AND METHODS

Low-pass filtered signal having some high-frequency information because the analysis filter bank has finite filter taps and also some low-frequency information is obtained from high pass filtered signal. The same phase has down sampled the both high-pass and low-pass filtered signals but remains some correlation though; there will be the relationship at low while downsampling by various aspects. Image enhancement is done using FT technique to obtain a resolution-enhanced image. Results show that the proposed method performs better than the existing wavelet methods regarding the PSNR (Fig. 1 and 2).

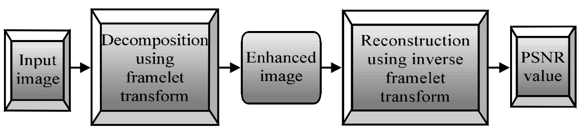


Fig. 1: Block diagram of the proposed system

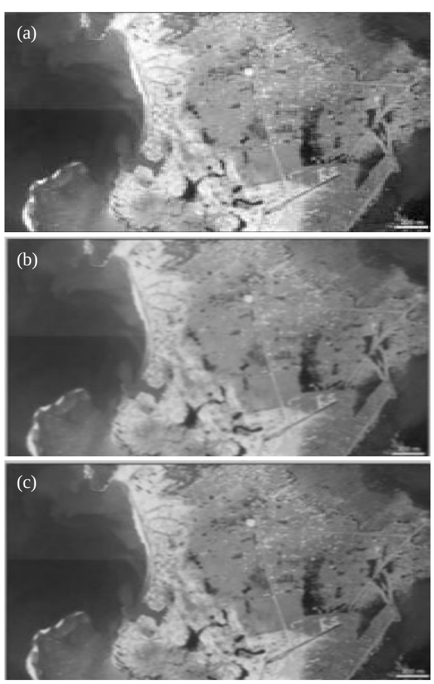


Fig. 2: a) Input image; b) DT-CWT Image and c) Framelet image

Figure 1 shows the block diagram of the proposed satellite image resolution enhancement system. An input image is decomposed by FT to get high-frequency sub-bands. The high-frequency subbands and the low-resolution input image are interpolated. Two different decompositions are used to calculate the complex transform using FT. Compare to Dual-Tree Complex Wavelet Transform (DT-CWT) FT is shift invariant. It has two or more high-frequency filter banks (Upadhyay *et al.*, 2016). Figure 2 shows the proposed input and resultant images.

## RESULTS AND DISCUSSION

Some well-known satellite test images experiments. After framelet decomposition, one coefficient can be remunerated by its associated coefficient. This section tells about the experimental results of the proposed contrast enhancement for satellite images. PSNR is calculated using satellite image. Satellite input image and output images are shown in Fig. 2. Our results show that the proposed technique provides constant improvements. Proposed PSNR value is 30.88 dB. Figure 2b shows an existing DT-CWT transform (Sykes and Das, 1998).

## CONCLUSION

FT domain based image resolution enhancement algorithm presented in this section. Input images are decomposed using this proposed technique. Then decomposed images are enhanced and finally reconstructed using inverse FT. Our results have shown that the proposed method outperforms conservative image enhancement approaches.

## REFERENCES

Aedla, R., 2014. Satellite image contrast enhancement algorithm based on plateau histogram equalization. Proceedings of the 10th IEEE International Symposium on Region, April 14-16, 2014, IEEE, Kuala Lumpur, Malaysia, ISBN:978-1-4799-2029-7, pp: 213-218.

Coumar, S.O. and V.V. Rosario, 2016. Contrast enhancement of satellite images using advanced block based DWT technique. Intl. J. Eng. Future Technol., 3: 1-10.

Demirel, H. and G. Anbarjafari, 2011. Image resolution enhancement by using discrete and stationary wavelet decomposition. IEEE Trans. Image Process., 20: 1458-1460.

Jadhav, B.D. and P.M. Patil, 2015. An effective method for satellite image enhancement. Proceedings of the IEEE International Conference on Computing, Communication and Automation, May 15-16, 2015, IEEE, Noida, India, ISBN:978-1-4799-8891-4, pp: 1171-1175.

Sharma, N. and O.P. Verma, 2014. Gamma correction based satellite image enhancement using singular value decomposition and discrete wavelet transform. Proceedings of the IEEE International Conference on Advanced Communication Control and Computing Technologies, May 8-10, 2014, IEEE, Ramanathapuram, India, ISBN:978-1-4799-3915-2, pp: 1286-1289.

Singh, H. and A. Kumar, 2016. Satellite image enhancement using beta wavelet based gamma corrected adaptive knee transformation. Proceedings of the IEEE International Conference on Communication and Signal Processing, April 6-8, 2016, IEEE, Melmaruvathur, India, ISBN: 978-1-46 73-8549-7, pp: 0128-0132.

Sykes, M.P. and U.C. Das, 1998. Removal of herringbone effects from AEM data maps using the Radon transform. Explor. Geophys., 29: 92-95.

Thriveni, R., 2015. Edge preserving Satellite image enhancement using DWT-PCA based fusion and morphological gradient. Proceedings of the IEEE International Conference on Electrical, Computer and Communication Technologies, March 5-7, 2015, IEEE, Coimbatore, India, ISBN: 978-1-4799-6084-2, pp: 1-5.

Upadhyay, A., A. Shetty, S.K. Singh and Z. Siddiqui, 2016a. Land use and land cover classification of LISS-III satellite image using KNN and decision tree. Proceedings of the 3rd IEEE International Conference on Computing for Sustainable Global The Development (INDIA Com), March 16-18, 2016, IEEE, New Delhi, India, ISBN:978-1-4673-9417-8, pp: 1277-1280.

Upadhyay, A., S.K. Singh and the S. Kambli, 2016b. The Combine technique for classification of IRS P6 LISS-III satellite the images. Intl. J. Control Theor. Appl., 9: 4293-4299.