Volume 2, Issue 12, December 2016 ISSN NO: 2454 - 7514

North Asian International Research Journal Consortium

North Asian International Research Journal

Of

Science, Engineering and Information Technology

IRJIF IMPACT FACTOR: 3.821

NAIRJC JOURNAL PUBLICATION

North Asian International Research Journal Consortium

Welcome to NAIRJC

ISSN NO: 2454 -7514

North Asian International Research Journal of Science, Engineering & Information Technology is a research journal, published monthly in English, Hindi. All research papers submitted to the journal will be double-blind peer reviewed referred by members of the editorial board. Readers will include investigator in Universities, Research Institutes Government and Industry with research interest in the general subjects

Editorial Board

Address: -North Asian International Research Journal Consortium (NAIRJC) 221 Gangoo, Pulwama, Jammu and Kashmir, India - 192301, Cell: 09086405302, 09906662570, Ph. No: 01933-212815, Email: nairjc5@gmail.com, nairjc@nairjc.com, info@nairjc.com Website: www.nairjc.com

IRJIF IMPACT FACTOR: 3.821

HYPER SPECTRAL IMAGE DENOISING USING LOCAL MEAN WEIGHTED FILTERING IN SPATIAL DOMAIN

[1] ER.PARVINDER KAUR & [2] ER.RAMANDEEP KAUR

[1] Assistant Professor, SUSCET, Tangori
[2] M. Tech Scholar, SUSCET, Tangori

ABSTRACT

Hyper spectral images are based on the three dimensional tensors in which first two dimensions deals with the spatial domain and the last deals with the spectral domain of the image. Image and Video Restoration Model Using Non-Global Mean Window Technique, which has been tested using database of images and Video, in order to verify the claimed performance of Image and Video Restoration Technology. The image restoration task involves an intricate removal of noise signal from 2D or 3D image signal, to reform the original structure of image content, while keeping its natural visual consistency intact. The proposed work involved a hybrid model for accomplishing the restoration of color images with high level of accuracy and minimum loss of data due to artifact generation.

Keywords: ***Hyper spectral images, restoration, spectrum, denoising.***

INTRODUCTION

Hyper spectral images are the images that works on the electromagnetic spectrum to process the information contained in the image. Spectrum for each pixel is derived to study the each pixel effiecntly. Spectrum imagining is used to divide the image pixels to n number of bands to study each point of image effiecntly. Hyper spectral technique improves the performance of image beyond the visible region. Hyper spectral images are designed to recognize objects, material and for detection of various objects. It has been used for various applications such as agriculture field, biomedical imaging, and surveillance in various areas, physics and science of geometry.

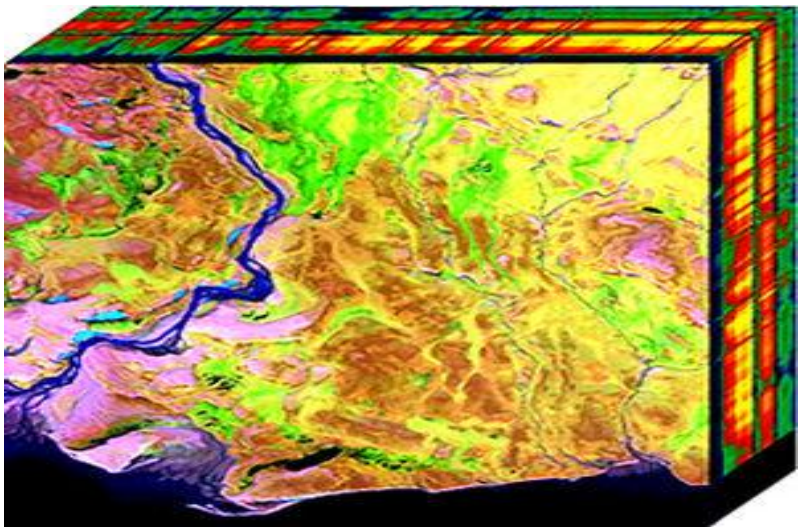

Figure1:shows the two dimensional projection of hyper spectral cube

Hyper spectral images deals with the two types of the nature for different applications. Automat has been used for distinguishing between the human work and then finding the best execution from them. Regular handling of the hyper spectral images deals with the examining the various tasks. Tasks can be categorized into the various categories such as recognition of any item in some particular situation, division of zones according to the some relation between the data, similar or relating pixels are grouped into groups, grouping on the basis of the material of the image[5][6]. Hyper spectral images deals with the wide range of the applications. Images are collected in the form of the stack in automat for the better processing. Denoising of the various hyper spectral images is important step in the handling of various chains of the hyper spectral images. Various flags issues are prepared on the basis of concealments to deal with achievements of various assignments. Various tests associated with the Denoising of the hyper spectral images are based on the spatial features and unearthly relationship between various pixels of the image. Stochastic Gaussian technique has been designed to identify the noise in the hyper spectral images by finding the connection between the intra band connections. Joint Denoising approach deals with finding the relationship between the flags and commotions that deals with the shared group of the pixels using the multivariate methodologies. Images are processed independently using the multivariate methodologies for removing the noise from the image. Multivariate methodologies are more efficient than the Denoising methodologies. Since Denoising algorithms deals with the calculations related to the tuning of parameters associated with the image. Various parameters are associated with the Denoising technique so the users need to be particular about the type of parameters they want to use. Stein's unprejudiced danger estimation metric was designed to enhance the parameters related to the light.

LITERATURE SURVEY

Yuan, et al. [18] discussed in their work bout the combination of the spatial and spectral perspectives of the denoising of the hyper spectral images. Hyper spectral aggregate variety was used to de-noise the hyper spectral images in the earlier researches. **Yong-Qiang Zhao et al. [19]**, discussed in their work about the HSI utilizing which deals with the calculation of the neighborhood and the spatial features of RAC to remove the noise from the hyper spectral images. Information is represented in the form of catch nearby of the various spatial and spectral spaces. **Knaus, et al. [21]** discussed in their work about the straight forward procedure for the denoising of the hyper spectral images. Deterministic toughening is the method that is used to decrease the noise in the image. This method of decreasing the noise is numerically best and is widely used for manufacturing the hyper spectral images.

METHODOLOGY

Non-Global Mean Window is a generalization of a binary search Non-Global Mean Window that stores points in k-dimensional space. It stores a collection of points in the Cartesian plane in three-dimensional space and it is also used to store biometric data. It can hold data of any dimension, but all of the data stored in a Non-Global Mean Window must have the same dimensions. Non-Global Mean Window splits the point set alternating by x-coordinate and y-coordinate. To evaluate the performance of the proposed system of Non-Global Mean Window model Images and Videos were collected to create the database. From the database total 100 images and 25 videos were taken and were restored using the Non-Global Mean Window model.

RESULTS:

The proposed Non-Global Mean Window system has improved the restoration capacity of Images and Videos in the current subjected environment.

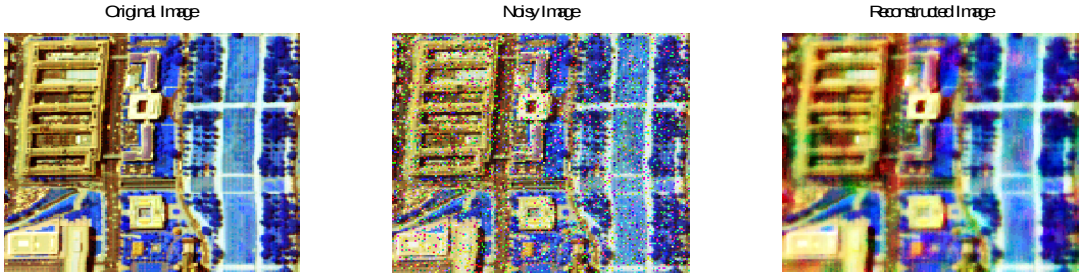

Figure 2 Shows the original Image (left), noisy image (center) and denoised image (right) using proposed Local Total variation patch model

The above figure shows the results for salt pepper noise attack on the 160x160x64 layer hyper spectral image for 10% noise level in overall frames the noise reduction in the output image is significantly high and the structural balance of the image layer in maintained, the colour balance of the image is also maintained with reduced dilation of the edge profile, below given graphical analysis is done to study the effect of the filter using metric analysis.

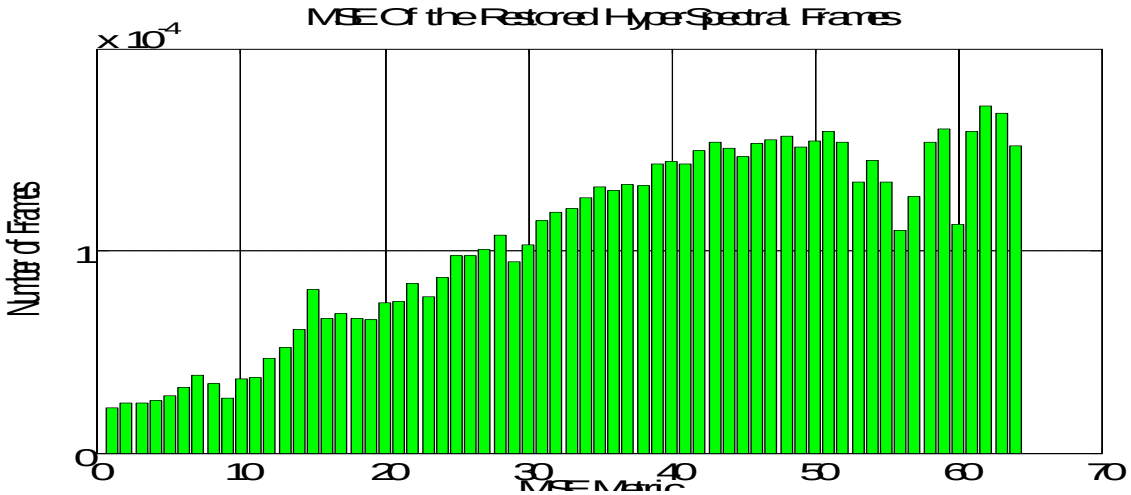

Figure 3 shows the graphical representation of the MSE values for all the layers of the hyper spectral image using local variation denoising model.

The above figure shows the MSE evaluation results for salt pepper noise attack on the 160x160x64 layer hyper spectral image for 10% noise level in overall frames the noise reduction in the output is significantly high for low frequency image frames using the proposed method for 64 layer HS image.

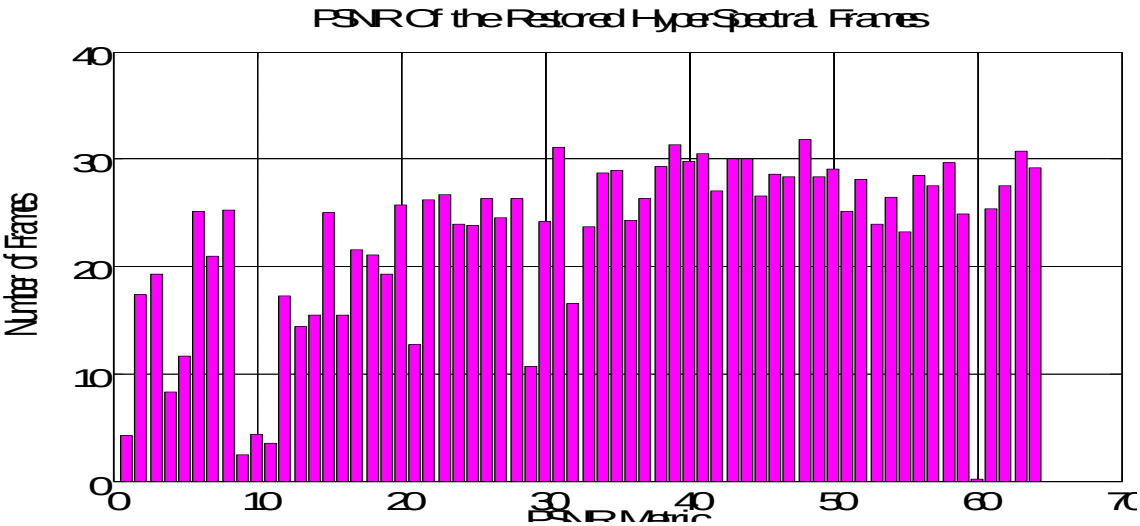

Figure 4: shows the graphical representation of the PSNR values for all the layers of the hyper spectral image using local variation denoising model

The above figure shows the PSNR evaluation results for salt pepper noise attack on the 160x160x64 layer hyper-spectral image for 10% noise level in overall frames the noise reduction in the output is significantly high for low frequency image frames using the proposed method for 64 layer HS image.

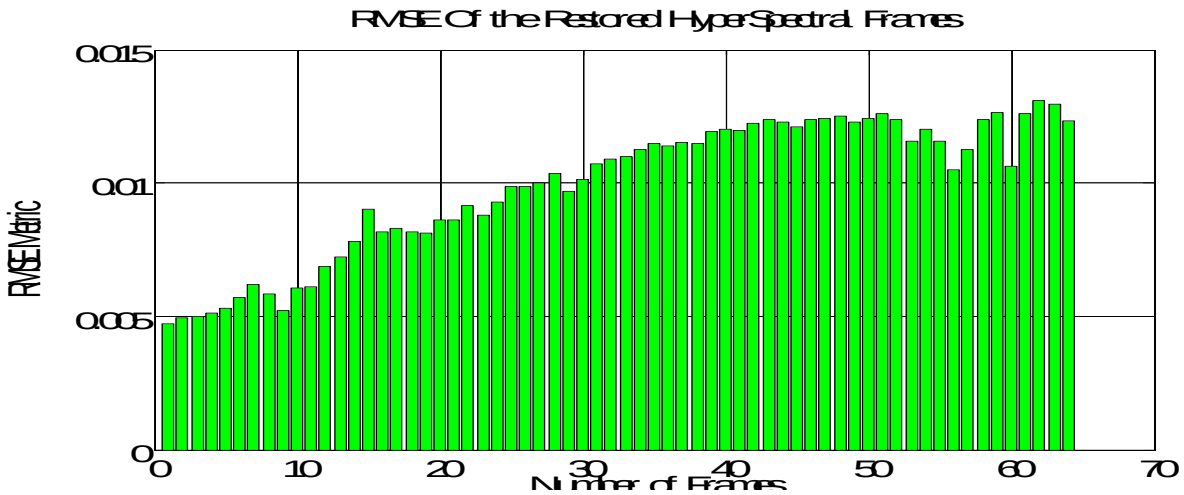

Figure 5 shows the graphical representation of the RMSE values for all the layers of the hyper spectral image using local variation denoising model

The above figure shows the RMSE evaluation results for salt pepper noise attack on the 160x160x64 layer hyper-spectral image for 10% noise level in overall frames the noise reduction in the output is significantly high for low frequency image frames using the proposed method for 64 layer HS image.

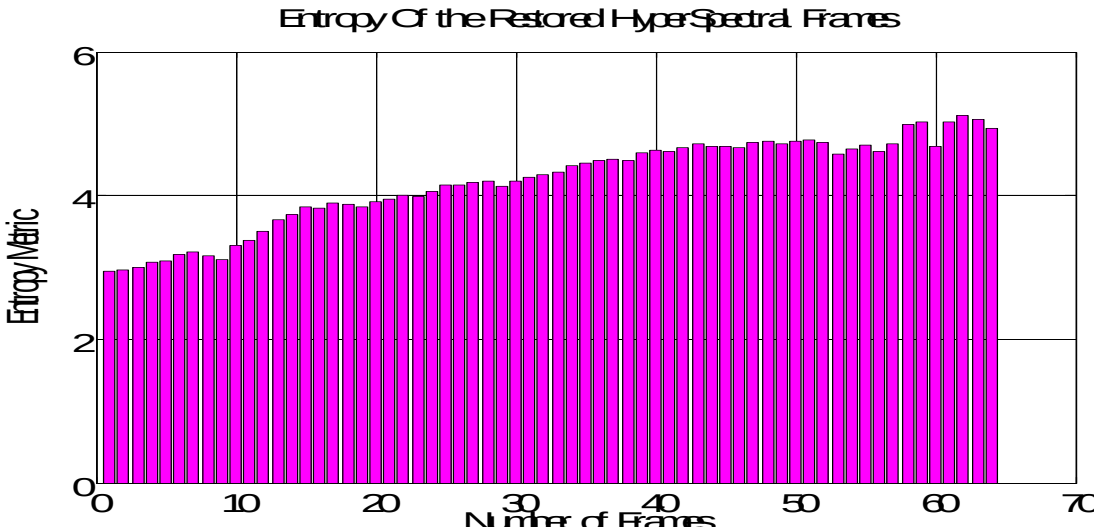

Figure 6: shows the graphical representation of the Entropy values for all the layers of the hyper spectral image using local variation denoising model

The above figure shows the Entropy evaluation results for salt pepper noise attack on the 160x160x64 layer hyper-spectral image for 10% noise level in overall frames the noise reduction in the output is significantly high for low frequency image frames using the proposed method for 64 layer HS image.

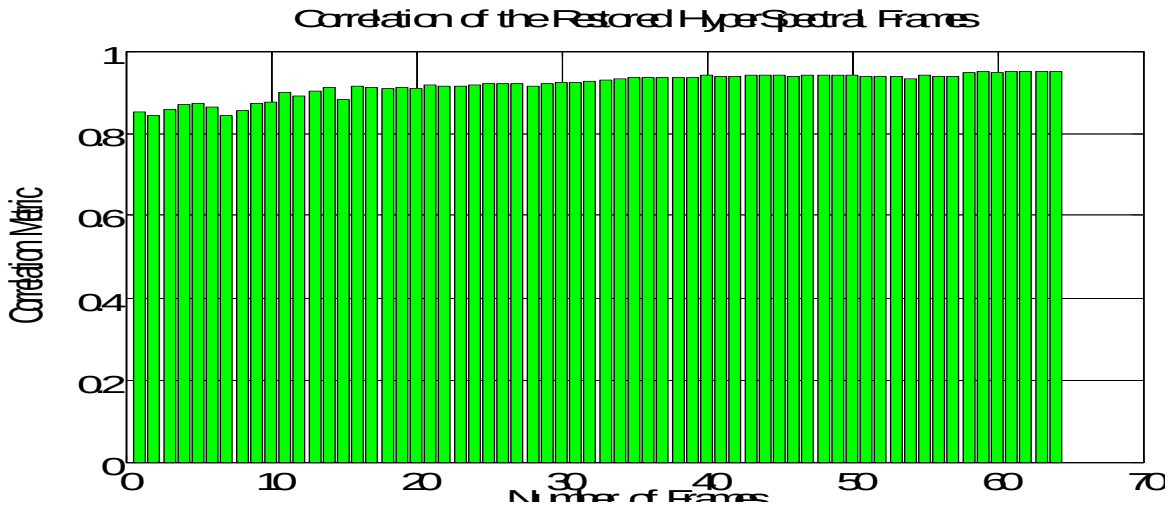

Figure 7 shows the graphical representation of the Correlation values for all the layers of the hyper spectral image using local variation denoising model

The above figure shows the Correlation evaluation results for salt pepper noise attack on the 160x160x64 layer hyperspectral image for 10% noise level in overall frames the noise reduction in the output is significantly high for low frequency image frames using the proposed method for 64 layer HS image.

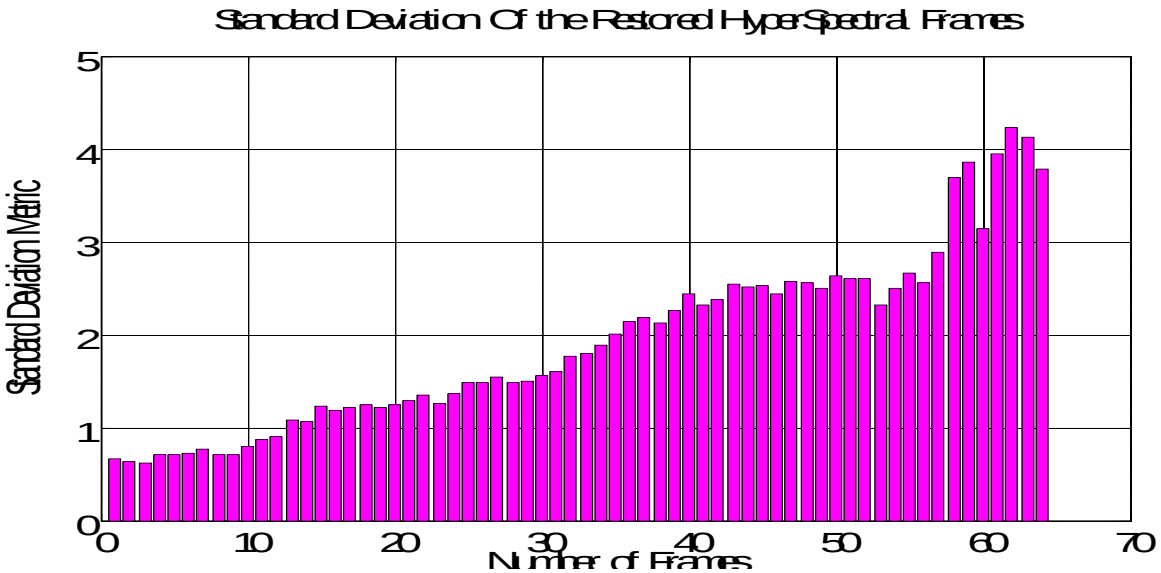

Figure 8 shows the graphical representation of the Standard Deviation values for all the layers of the hyper spectral image using local variation denoising model

The above figure shows the Standard deviation evaluation results for salt pepper noise attack on the 160x160x64 layer hyper spectral image for 10% noise level in overall frames the noise reduction in the output is significantly high for low frequency image frames using the proposed method for 64 layer HS image.

Table shows the Result for the Local Variation Filter for parameters PSNR, MSE, RMSE, Entropy, Correlation and STD

Method	Base Approach				Proposed Approach			
PSNR	24.23973	22.61298	18.92827	13.43108	25.74549	25.55732	19.25582	16.57033
MSE	2.38E-05	2.43E-05	2.45E-05	3.52E-05	2.88E-05	2.93E-05	3.22E-05	3.03E-05
RMSE	0.004876	0.004931	0.004952	0.005937	0.005365	0.005414	0.005676	0.005501
Entropy	2.977162	3.012954	2.992296	3.107723	3.08752	3.194121	3.205514	3.208429
Corr	0.842143	0.84723	0.859403	0.821891	0.873217	0.877938	0.871068	0.873987
ST. DEV	0.677972	0.675865	0.662331	0.761717	0.683872	0.764111	0.775408	0.761558

CONCLUSION

The proposed model of restoration relied on a noise search Non-Global Mean Window model for generating a restoration spectrum, this spectrum used Non-Global Mean Window search to optimize the restoration power of the kernel filter. The kernel filter was applied in a recursive manner changing the restoration threshold gradually until the maximum number of iterations is not reached. To enhance the effectiveness of the filter, the images were processed in luminosity color space (HSI domain). This resulted in increasing the efficiency of the proposed Non-Global Mean Window model as compared to the MULTI LEVEL HYBRID FILTERING based restoration model, which used raw RGB format for restoration.

REFERENCES

[1] http://ltpwww.gsfc.nasa.gov/ISSSR 95/hydiceop.htm.

[2] http://aviris.jpl.nasa.gov/.

[3] G. Shaw and H. Burke. Spectral imaging for remote sensing. Lincoln Laboratory Journal, 14(1):3-28, 2003.

[4] G. Shaw and D. Manolakis. Signal processing for hyper spectral image exploitation. IEEE Signal Processing Mag., 19(1):12-16, 2002.

[5] A. R. Gillespie, M. O. Smith, J. B. Adams, S. C. Willis, A. F. Fisher, and D. E. Sabol. Interpretation of

residual images: Spectral mixture analysis of AVIRIS images, Owens Valley, California. In Proc. of the 2nd AVIRIS Workshop, R. O. Green, Ed., Jpl Publ. 90-54, pages 243-270, 1990.

[6] M. O. Smith, J. B. Adams, and D. E. Sabol. Spectral mixture analysis-New strategies for the analysis of multispectral data, pages 125{143. Kluwer Academic Publishers, Brussels and Luxemburg, Belgium, 1994.

[7] N. Keshava and J. F. Mustard, "Spectral unmixing," IEEE Signal Process. Mag., vol. 19, no. 1, pp. 44–57, Jan. 2002.

[8] C.-I Chang, C.-C.Wu,W. Liu, and Y.-C. Ouyang, "A new growing method for simplex-based endmember extraction algorithm," IEEE Trans. Geosci. Remote Sens., vol. 44, no. 10, pp. 2804–2819, Oct. 2006.

[9] D. D. Lee and H. S. Seung, "Learning the parts of objects by non-negative matrix factorization," Nature, vol. 401, pp. 788–791, 1999.

[10] D. D. Lee and H. S. Seung, "Algorithms for non-negative matrix factorization," Advances in Neural Information Processing Systems, MIT Press, pp. 556–562, 2001.

[11] D. L. Donoho. De-noising by soft-thresholding. *IEEE Trans. In-form. Theory*, 41:613–627, May 1995.

[12] D. L. Donoho and I. M. Johnstone. Ideal spatial adaptation via wavelet shrinkage. *Biometrika*, 81:425–455, 1994.

[13] I. Atkinson, F. Kamalabadi, and D. L. Jones. Wavelet-Based Hyperspec-tral Image Estimation. *Proc. IGARSS Conf.*, 1993.

[14] C.Liu, R.Szeliski, S.Bing, C.Lawrence, W.Freeman, "Automatic Estimation And Removal Of Noise From a Single Image" IEEE Transaction on Pat-tern Analysis And Machine Intelligence, Vol.30,No.2,pp.299-314, February 2008.

[15] S.Smith,"Digital Signal Processing A Practical Guide For Engineers and Scientists","An Imprint of Elsevier" 2006.

[16] N. Bhatia, A.Kumar, V.A Tolpekin, "Automatic Segmentation of Image Us-ing Orthonormal Wavelet Transform," SUBMITTED FOR PUBLICATION TO: IETE, manuscriptID IETEJR$_5$72$_0$9 , OCTOBER 24, 2009

[17] Q. Yuan, L. Zhang, and H. Shen, Hyperspectral image denoising employing a spectral-spatial adaptive variation model, IEEE Trans. Geosci. Remote Sens., vol. 50, no. 10, pp. 36303677, Oct. 2012.

[18] Yuan, Qiangqiang, Liangpei Zhang, and HuanfengShen. "Hyperspectral Image Denoising With a Spatial Spectral View Fusion Strategy."(2014): 1-1.

[19] Yong-Qiang Zhao; Jingxiang Yang, "Hyperspectral Image Denoising via Sparse Representation and Low-

Rank Constraint," Geoscience and Remote Sensing, IEEE Transactions on , vol.53, no.1, pp.296,308,Jan.2015 doi:10.1109/TGRS.2014.2321557

[20] Zhang, H. "Hyperspectral image denoising with cubic total variation model." *ISPRS Annals of Photogrammetry, Remote Sensing and Spatial Information Sciences* 7(2012): 95-98.

[21] Knaus, C., and M. Zwicker. "Progressive Image Denoising." (2014): 1-1.

[22] H. Othman and S. E. Qian, "Noise reduction of hyperspectral imagery using hybrid spatial-spectral derivative domain wavelet shrinkage," *IEEE Trans.Geosci. Remote Sens.*, vol. 44, no. 2, pp. 397–408, Feb.2006.

[23] J Martin-Herrero, Anisotropic diffusion in the hypercube. IEEE Trans. Geosci. Remote Sens. 45(5), 1386–1398 (2007)

[24] Chen G. and Qian S., 2008. Simultaneous dimensionality reduction and denoising of hyperspectral imagery using bivariate wavelet shrinking and principal component analysis. Can. J. Remote Sens.,34(5), pp. 447–454.

[25] Xu, Dong, et al. "Analysis and denoising of hyperspectral remote sensing image in the curvelet domain." *Mathematical Problems in Engineering* 2013 (2013).

[26] Guo, Xian, et al. "Hyperspectral image noise reduction based on rank-1 tensor decomposition." *ISPRS Journal of Photogrammetry and Remote Sensing* 83 (2013): 50-63.

[27] Joachimiak, M.; Rusanovskyy, D.; Hannuksela, M.M.; Gabbouj, M., "Multiview 3D video denoising in sliding 3D DCT domain," Signal Processing Conference (EUSIPCO), 2012 Proceedings of the 20th European , vol., no., pp.1109,1113, 27-31 Aug. 2012.

[28] Kaimal, A.B.; Manimurugan, S.; Anitha, J., "A modified anti-forensic technique for removing detectable traces from digital images," Computer Communication and Informatics (ICCCI), 2013 International Conference on , vol., no., pp.1,4, 4-6 Jan. 2013.

Publish Research Article

Dear Sir/Mam,

We invite unpublished Research Paper,Summary of Research Project,Theses,Books and Book Review for publication.

Address:- North Asian International Research Journal Consortium (NAIRJC)
221, Gangoo Pulwama - 192301
Jammu & Kashmir, India
Cell: 09086405302, 09906662570,
Ph No: 01933212815
Email:- nairjc5@gmail.com, nairjc@nairjc.com , info@nairjc.com
Website: www.nairjc.com