A Novel Approach for Deep-Sea Mining Image Restoration & its Enhancement using Adaptive Wavelet Transform and Histogram Equalization

Prof. Sucheta V. Pawar[1] Prof. G.S. Bhavekar[2] Prof. Poonam P. Shilwant[3] Prof. Pratiksha V. Chafle[4] Prof. Y.S. Bhavekar[5]

[1,2,3]Lecturer [4,5]Assistant Professor

[1]Department of Chemistry [2,3]Department of Information Technology [4]Department of Electronics

[1,2,3,4,5]Dr. D. Y. Patil ACS Jr. College, Akurdi, Pune [5]Indrayani College Pune-44

Abstract— Any kind image is transform in the form of digital in images, but after sending of image still the images corrupted with noises so the received images signal needs pre-processing before it can be used in various application. So one of the methods for clear the image. De-noising technique is involved managing of images data to produce a visually high quality images for improving the quality of images by improving some its features, there are various methods or algorithm are available for de-noising of various type of Images like spatial domain filtering, nonlinear filtering, wavelet domain, etc. So using adaptive wavelet transform one have numerous advantages like, wavelet offer a simultaneous localization in the time and frequency domain also using fast wavelet we transform it is computationally very fast than other filtering methods .We live in a material world. Today, it is important role of the materials engineer to study and analyses the various things, develop, design and operate processes that transform raw materials into useful engineering products intended to improve the quality of our lives. The industrial revolution thrust metals into the forefront of technology, and they have become the very foundation of our modern society. One cannot envision a life in which electronics, transportation systems, buildings and machines are not part of our daily lives. Metallurgy is the part of materials science and materials engineering, that studies the physical and chemical behavior of metallic elements, their intermetallic compounds and their alloys. Metallurgy is also the technology of metals: The way in which science is applied to the production of metals and the engineering of metal components for use in consumer products and manufactured goods. The production of component parts made from metals is traditionally divided into several categories.

Key words: Deep Sea Mining, Problem Associated Underwater Image, Image De-Noising using AWT, Image Enhancement using Histogram Equalization Method

I. INTRODUCTION

Deep sea mining is a relatively new mineral extraction process that carries out on the ocean floor. Ocean mining sites capture large areas where metals are found in extremely higher depth or active and extinct opening on sea floor to extract metal or mineral at about 1,400 – 3,700 m below the ocean's surface The vents create sulfide deposits, in which posses precious metals such as gold, silver, manganese, copper, cobalt, and zinc. These ores are extracted from sea bed using various equipments by hydraulic pumps or bucket systems that take it to the surface for further purification process. As these mining steps, deep sea mining creates major environmental issues. So sea-bed mining should be specified for limited zone because it has adverse effect on ecosystems and creates pollution by heavy metal.

A. Minerals and Related Depths

Type of Mineral Deposit	Average Depth	Resources found
Polymetallic nodules	4,000 – 6,000 m	Nickel, copper, cobalt, and manganese
Manganese Crusts	800 – 2,400 m	Mainly cobalt, some vanadium, molybdenum and platinum
Sulfide deposits	1,400 – 3,700 m	Copper, lead and zinc some gold and silver

Table 1: Minerals and related depths

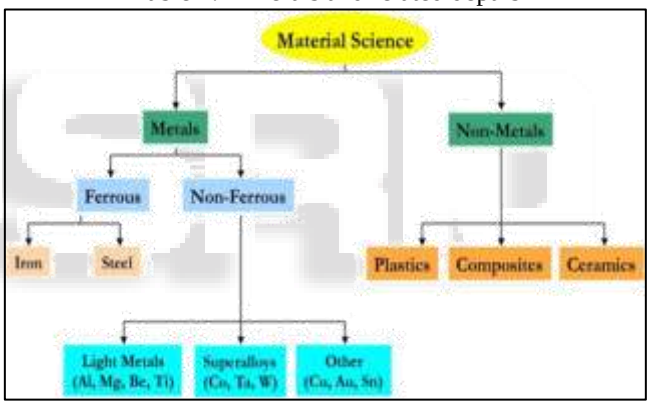

Fig. 1: Material Science &its Family

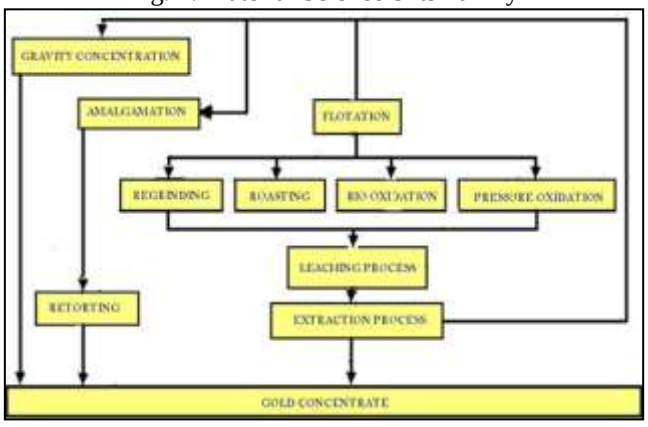

Fig. 2: Process of Extraction of Gold under Sea water

Metallurgy is mainly based on material science. Material science has two parameters metal & non-metal. Both are very useful in daily life. Metals are sub-divided into ferrous & nonferrous. All ferrous metals are magnetic and give little resistance to corrosion. Non-Ferrous metals, these are metals which do not contain any iron. They are not magnetic and are usually more resistant to corrosion than

ferrous metals. Examples are aluminum, copper, lead. Plastics are typically organic polymers of high molecular mass, but they often contain other substances. They are usually synthetic, most commonly derived from petrochemicals, A ceramic is an inorganic, nonmetallic solid material comprising metal, nonmetal or metalloid atoms primarily held in ionic and covalent bonds.

1) Removal of Impurity

Before the adsorption of cyaniding pulp, remove the wood fine pieces to prevent it from adsorption of gold and avoids the carbon screen.

2) Draining and Adsorption

In leaching tank carbon is added for the absorption of gold to make the gold with loaded carbon. After adsorption, carbon screen separate out the pulp and carbon.

3) Desorption Electrolysis

At high temperature and pressure, gold loaded with carbon separates out gold mud and carbon in closed system.

4) Smelting

After the process of simple removal of pickling and impurity, particles of the gold obtain. Desorption electrolysis system have high efficiency with low energy consumption. At the high temperature and pressure, this system has advantages of no cyanide, automatic controlling, high efficiency, fast and low energy consumption. High Efficiency: When the grade of gold loaded carbon reaches 3000g/t, desorption rate can reach more than 96%. Fast: because of the high temperature and pressure, the time of desorption electrolysis is about twelve hours decreases by 50-70%.Low energy consumption: because of the equal temperature and speedly working, the energy consumption is 1/2-1/4 of regular system No cyanide: without adding NaCN in desorption solution, low pay and no pollution. High grade gold mud, extract gold mud very easily. Automatic control: installed level liquid control system, temperature control system, automatic control system Safety: With three security measures, system intelligent, automatic limit pressure and pressure release mechanism,

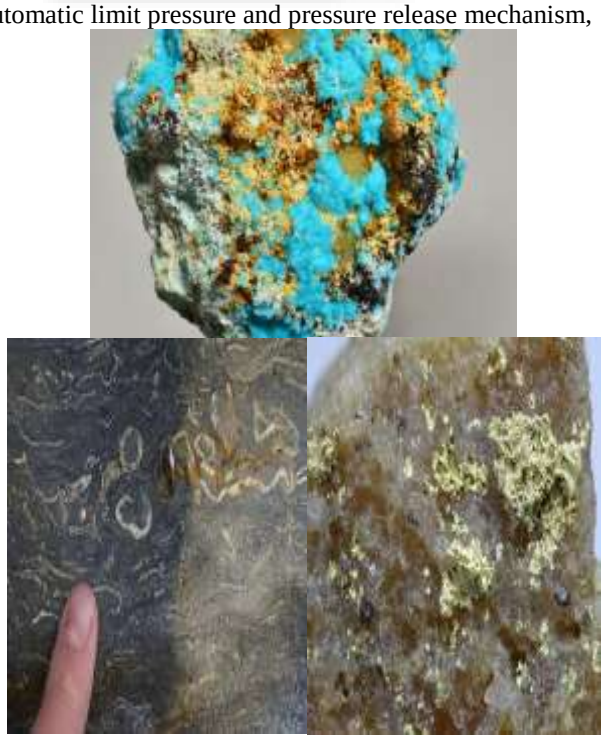

Fig. 3: Minerals

Minerals such as salt, sand, gravel, and some manganese, copper, nickel, iron, and cobalt can be occur in the deep sea and drilled for crude oil. Some of the images shown above.

There are already few systems method are designed for the perform best with document images with simple data collection. Some systems standard technologies systems are invented. This depends on existing techniques and methodology.

II. LITERATURE SURVEY

De-An Huang, Li -WeiKang, Yu-Chiang Frank Wang, Chia-Wen Lin [1] et al suggested in "Self-Learning Based Image Decomposition with Applications to Single Image De-noising" in this paper, it has been showed a learning-based image decomposition framework for single image de-noising. S. Grace Chang, Bin Yu, Martin Vetterli [2] et al suggested in "Adaptive Wavelet Thresholding for Image De noising and Compression", two main concepts belongs to image de-noising were discussed in this paper. The first one was an adaptive threshold for wavelet thresholding images was proposed, based on the GGD modeling of sub band coefficients, and results output was excellent performance. The second one was, a coder was designed for both compression and de-noising. The proposed Bayes Shrink threshold consist the zero-zone of the quantization step of this coder.S. S. Thakare and A.M. Sahu[3] suggested in "Underwater Image De-noising with Adaptive Wavelet Transformation", thus the proposed system has made combination of the available methods for image restoration and image enhancement. The proposed method produces more enhanced images which remove noise with improvement in the PSNR, but also get a better visual quality. J. Patil1, S. Jadhav [4] et al suggested in "A Comparative Study of Image De -noising Techniques", the comparative study of various de-noising techniques for digital images shows that wavelet enhanced outperforms the other standard spatial domain filters..Prabhkar C.J, Praveen Kumar P.U [5] et al suggested in "An Image Based Technique for Enhancement of Underwater Images", it has been involved a pre-processing technique for enhancing the quality of degraded underwater images. The proposed technique includes four filters such as homomorphism filtering, wavelet de-noising, bilateral filtering and contrast equalization, which are applied one after another. RaimondoSchettini and Silvia Corchs [6] et al suggested in "Underwater Processing of Images: Step of the Art of Restoration and Enhancement of image Methods", in this it has been reviewed the information together for a better comprehension and comparison of the methods. It has been have concluded that the available methods for image enhancement and image restoration, based on the conditions for which each of the algorithms has been developed.

III. SYSTEM DESIGN

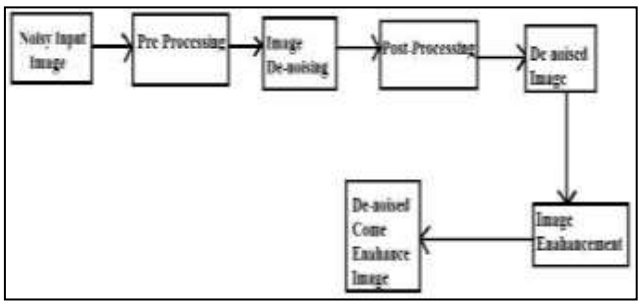

Fig. 3: Block diagram of Deep Sea Mine image De-noising & its Enhancement

A. *Image De-Noising*

The image processing is done for underwater images, which is able to enhancement image, but they are not efficient to remove noise from underwater image. The Objective is to improve underwater image by using de-noising method, the processing of underwater image is necessary because these image leads serious problems when compared to original Image. In this method pre-processing or post-processing is done on the underwater image using some filtering algorithm, which makes the image look more clear and effective uniform illumination and balance contrast. This step cans realize the purpose to reduce the illumination changes, sharpen the edge details, and eliminate the noise in the underwater image

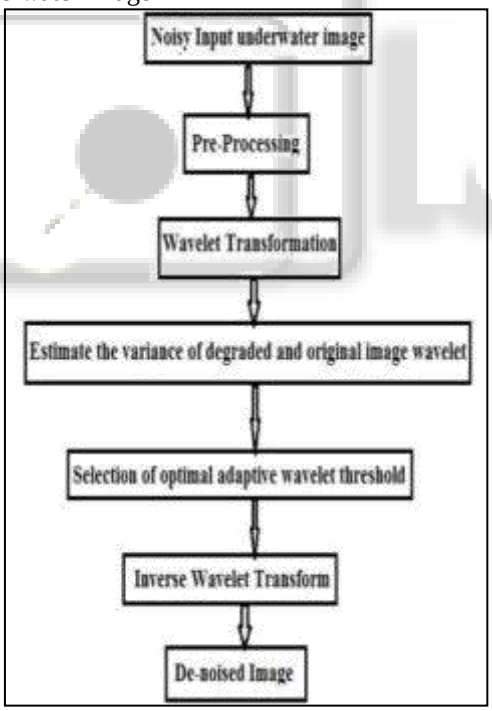

Fig. 4: Image De-noising Procedure

B. *Image Enhancement*

The aim of image enhancement is to provide a better transform representation for future automated image processing. The high-performance of the HE in enhancing the contrast of an image as a consequence of the dynamic range expansion, HE also flattens histogram.

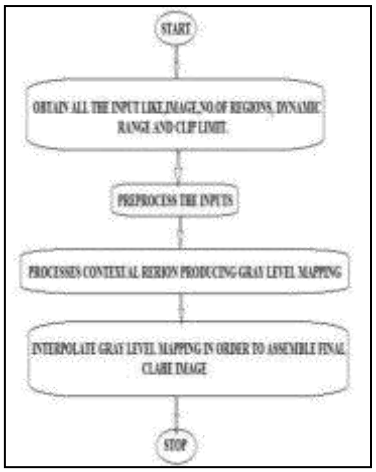

Fig. 5: Image De-noising algorithm

Method based on brightness preserving histogram equalization Contrast Limited Adaptive Histogram Equalization (CLAHE).

It enhances the contrast in images by transforming the values of intensity in the image

- Find all the inputs of Image that is Number of regions available in row and the number of region available column directions.
- Pre-process the inputs Determine the real clip limit value from the normalized value pad the image before splitting into the regions and then go toward preprocessing.
- Process on each contextual region on row and column thus create gray level mappings of image. And then the regions that make a histogram for this region it extract a single image
- And at the last Interpolate gray level mappings of image in order to assemble final CLAHE image.

IV. TECHNICAL RESULT & EQUITANT HISTOGRAM

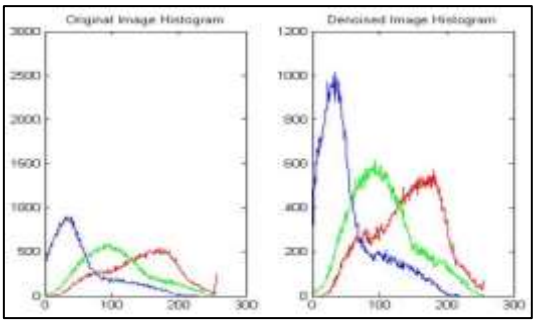

Fig. 6: After De-noising Histogram Have showing Pixels are Recover

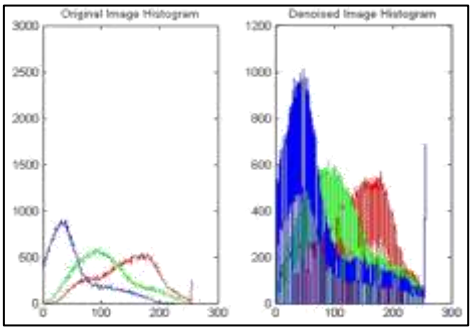

Fig. 7: After Enhancement Histogram Have showing Pixels are Recover

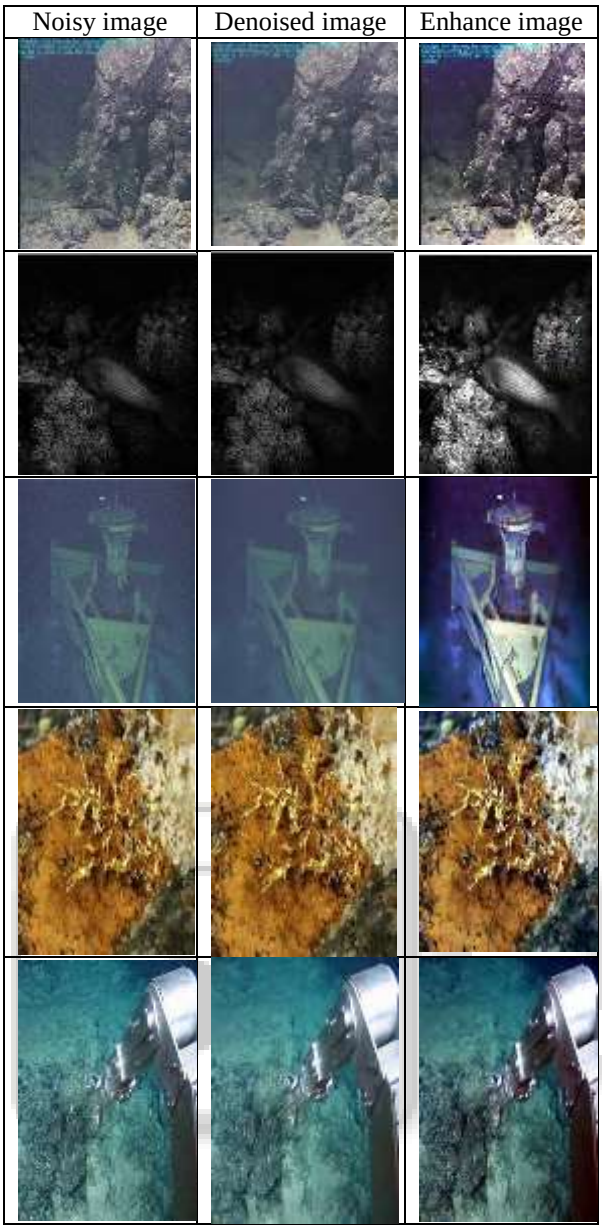

Fig. 8: Noisy Image, Denoised Image & Enhance Image

V. CONCLUSION

There are so many problem associated with clear view of objects in underwater with at long or short distance. This is very important challenge to the image processing community for their research activity in various images processing area. Now days, leading advance technique as related with optical imaging technology and the use of clear sensing techniques are rapidly increasing for the image objects in the sea. The proposed technique will be restore the original image that is capture by underwater researcher by adopting the de-noising as well as it will gives more enhanced images using this Histogram equalization. The proposed technique is a combining of an adaptive threshold with adaptive output response and the threshold function is not only remove the noise, improve the Peak Signal to Noise Ratio (PSNR), but also gets a best visual effect for underwater image. By applying the proposed approach, we can produce excellent results and this will help for Future work will include further evaluation in underwater area.

REFERENCES

[1] De-An Huang, Li-Wei Kang,Yu-Chiang Frank Wang and Chia-Wen Lin," Self-Learning Based Image Decomposition With Applications to Single Image Denoising," IEEE Transactions on Multimedia, Vol. 16, no. 1, January 2014.
[2] Chang S G. Yu B, Vetterli M. Adaptive Wavelet Thresholding for Image Denoising and Com- pression, IEEE Trans. Image Processing, 2000.9 (9): 1532-1546.
[3] Shiwam S. Thakare and Amit M. Sahu"Underwater Image De-noising by using Adaptive Wavelet Transformation" International Journal of Innovative Research in Computer and Communication Engineering, Vol. 3, Issue 4, April 2015.
[4] Jyotsna Patil1, Sunita Jadhav,"A Comparative Study of Image De-noising Techniques ", International Journal of Innovative Research in Science, Engineering And Technology, Vol. 2, Issue 3, March 2013.
[5] Prabhkar C.J, Praveen Kumar P.U,"An Image Based Technique for Enhancement of Underwater Images", International Journal of Machine Intelligence ISSN: 0975–2927 & E-ISSN: 0975–9166, Volume 3, Issue 4, 2011.
[6] Raimondo Schettini and Silvia Corchs, Underwater Image Processing: State of the Art of Restoration and Image Enhancement Methods", Hindawi Publishing Corporation EURASIP Journal on Advances in Signal Processing Volume 2010.
[7] Sethunadh R and Tessamma Thomas,"image de-noising using sure based adaptive thresholding in direction let domain", An International Journal (SIPIJ) Vol.3, No.6, December 2012.
[8] Defeng Zhang, Digital Image Processing Using MATLAB. Beijing: Posts and Telecom Press, 2009, 10
[9] Rafael C.Gonzalez, Richhard E. Woods.Digital Image Processig Second Edition, Publishing House of Electronics Industry.2007.8
[10] Jie Lin,Mengyin Fu,Daoping Li, Self-adaptive Wavelet Threshold De-noising Method and Its Application in Image Processing. ACTA ARMAMENTARII, 32(7):896-900, 2011
[11] Chang S G. Yu B, Vetterli M. Adaptive Wavelet Thresholding for Image Denoising and Com pression, IEEE Trans. Image Processing, 2000.9 (9): 1532-1546
[12] Prabhakar C.J.#Praveen Kumar P.U. Underwater Image De-noising Using Adaptive Wavelet Sub band Thresholding, Proceedings of the 2010 International Conference on Signal and Image Processing, Piscataway, United States: IEEE Computer Society, 2010: 322-327
[13] Chao Wang, Zhongfu Ye, "Brightness preserving histogram Equalization with maximum entropy: a variational Perspective", IEEE Trans. Consumer Electron.vol. 51, No. 4, pp. 1326-1324, Nov. 2005
[14] Yu Wan, Qian Chen, Bao-Min Zhang, "Image enhancement based on equal area dualistic sub-image histogram equalization method", IEEE Trans. Consumer Electron. vol. 45, no. 1, pp. 68-75, Feb. 1999
[15] Y. T. Kim, "Quantized bi-histogram equalization," in IEEE Conf. on Acoustics, Speech, and Signal Processing, vol. 4, Apr. 1997, pp. 2797– 2800.

[16] J. Zimmerman, S. Pizer, E. Staab, E. Perry, W. McCartney, B. Brenton, "Evaluation of the effectiveness of adaptive histogram equalization for contrast Enhancement," IEEE Tr. on Medical Imaging, pp. 304-312, Dec. 1988.
[17] Yeong-Taeg Kim, "Contrast enhancement using brightness preserving bi-histogram equalization", IEEE Trans. Consumer Electronics, vol. 43, no. 1, pp. 1-8, Feb. 1997.
[18] N. Otsu, "A threshold selection method from gray-level histograms," IEEE Trans. on Systems, Man and Cyb., vol. 9, no. 1, pp. 41-47, 1979.
[19] H. Ibrahim, N.S.P. Kong, "Brightness preserving dynamic histogram equalization for image contrast enhancement," IEEE Transactions on Consumer Electronics, vol. 53, no. 4, pp. 1752-1758, Nov. 2007
[20] Author: mciesielska 17 gru 2015
http://www.deepseamining.wzp.pl/deep-sea-mining
Source: wikipedia.org, iom.gov.pl

