iJRASET
International Journal For Research in
Applied Science and Engineering Technology

# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

**Volume:** 8 **Issue:** II **Month of publication:** February 2020

**DOI:** http://doi.org/10.22214/ijraset.2020.2119

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 8 Issue II Feb 2020- Available at www.ijraset.com

# Image Enhancement of Underwater Digital Image using L*A*B Color space and UN sharp Masking

Jafrin. S K[1], Alekhya. V[2], Madhuri. B[3], Nadiya S K[4], Hemasri. D[5], Munwar Ali. S K[6]
[1, 2, 3, 4, 5]*B.Tech Students, Department of ECE, ESWAR college of Engineering , Narasaraopet, A.P, India.*
[6]*Assistant Professor, Department of ECE, ESWAR college of Engineering, Narasaraopet, A.P, India.*

***Abstract: The underwater digital images generally ache from blur, low contrast, non uniform lighting and shrink color. This research paper proposed a preprocessing technique based on image to improve the quality of underwater digital images. The mixed contrast limited adaptive histogram equalization has actually rejected the utilization of L*A*B color image space to improvise the image in an effective way.***

***The mixed contrast limited adaptive histogram equalization have uneven illumination problem. And it is ignored by many researchers.***

***To overwhelm the problem of uneven illumination in the output image of the CLAHE image output has been again removed by utilizing the smoothing processes of image incline.***

***The main objective is that the images may get noisy due to various factors than filtering of images has become an major role operation to de-noise the noisy images***

***Keywords: L*A*B color space, pre-processing under water image, mixed CLAHE, image enhancement, image smoothing, image inclination.***

## I. INTRODUCTION

Underwater images are essentially characterized by their poor visibility, blur & diminished colors, contrast limited and hazy.

Virtually no analytical equalization has been carried out on underwater images. The light quantity is reduced once as we go deeper into the water & so color disappear one by one depending upon the wavelength.

The red color goes always approximately, at the depth of 3mtsorange color disappears at approximately 5mdepth.at 10mdepththe yellow color goes off &lastly the purple &green color disappears at depth which are beyond 10m.as the blue color has the shortest wavelength so, it travels more deeply in the water .the shortest wavelength so, it travels more deeply in the water.

The underwater digital images are mostly dominated by a mix blend of blue-green color. These images may create various problems mainly occur due to denser medium, light scattering, light absorption & light reflection. These problems may also effect on other components like floating particles and dissolved organic matter.

There are mainly two types of scattering

*A.* Forward scattering
*B.* Backward scattering

1) Light reflected by the object that reaches the camera has two components:
2) Light that has not been scattered at the intervening water
3) Light that has been scattered components.
4) The light received from the camera may include light that has been reflected by an objection from the object .The latter is called backward scattering.

There are many researchers developed preprocessing techniques for underwater images using image enhancement methods. The main goal is to ameliorate the caliber of the image and furbish the underwater pictures.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
*ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177*
*Volume 8 Issue II Feb 2020- Available at www.ijraset.com*

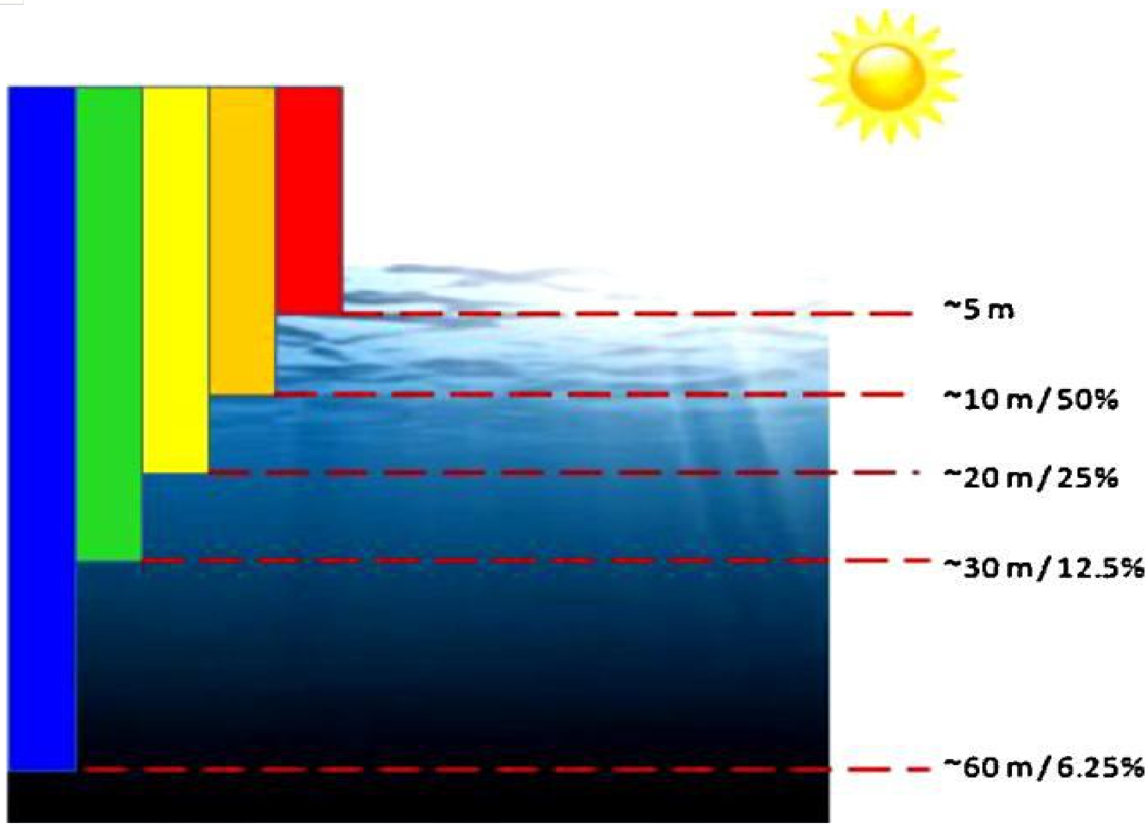



Fig.1. Illustration of underwater color diminishing

The next section show the commended method , comparative analysis is taken out by using various available techniques, and lastly the conclusion section of the proposed work.

## II. HISTOGRAM BASED TECHNIQUES

Underwater image enhancement by using histogram based techniques are classified in to three types as shown Below

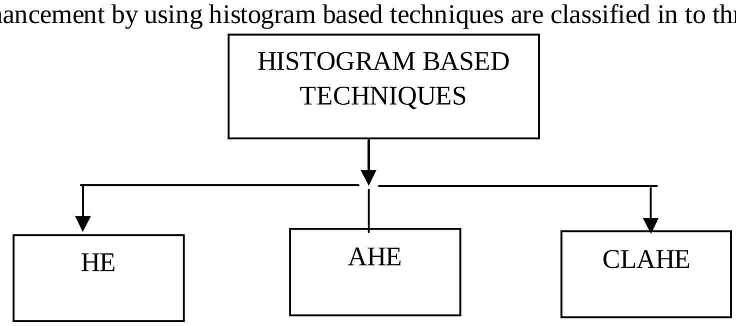



Fig.1. Histogram based techniques

## III. HISTOGRAM EQUALIZATION

Histogram equalization is a technique for adjusting image intensities to enhance contrast

Let F be a given image represented as a mr by mc matrix of integer pixel intensities ranging from 0toL-1.is the number of possible intensity values , often 256. Let p denote the normalized histogram of F with a bin for each possible intensity so

$$P_n = \frac{\text{Number of pixels with intensity } n}{\text{Total number of pixels}} \qquad n=0, 1, \ldots L-1$$

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 8 Issue II Feb 2020- Available at www.ijraset.com

## IV. CONTINUOUS CASE

For r satisfying this conditions, we focus attention on transformation (intensity mappings) of the form

$$S=T(r) \quad 0\leq r\leq L-1 \qquad (3,3\text{-}1)$$

That produce an output intensity level S for every pixel in the input image having intensity r . we assume that :

1) T(r) is a monotonically increasing function in the interval $0\leq r\leq L-1$;and
2) $0\leq T(r) \leq L-1$ for $0\leq r\leq L-1$

In some formations to be discussed later, we use the inverse

$$r=T^{-1}(S) \quad 0\leq S\leq L-1 \qquad (3.2\text{-}2)$$

A fundamental result from basic probability theory is that if Pr(r) and T(r) is continuous and differentiable over the range of values of interest, then the PDF of the transformed variable S can be obtained using the simple formula.

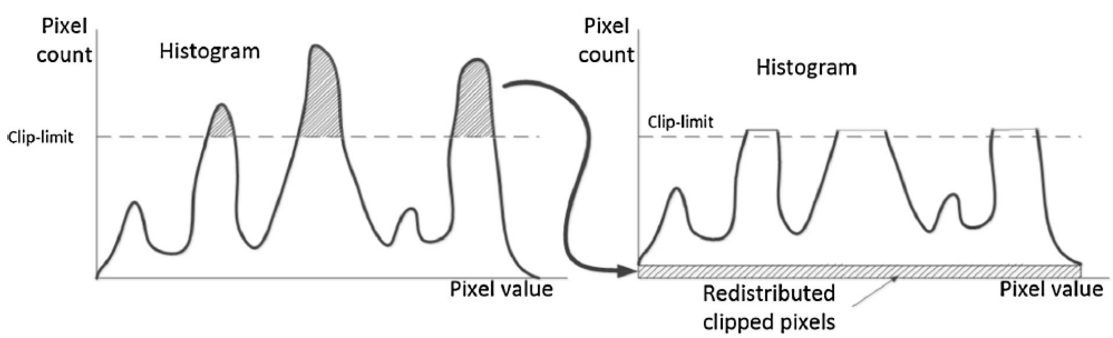
$$Ps(S)=Pr(r)\frac{dr}{ds} \qquad (3.3\text{-}3)$$

A transformation function of partial importance in image processing has the form.

$$S=T(r)=(L-1)$$

Where W is a dummy variable of integration. then, it can be show that PDF of the output levels is uniform,

$$Ps=\begin{cases} 1, & \text{for } 0\leq S\leq 1 \\ 0, & \text{other wise} \end{cases}$$




## V. ADAPTIVE HISTOGRAM EQUALIZATION (AHE)

The adaptive histogram equalization is different from normal histogram equalization in the mean that is not universal and it enumerate many histograms according to various sections of an image. So, it is conceivable to magnify the local contrast of an image through AHE. With AHE, the data of all potency ranges of an image can be observed simultaneously and there by expounding image can be observed simultaneous and there by expounding the problem of many ordinary devices which are unfitted to portray the full dynamic potency range .

First ,a provisional region is clarified for every pixel in the image. The provisional region is the region pointed about that particular pixel. Then, the potencity values for this region are helpful to identifying the histogram equalization mapping function. The mapping function there by required is applied to the pixel being processed in the region and therefore ,the outgrowth image fabricated after each pixel in the image is mapping differently. this ramificates in the local distribution of intensities and ultimate magnifications are based on local area preferable than the total universal or global area of the image. And this is the main advantage of AHE.

1) *Disadvantage:* Sometimes, AHE leans to over raise the noise content that may subsist in some homogenous local block of the image by mapping a short scope of pixels to a wide one.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 8 Issue II Feb 2020- Available at www.ijraset.com

## VI. CONTRAST LIMITED ADOPTIVE HISTOGRAM EQUALIZATION (CLAHE)

The almost difference between adaptive histogram equalization (AHE) and contrast limited adaptive histogram equalization (CLAHE) is contradistinction finite. The CLAHE created clipping limit for histogram to overcome the noise amplification issue. The CLAHE method splits the image in to relative region and appeals the histogram equalization process to each region. CLAHE has two specifications clip limit c(L) and lump size the range becomes bigger due to these the image disparate also increase.
CLAHE is one of the most widely and entrenched technique for the affluent magnification of low-contrast image .The CLAHE method consists of the following 7 steps.

*A.* Spited the original intensity image in to non-overlapping provisional regions. The total number of image boards is equal to MXN and 8x8 is a good value to protect the image vibrant data.
*B.* Crafting the histogram of each provisional region according to gray level region present in the array image.
*C.* Calculating the contrast limited histogram of the provision region by clipping limit value
*D.* Re-allocate the remain pixels until the persisting pixels have been all disturbed.
*E.* Enhancing intensity values in each region by Rayleigh distribution.
*F.* Diminishing abruptly changing effect.
*G.* Calculating a new gray level errand of pixels within a sub-matrix provisional region by using a bi-linear interpolation between for different mapping in order to eliminate boundary artifacts.

## VII.LAB COLOR SPACE

The lab color space is a color space defined by the international commission on illumination in 1976 it expresses color as three values: L*for the lightness from black to white A*from green tored,and B* from blue to yellow .
Working with the lab color space includes all of colors in the spectrum as well as colors outside of human perception. The lab color space is the most exact means of representing color and is device independent

## VIII. EXPERIMENTAL RESULTS

The work is executed on MATLAB Software with various images. The underwater images are of size 512 x 512,Taken from the internet source. First the different Histogram based techniques mentioned in the previous section are applied to the images and then the performance of Histogram based techniques are Analyzed .

*VIII A. UNDERWATER IMAGE A:*

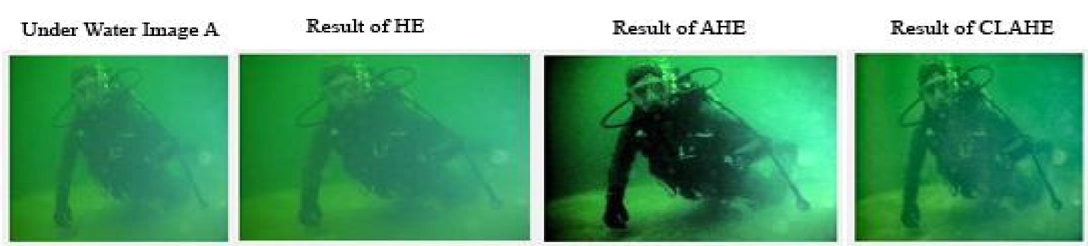



Fig: Performance of HE, AHE, CLAHE on Underwater Image A

*VIII B. UNDERWATER IMAGE B:*

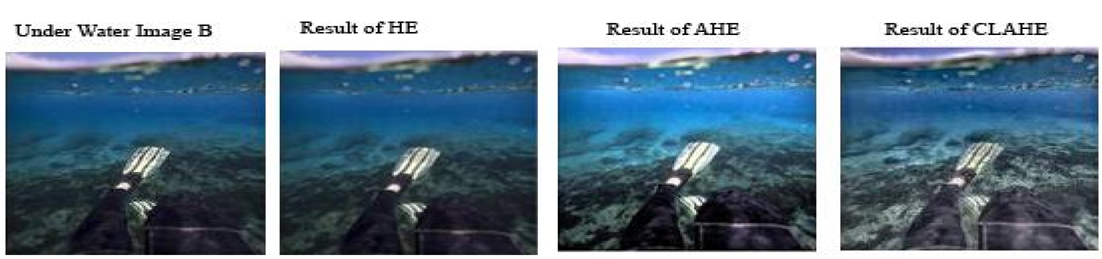



Fig: Performance of HE, AHE, CLAHE on Underwater Image B

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
*ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177*
*Volume 8 Issue II Feb 2020- Available at www.ijraset.com*

*VIII C. UNDERWATER IMAGE C:*


Fig: Performance of HE, AHE, CLAHE on Underwater Image C

Results Of Proposed Method On Different Input Images

## IX. CONCLUSION

The difficulty associated with obtaining visibility of objects at long or short distance in underwater scenes presents a challenge to the image processing community. To resolve the various problems of existing methods a new image enhancement technique based on CLAHE and L*A*B* color space is presented in this regard link MSE,PSNR,PMSE,NAE,NCC,MD and AD. A comparative study is also performed in this research work. Many researchers have developed preprocessing techniques for underwater images using image enhancement methods. The experimental result demonstrate that the FHE method not only give a batter equalization but also improves the contrast of image. This can be clearly seen from the histogram of result.

Now days leading advancement in optical imaging techniques is rapidly increasing the ability to image to image objects in the sea. Emerging underwater imaging techniques and extend the above cited method to, for example handle data from multiple sources that can extract 3-dimantional scene information. On the other hand, studying the vision system of underwater animals (there are physical optical photoreceptors and neuro physiologically mechanisms) will certainly give us new insights to the information processing of underwater image.

## REFERENCES

[1] C. funk, S. Bryant, and P. Heckman," Handbook of underwater imaging system dersign",Tech.Rep.TP303,Naval undersea center, san Diego, calif, USA,1972.
[2] J. Mclean and K. Voss," point spread functions in ocean water: comparison between theory and Experiment", Applied optics,vol.30,pp.2027-2030,1991.
[3] K. Voss," simple empirical model of the oceanic point spread function", Applied optics,vol.30,pp.2647-2651,1991.
[4] Z.liu ,Y.yu, K. zhang, and H. Huang ," underwater image transmission and blurred restoration", optical engineering,vol.40,no.6,pp.1125-1131,2001.
[5] H. singh, J. Howiand, D. yoerger, and L.WHITCOMB," Quantitative photo mosaicing of underwater imaging", proceedings of the IEEE oceans conference,vol.1,pp.263-266,1998.
[6] R. Eustice, H. singh, and J. Howland," image registration underwater for fluid flow measurements and mosaicing", in proceedings of the IEEE oceans conference record,vol.3,pp.1529-1534,2000.
[7] Haidilbrahim and vicholas sia pik kong" image sharpening using sub-region histogram equalization", IEEE transaction on consumer electronics,volume:55,Issue:2,may209.
[8] Ghada S. Karam, ziad M. Abood and Rafal N. sales", enhancement of underwater image using fuzzy Histogram equalization", International Journal of Applied Information system (1JAIS)-1SSN;2249-0868 foundation of computer science FCS. new York, USA volume 6-no.6,December 2013.
[9] Achant R, Susstrunk S. Saliency detection using maximum symmetric surround. 17th IEEE International Conference on Image Processing (ICIP); 2010. p. 2653-6. Crossref
[10] Wynn RB. Autonomous Underwater Vehicles (AUVs): Their past present and future contributions to the advancement of marine geo science. Marine Geology. 2014; 352:451-68. Crossref
[11] Jaffe JS. Underwater Optical Imaging: Status and Prospects.2001. p. 66-76.
[12] Yang HY. Low complexity underwater image enhancement based on dark channel prior. IEEE 2nd International Conference on Innovations in Bio-inspired Computing and Applications (IBICA); 2011. p. 17-20. Crossref

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
*ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177*
*Volume 8 Issue II Feb 2020- Available at www.ijraset.com*

**AUTHORS**

Jafrin Shaik is presently studying final year B.tech in Electronics and Communication engineering in ESWAR college of engineering Narasaraopet, Andhra Pradesh ,India. Jafrin research interests include Digital Signal Processing and Digital image processing.

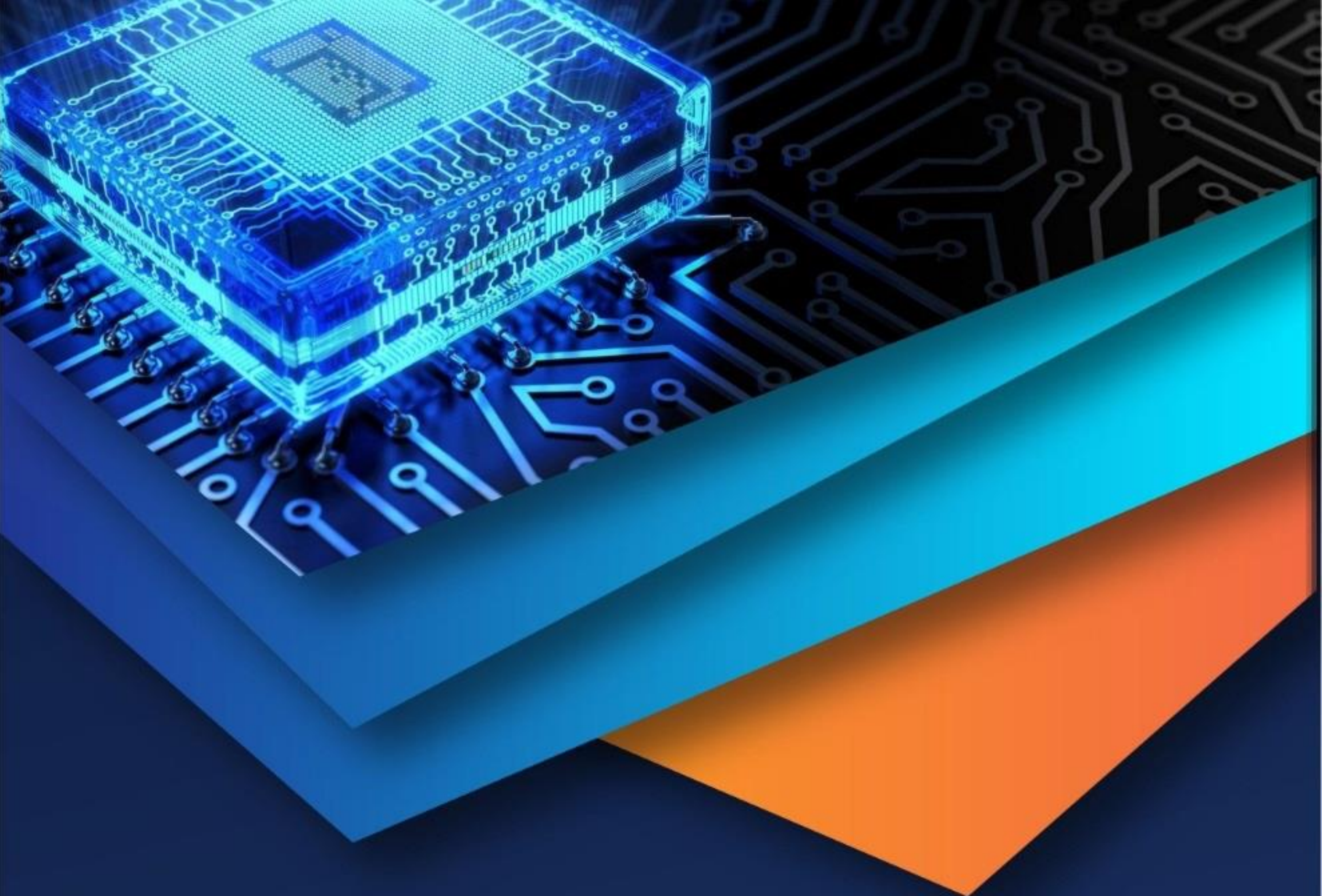
Alekhya Vemula is presently studying final year B.tech in Electronics and Communication engineering in ESWAR college of engineering Narasaraopet, Andhra Pradesh ,India. Alekhya research interests include Digital Signal Processing and Digital image processing.

Madhuri.B is presently studying final year B.tech in Electronics and Communication engineering in ESWAR college of engineering Narasaraopet, Andhra Pradesh ,India. Madhuri research interests include Digital Signal Processing and Digital image processing.

Nadiya.Sk is presently studying final year B.tech in Electronics and Communication engineering in ESWAR college of engineering Narasaraopet, Andhra Pradesh ,India. Nadiya research interests include Digital Signal Processing and Digital image processing.

Hemasri.D is presently studying final year B.tech in Electronics and Communication engineering in ESWAR college of engineering Narasaraopet, Andhra Pradesh ,India. Hemasri research interests include Digital Signal Processing and Digital image processing.

Sk. Munwar Ali was born in Guntur, India. He obtained his B.E Degree in Electronics and Communication Engineering From C. Abdul Hakeem College of Engineering and Technology Mel visharam Tamilnadu in 2010 and M.Tech degree in Digital Electronics and Communication Systems from ESWAR college of engineering Narasaraopet, India in 2014. He is currently working as Assistant Professor in ECE department of ESWAR college of engineering Narasaraopet, India . His research interests include Digital image processing, Wireless communications, Radar systems and Speech processing.




10.22214/IJRASET

INDEX COPERNICUS

45.98

IMPACT FACTOR:
7.129

TOGETHER WE REACH THE GOAL

IMPACT FACTOR:
7.429


# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY