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Improved Metaheuristic For High Density Impulse Noise

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Abstract*: In this research paper, we proposed an ACO with a versatile for vector middle channel for the expulsion of motivation commotion from shading pictures. Regularly, the homogeneousness among the pixels is adulterated, when motivation clamor extraordinarily contorted the pictures. In the proposed method, just when the sifting activity will be done if the pixel is observed to be ruined. The choice about a specific pixel of being undermined or not relies upon the straight forecast blunder figured from the non-causal locale around the pixel under operation. Versatile window based vector middle separating activity will be done, if the mistake of the center pixel of the bit outperforms the officially characterized limit esteem. The span of versatile window will rely upon the level of blunder as indicated by the effectively characterized limit esteem. The proposed sifting system in charge of enhancing the pinnacle flag to clamor proportion the structural similarity index measure (SSIM), peak signal to noise ratio (PSNR), and the mean square error (MSE).

Keywords— Impulse noise; vector median filter; adaptive filtering; similarity index measure.

I. INTRODUCTION

Now-a-days, digital images play a key role both in general applications such as computed tomography, resonance imaging, satellite television, and in areas of analysis and engineering sciences such as astronomy and geographical information systems. Commonly, the data captured by imaging sensors are frequently adulterated by noise. Digital images are vulnerable to a variety of noises that affects image quality. Hence, image denoising is employed to restore the details of the original image by removing the unwanted noise. Some factors that determine image quality are (i) factors influencing visual quality, (ii) visual artifacts, and (iii) noise. Restoration algorithms are designed assuming parameters based on these factors. Moreover, these performance parameters must be optimized to ensure the final filtered image possess pleasant quality [1]. Image rebuilding is dependable to reestablish the debased picture into genuine picture. Certain purpose of corruption and mutilation are unavoidable in the arrangement, transmission, stockpiling, recording and show of the picture. Since image quality debasement might be caused in each connection of the development of computerized image, by and large, the image should be reestablished keeping in mind the end goal to get amazing advanced image [2]. Images are produced to catch the valuable data. In any case, because of numerous flaws in the catching frameworks, the caught pictures are in the long run spoken to a debased show of the real scene. There are many explanations behind the corruption; however the two sorts of debasements that are regularly overwhelming to commotion and obscuring.

II. IMPULSIVE NOISE MODEL

There are two sorts of drive commotion: arbitrary esteemed motivation clamor and settled esteemed motivation commotion. The settled driving forces demonstrate is additionally called the "salt and pepper commotion display". At the point when motivation commotion have vast esteem (255), it is named as the 'salt' clamor and if then commotion is having little esteem (0) it is named as the 'pepper' commotion. On the off chance that 'p_1' demonstrates the likelihood of event of low esteemed drive commotion in a flag part and that ' p_2' gives the likelihood of event of a high esteemed motivation clamor in a similar flag, at that point the aggregate likelihood of event of 'salt and pepper commotion' in the flag under thought is given by (p_1 + p_2). On the off chance that 256 (one pixel in a dim channel is spoken to utilizing 8 bit) is the quantity of dim levels utilized per pixel, at that point we expect that 255 or '*h*' speaks to the 'salt commotion, while 0 or '*l*' speaks to the 'pepper' clamor. Let X_c, (where c = 1 for red, 2 for green or 3 for blue) be a pixel part of a vector pixel in any of the channels of a multichannel image.
The impulse noise is expressed through following model:

$$X_c = \begin{cases} l, with\ probability\ p1 \\ h,\ with\ probabilty\ p2 \\ S_c, with\ probability\ p3 \end{cases} \quad (1)$$

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III.PROPOSED MODEL

For the removal of impulse noise of all density of impulse noises, ACO based non-causal linear prediction adaptive median filter has been proposed in this paper.

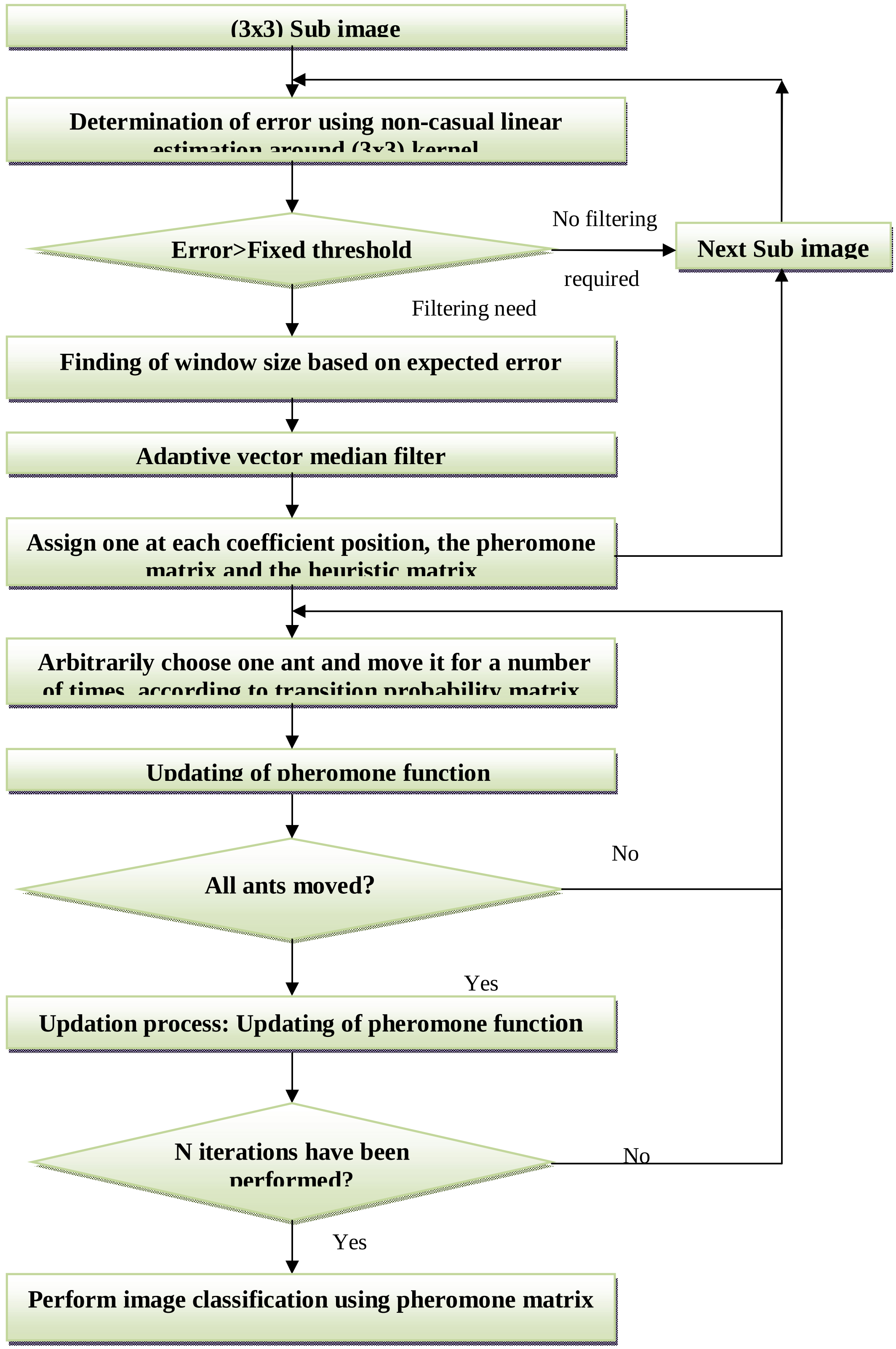

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Fig. 1 A Basic block diagram of proposed meth

This proposed procedure dependable to take pixels around the non-causal neighboring locale for figuring gauge mistake. The coefficients are computed by utilizing a model named, Autoregressive Moving Average Model (ARMA). In the versatile middle channel with ACO procedure, the window measure is nearly novel according to the assessed blunder while the separating operation. The proposed method performs denoising process on all the debased pictures from the "drive commotion". The proposed algorithm performs uniformly well on all the images corrupted either by the “salt & pepper” noise or “random valued” noise.

A. The proposed method approach is summarized in the following steps

1) Initialize the window size (3x3 window).
2) Calculate the prediction error based on non-causal linear prediction.
3) Determining the threshold and window Size. After processing through adaptive vector median filtering, if the pixel intensity of each pixel is found have extreme intensity levels (zero or 255), then that particular pixel is pre-processed using fixed size window (3×3). If the processed pixels are still having extreme intensity levels, then the pixel under operation will be replaced with the neighbouring pixel value.
4) Fixed window based VMF, the quality of the ANCLPVMF based filtered image is further being enhanced by processing the whole image through fixed 3×3 kernel based VMF. Even though the quality of the ANCLPVMF based filtered image is good enough. However, there is slight improvement in the image quality by processing the whole image using 3×3 window. This type of final processing enhances the image quality and has more noise reduction capability.
5) Apply the ACO operation; assign one ant at each coefficient position; initialize the pheromone matrix and heuristic matrix
6) Randomly select one ant and move it for a number of steps, according to the transition probability matrix.
7) Update the pheromone function.
8) All ants have been moved?
   a) If yes, the Update process; updating of pheromone function
   b) Else backtrack to step (1)
9) N iterations have been done?
   a) If yes, the perform image classification using the pheromone matrix
   b) Else backtrack to step (1)
10) Perform image classification using the pheromone matrix.
11) Evaluate optimistic adjustment factor for morphological transforms to enhance the contrast of color images by using ant colony optimization.

IV. RESULT AND DISCUSSIONS

The examinations have been done on number of pictures with various densities of commotions. The execution of the framework is ascertained by execution measure, PSNR, MSE and SSIM. The investigation has been done as far as two sided settled esteemed motivation clamor. Standard shading pictures like Lena, Mandrill, Tulip, Pepper, and Cameraman are a portion of the pictures utilized as a part of this investigation. Amid the procedure of experimentations, the misleadingly drive clamors are included into previously mentioned pictures and the exhibitions are surveyed by the PSNR execution metric.

The PSNR execution parameter is measured as far as dB unit. The PSNR for shading pictures is said underneath:

$$PSNR=10log_{10}\left(\frac{I_{MAX}^{2}}{MSE}\right) \tag{2}$$

Where, I_{MAX} indicates the greatest estimation of the vector pixel of the genuine picture.

MSE refers to the m ean square error between the two images and is described as:

$$MSE=\frac{1}{MNS}\sum_{p=1}^{M}\sum_{q=1}^{N}\sum_{r=1}^{S}(Y_{p,r,t}-Y_{p,r,t}^{/})^{2} \tag{3}$$

If the M, N, S gives the size of the images i.e. length, width and channels of the image respectively , then the actual and the denoised images are specified by $Y_{p,q,t}$ and $Y'_{p,q,t}$.

SSIM refers to the structural similarity index measure, a method for evaluating the similarity between the actual image and the filtered image, and is described as:

$$SSIM=\frac{(2\mu_x\,\mu_y+C1)(2\sigma_{xy}+C2)}{(\mu_x^2+\mu_x^2+C1)(\sigma_x^2+\sigma_x^2+C2)} \tag{4}$$

Where, C1 and C2 are the constant are calculated according to the paper. μ_x *and* μ_y are the mean of the input image and reconstructed image respectively. σ_{xy} is the covariance of the input and reconstructed image. $\sigma^2{}_x$ is the variance of input image and $\sigma^2{}_y$ is the variance of the reconstructed image.

Amid the investigation of execution examination, the proposed system has been contrasted and a versatile non-causal direct forecast based vector middle channel (ANCLPVMF) [20].

Fig.2. (a) Actual image 1 (Lena), (b) Image contained 30% of addictive impulse noise, (c) Image filtered by ANCLPVMF, (d) Image filtered PROPOSED technique.

Fig.3. (a) Actual image 2 (Mandrill), (b) Image contained 30% of addictive impulse noise, (c) Image filtered by ANCLPVMF, (d) Image filtered PROPOSED technique.

Fig.4. (a) Actual image 3 (Tulip), (b) Image contained 30% of addictive impulse noise, (c) Image filtered by ANCLPVMF, (d) Image filtered PROPOSED technique.

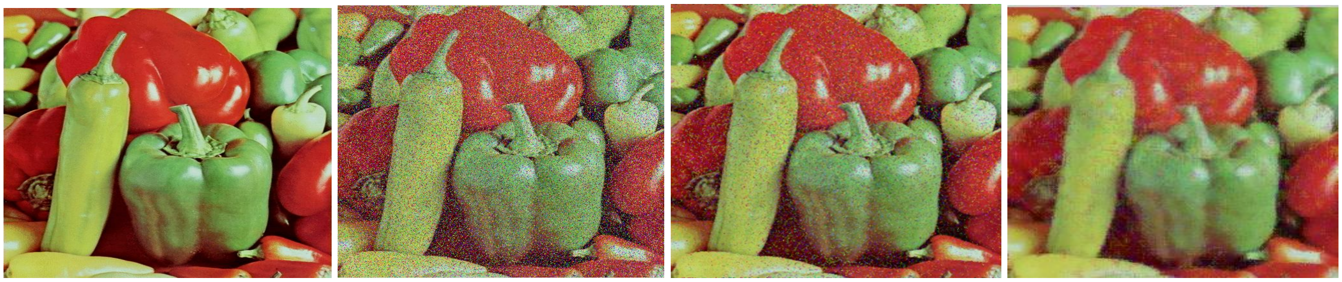

Fig.5. (a) Actual image 4 (Pepper), (b) Image contained 30% of addictive impulse noise, (c) Image filtered by ANCLPVMF, (d) Image filtered PROPOSED technique.

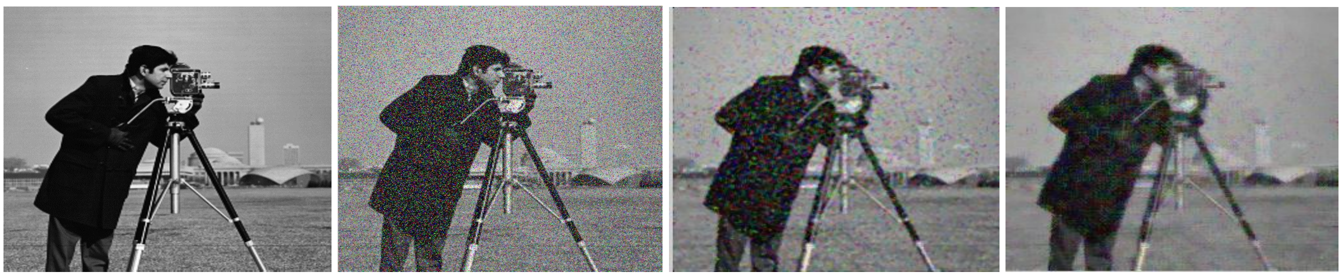

Fig.6. (a) Actual image 5 (Cameraman), Image contained 30% of addictive impulse noise, (c) Image filtered by ANCLPVMF, (d) Image filtered PROPOSED technique.

From above Figures, number of pictures has been appeared for proposed method while drive commotion has been misleadingly added to the real pictures. It is inferred that the high thickness drive commotion is expelled.

A. Performance evaluations for Impulse Noise

Table 1 Performance evaluations show that the comparison between different methods on number of images degraded with 30% impulse noise. The value of PSNR performance parameter in decibels (dB) unit has been mentioned below.

Images/Filters	ANCLPVMF	PROPOSED METHOD
Image 1	25.27	35.41
Image 2	23.05	35.17
Image 3	28.28	35.51
Image 4	24.43	35.06
Image 5	23.08	35.78

In Table 1, experiment has been carried out with different number of images. It is found that the proposed technique provides better performance for all images as shown above.

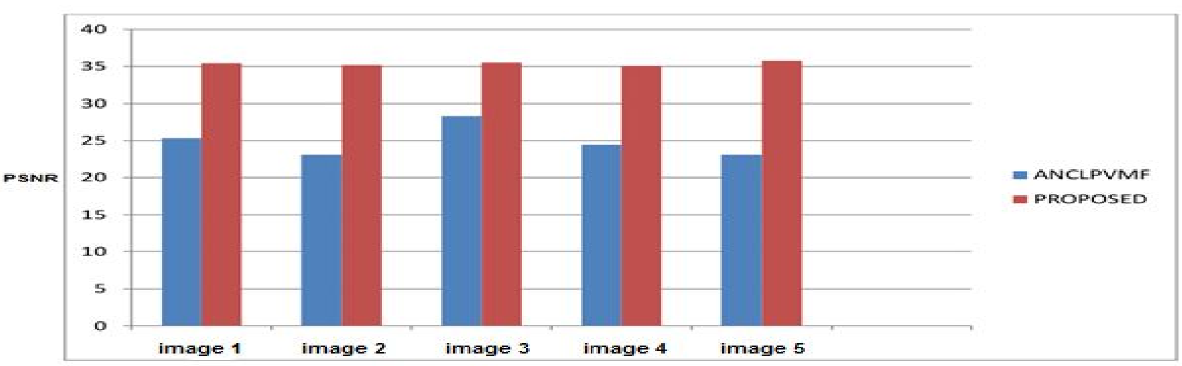

Fig.7. PSNR graph for no. of images

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Table 2 Performance evaluations show that the comparison between different methods on number of images degraded with 30% impulse noise in terms of MSE values has been listed.

Images/Filters	ANCLPVMF	PROPOSED METHOD
Image 1	1.94	0.61
Image 2	3.22	0.20
Image 3	3.30	0.83
Image 4	2.35	0.55
Image 5	3.20	0.52

In Table 2, experiment has been carried out with different number of images. It is found that the proposed technique provides better performance for all images as shown above.

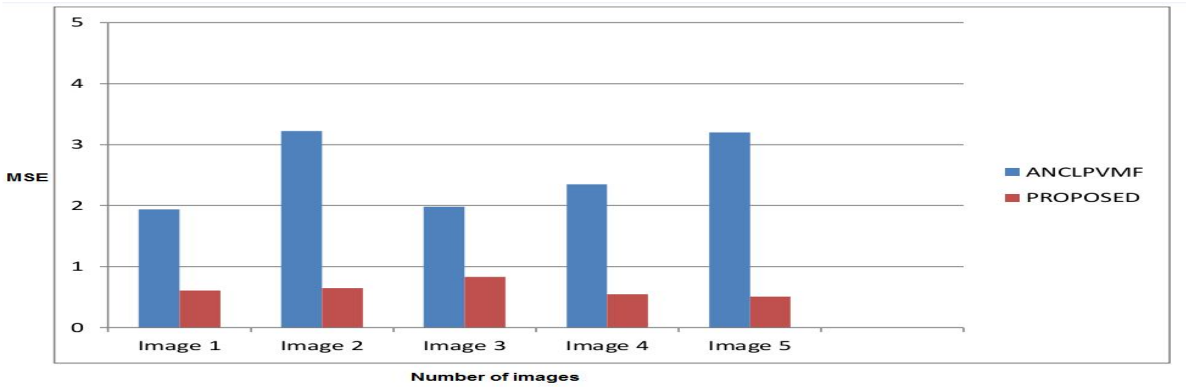

Fig.8. MSE graph for no. of images

Table 3 Performance evaluations show that the comparison between different methods on number of images degraded with 30% impulse noise in terms of SSIM values has been listed.

Images/Filters	ANCLPVMF	PROPOSED METHOD
Image 1	0.18	0.61
Image 2	0.20	3.66
Image 3	0.18	0.85
Image 4	0.20	0.66
Image 5	0.16	0.53

In Table 3, experiment has been carried out with different number of images. It is found that the proposed technique provides better performance for all images as shown above.

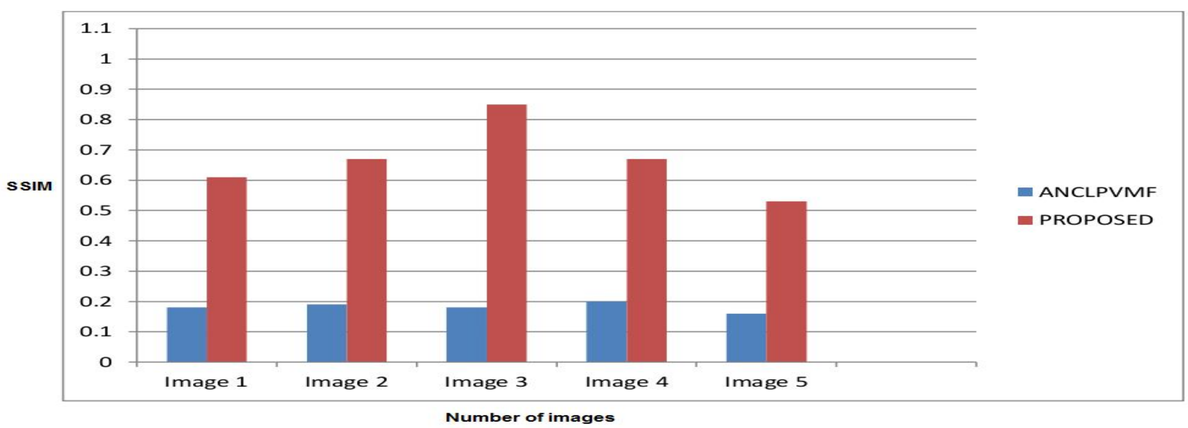

Fig.9. SSIM graph for no. of images

V. CONCLUSIONS

In this exploration paper, proposed an ACO based versatile middle separating strategy for the evacuation of drive clamor having high commotion rates from the shading pictures. The Subterranean insect State streamlining is a procedure which is utilized for picture preparing. As ACO is utilized for enhancement of nonstop issues, so it is utilized for different uses of picture preparing which indicates consistent conduct. The Subterranean insect Province streamlining gives the ideal arrangements which are additionally handled to locate the genuine outcomes. It gives many yields on various edge esteems. The most brief way of ants has more pheromone than longest ways. So the pheromone refreshing data is essential in ACO. The execution assessment of the proposed technique is surveyed by utilizing target measure, for example, PSNR, SSIM and the MSE. The Test comes about with examination investigation demonstrate that proposed calculation beats a few other considered sifting systems.

The speculative outcomes inferred that the proposed strategy proficiently comes about into the evacuation of high thickness motivation commotion from an undermined picture with various clamor rate (densities from 10% to 70%). Accordingly, the separated picture is denoised picture given by the proposed strategy.

As a future extent of work, existing system is done with restorative pictures. The examination may likewise be conveyed forward by considering the low thickness drive clamor for upgrading the execution of the framework.

VI. ACKNOWLEDGMENT

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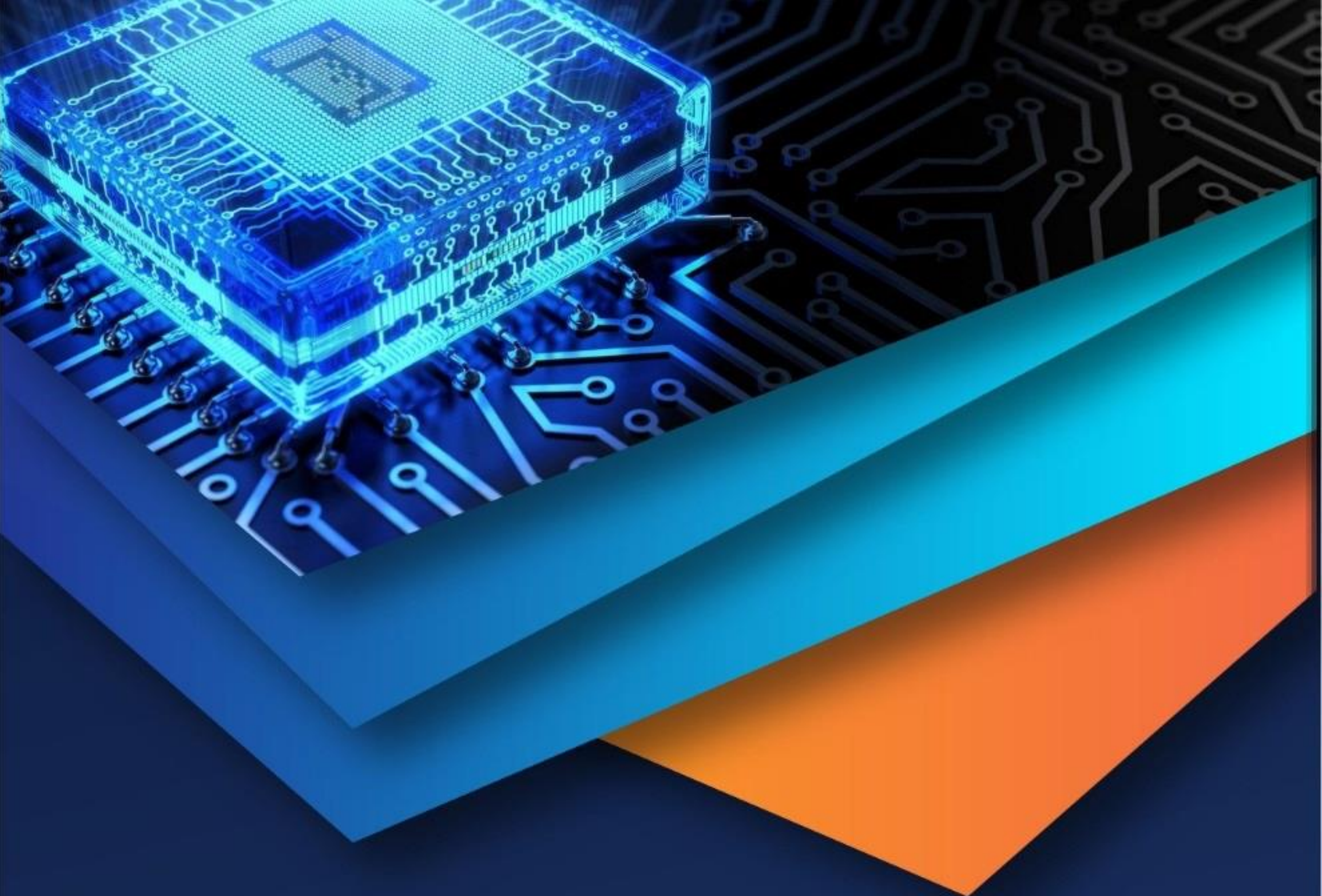
REFERENCES

[1] K. Sakthidasan Sankaran , N. Velmurugan Nagappan, Noise free image restoration using hybrid filter with adaptive genetic algorithm, Computers and Electrical Engineering 000 (2016) 1–11.
[2] Zhang H, Yang J, Zhang Y, Huang T. Image and video restoration via non-local kernel regression. IEEE Trans Cybern 2013; 43(3):1035–46
[3] Lien C-Y, Huang C-C, Chen P-Y, Lin Y-F, An efficient denoising architecture for removal of impulse noise in images. IEEE Trans Computer 2013; 62(4):631–43.
[4] Zhao JF, Feng H-J, An improved image restoration approach using adaptive local constraint. Opt Int J Light Electron Opt 2012; 123(11):982–5
[5] R H Chan, H W Chung, M Nikolova, Salt-and-Pepper noise removal by median-type noise detectors and detail-preserving regularization, IEEE Transaction on Image Processing. 14(10) (2005) 1479-1485.
[6] ANNA VERONICA C. BATERINA, CARLOS M. OPPUS,"
[7] Ant Colony Optimization for Image Edge Detection" Department of Electronics and Communications Engineering Ateneo de Manila University Katipunan Avenue, Loyola Heights, , Quezon City Phillipines.
[8] Jing Tian, Weiyu Yu, Shengli Xie ," An Ant Colony Optimization Algorithm For Image Edge Detection", 2008 IEEE Congress on Evolutionary Computation (CEC 2008).
[9] C.Naga Raju, O.Rama Devi, Sharada Mani, Sanam Nagendram, "An Improved Ant Colony Optimization Technique by using Fuzzy Inference Rules for Image Classification and Analysis", International Journal of Advanced Engineering & Application, Jan. 2010
[10] Alirezae Rezaee," Extracting Edge of Images with Ant Colony ",Journal of ELECTRICAL ENGINEERING, VOL. 59, NO. 1, 2008, pp. 57–59.
[11] Shahab Kamali, Jaroslav Opatrny, "A Position Based Ant Colony Routing Algorithm for Mobile Ad-hoc Networks", JOURNAL OF NETWORKS, VOL. 3, NO. 4, APRIL 2008.
[12] M. Dorigo, G. D. Caro, L. M. Gambardella., "Ant algorithms for discrete optimization.Artificial Life", 5(2): pp. 137–172, 1999.
[13] J. Dr´eo, P. Siarry., "Continuous interacting ant colony algorithm based on dense heterarchy". Future Generation Computer Systems, 20(5): pp. 841–856, June 2004.
[14] C.T. Lu, T.C. Chou, Denoising of salt-and-pepper noise corrupted image usingmodified directional-weighted-median filter, Pattern Recognit. Lett. 33 (2012)1287–1295.



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