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Image Enhancement Seas Water Using algorithm Neural Network (GAN)

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Abstract:

There are many problems in colour images in seas and oceans, including the loss of some information such as poor contrast, low brightness and loss of important data. to avoid these problems, it is necessary to improve the quality of the image in which there is low light and recover the original information in order to obtain an image with clear and complete details to show clearer images of the results that were before processing. In this research, the technique of generative adversarial networks will be used to improve the image.

Keywords: GAN, Image enhancement, under water image, deep learning

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تحسين الصورة مياه البحار باستخدام خوارزمية الشبكة العصبية

أ. عبد الكريم إبراهيم سالم [1].

الملخص:

يوجد العديد من المشاكل في الصور الملونة في البحار والمحيطات تشمل فقدان بعض المعلومات مثل ضعف التباين وانخفاض السطوع وفقدان البيانات المهمة. لتجنب هذه المشاكل لابد من تحسين جودة الصورة التي يوجد فيها ضوء منخفض واستعادة المعلومات الأصلية من أجل الحصول على صورة ذات تفاصيل واضحة وكاملة لتظهر لنا صورة أوضح للنتائج التي كانت قبل المعالجة في هذا البحث سنستخدم تقنية شبكات الخصومة التوليدية لتحسين الصورة.

1. محاضر بقسم الحاسوب كلية العلوم الخمس-جامعة المرقب.

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I. Introduction:

There is sometimes contaminated water in seawater, This causes the image quality to not appear favorable to the user For example, light absorption degrades image quality the visibility of the light changes the color of the image and reduces the important parts of the underwater image (Jiang & Qin, 2023)Sometimes we require the use of underwater robots and remotely operated vehicles (ROVs), these robots are used in the oceans to provide visibility and include robots to explore the image on the seafloor (Sharif, Zhai, Min, Jia, & Munir, 2021) the more light in the sea water, the lower the quality of the image under water and it is absorbed at different rates , For example, red light is absorbed in a few meters of water and this gives us a blue or green image, which affects the quality of the image and the accuracy of the underwater image analysis[2] (Ma, Wang, Jiang, Yang, & Zhang, 2021).Sometimes we find that sea water has sediment or particles that lead to light scattering and significantly reduce the lack of visibility of the image clearly and cause the image to become blurred naturally and reduce the details of the image and extract the required information (Zhang, Wang, Jiang, Yang, & Zhang, 2023).

There are several techniques to improve the image underwater, such as recognizing the parts under seawater, and we must determine the types and targets, and these techniques correct colors, improve image quality, and compensate for the damage caused by water (Wahid, Azhar, Ali, Zia, & S, 2022).

In recent years, the rise of the deep-sea ecosystem has increased , And that increases the discoveries that we sometimes want in our daily lives , Such as food sources, renewable energy and medical medicines (Xu, Kang, & Lu, 2023). However, most research in image processing is growing underwater. For this underwater photography must be specialized cameras and most conventional cameras are affected in water As a result of blurred images, such as blurry images in green and blue, and in this research the technique of generative adversarial networks will be used In order to improve the picture, meaning translation from picture to picture in order to reach the desired goal and check the color, and a large group of underwater images will be trained It includes colors of all kinds under water that show results in contrast (Qilong, Ping, Zhenhui, Xin, & Yan, Sand and dust image en-

hancement algorithm based on dark channel, 2021).

II. Literature Review:

Sometimes it is difficult to describe the underwater image and accurately identify the required information; there are two problems in improving the image, which are color and underwater fuzzy, But the blurring of the picture with the presence of light (Qilong, Ping, Zhenhui, Xin, & Yan, Sand and dust image enhancement algorithm based on dark channel, 2021).

In general, there are many different cases to deal with the effect of fuzzy and color in the underwater image, we can divide these cases into two parts in order to retain the elements more visible (Azouz, Shakibaei , & Khan, 2023).In order to reach the final output and improvement the quality of the underwater image (Sambas, et al., 2024). there are physical ways to improve the underwater image Although the characteristics of the underwater image are similar to the blurry image that's why we use physical remove fuzzy methods (Li & Hu, 2024). Sometimes use technology DCP Its purpose is to reduce the light, improve the image, and treat the light in the red underwater color, and sometimes it looks misleading (Wotring, Antin, & Hankey, 2024). studies have proven that the technique UDCP of Better than technology DCP In transferring the existing image with blue and green color technique DCP Used underwater in other words (Liu, et al., 2019) . in some underwater images, the information in them is ignored because it has no importance and sometimes it has importance, and for this it is necessary to improve the image in order to address the problems of the important areas in the image and do it correctly (Li, et al., 2025).There's a lot. Who is it Noise when is taken Underwater image because Lack quality Cameras and causes in both Lack length Waveform and lighting quality and is under Water image. There is in it Noise (more complex) and Private in natural images that's Therefore Who is it Necessary From reducing noise in Image Existing Underwater Wan Underestimate Also Noise In the background of the image (Zhang, Hu, & Wang, 2023).

III. Research Problem:

There are many problems with underwater images because from their weather changes , snow and Lack of color clarity Therefore, the problem must be solved Image Enhancement Seas Water until

Show for us important information in the orig-

inal image.

IV . Objective of the study:

The aim of the study is to reduce the blur in the underwater image so that the image is optimized and appears more natural.

V. Theoretic Groundwork

A. Method image merging

There are several techniques in image processing , Among them is the image merging technology And sometimes it is considered very important In image processing . Information is collected from various images (Weihua & Chong, 2021) . for example an image of the ear and throat is the same scene and when it is recombined we get an image to be processed (Li, et al., 2024). and sometimes there are a low-light image that's why image merging technology is used Basically. the purpose of image merging technology is the extraction of detailed information About it images at different levels in order to obtainment Better quality images And more accuracy In contrast image And use this part and this stage is used in high illumination to get a matrix (Merge a matrix) and sometimes we use cameras with modern technologies to get a good picture and Very special In the area where there is not Light in the image (Yingying, 2021), "and an image is designed, the matrix is designed according to the weight of the matrix And the purpose of this image merging In order to get image enhancement, In recent years, there has been a development in (modern cameras) Its purpose is to adjust the low-contrast image in which there is high quality (Liu, Wu, Li, Vasluianu, & Zhang, 2024).

B. LEARN METHOD

In the last three years there has been an evolution in technologies (Cameras) For example, digital images And this is what leads to communication between people in their daily lives For example, in schools, photos of students are required in order to register in the system . there is also technology (Neural networks) and its purpose reduce training , weight sharing , receptive filed , And sometimes there are still images there is noise in it That's why some researchers keep using Neural networks in Aghlabid Alaina using image processing , And there are some images There is in it Low light and noise and the purpose of CNN Image Enhancement which contains on Low light.

C. Basic importance of image processing (UNDERWATER)

1. Mitigation of LIGHT IN (UNDERWATER)

The higher the temperature rises whenever more difference Waves UNDERWATER, For example Red light has a longer wavelength in water whilst Blue light has the lowest wavelength in the water But the breakthrough force is stronger. That's why A reason deviation color Image In water because spreading Light which depends on the wavelength that Depends on Wavelength. and equation 1 Shows Compare between greater Value for color red and blue

$$D(x) = maxI_R(x) - max\ I_{BG}(x) \quad (1)$$

the x is pixel pint Equation 1 shows the difference between the largest value of red, the largest values of blue, green and pixel For every color and Equation Number 2 Show ac-

$$\tilde{t}(x) = D(x) + [1 - \max D(x)] \quad (2)$$

Get on color Red Using Equation 3

$$A_r(x) = 1 - \tilde{t}(x) \quad (3)$$

Figure 1 Explain drawing Planning Water Sea.

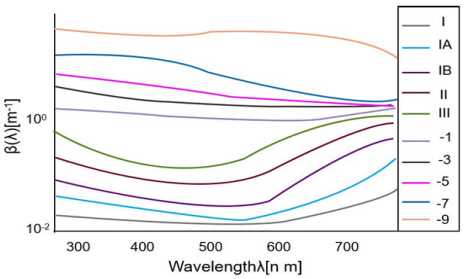

Fig1 Planning Water Sea

2. Principles OF Seas Image

There are Components in water Sea Cause lack under Water in this case Effect on light Cameras That's why Will imaging in Water Sea least quality not way vision Image Significantly direct And there are Problems when orphan imaging under Water and they Noise Image and noise Image and some Often when relocates Light in Water Cause Noise , Image under Water because Light noise he Partials Water Difference Light in Water Cause Distortion Color And this happen During photography color Green and blue (Jing, 2021) . therefore must that Be study occasion To improve Image under Water.

D. Generative Adversarial Network

The GAN Consists of discriminator & generator and its purpose Who is it generator

Create an image and purpose Who is it discriminator Differentiate between Wrong And the right thing in Image (Hailong & Bo, 2021) ; And figure 2 Explain method It worked and Control Weak and proposal GAN Called in DE-GAN and he Basis Regulates GAN ; and DE-GAN More control Who is it GAN and and the equation 4 Shows function DE-GAN.

$$\min_G \max_D L_{cGA}(G,D) = E_{I,J}[\log(D(I,J)] + E_I[\log(D(I,G(I))] \times E_I\left[\log\left(1 - D(I,G(I)\right) - D(I,G(I))\right)] \quad (4)$$

They are g is generator and D is discriminator and I is initial image and J is real image and G(I) is fake image and DE-GAN is initial image And I to real image . Figure 3 Explain It worked DE-GAN and the image I is a synthetic underwater image and J is real image and corresponding between Ground Truth ,and the generated image ; Functions It's important to discriminator is Equation 5 (Qilong, Ping, Zhenhui, Xin, &

$$\min_G \max_D L_cGAN(G,D) = E_{I,J}[\log(D(I,J)] + E_{I,J}[log(D(I,J)] + E_I\left[log\left(d\left(i,g(i)\right)\right)\right] \quad (5)$$

Equation 6 Shows Purpose from generator :

$$\min_G L_{cGAN}(G,D) = E_I[\log(1- D(I,G(I)))] \quad (6)$$

Consists entering image from D & G(I) under Training So that Explain troupes between two images and Output Range between Zero and one and Possible Values Be image Real And the value is Correct when Become greater Who is it 0.5 And when Be least become false in Training (Robertson, Thrall, Nelson, & C, 2024); D & G(I) Don't be Training same Time But it is done step by step Training Any of min to max In or-

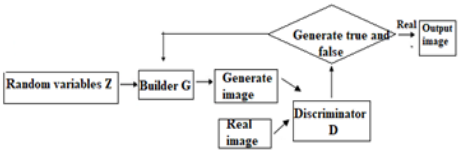

Fig 2 generative adversarial networks

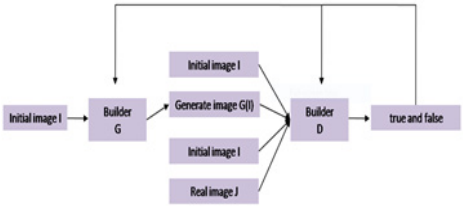

Fig 3 DE-GAN

E. DATA SET

Short light that is in water Sea may get on 5032 images and And in case the presence of images Low and in it Lighting Obtained On it from During long light and there is data Contains 420 and all of it has Levels Low Who is it Lighting And it was btained on it tmes different (Xu, Zhou, & Li, 2022).

D. DIARETDB0 dataset

It's been Obtaining 3421 images and 3245 images And it was obtained On it Through 10 Cameras Includes 200 trainings and 100 tests And the test was congruence Data and evaluate it And the use of images second and Number 1277 on training and most images stored format png,jpg,jif But most of Cameras did not It is improved Image That's why Technology GAN to enhancement and Not used DIARETDB0 test & train (Wanjun & Jiankang, 2021).

VII. METHOD OF THIS RESEARCH

In this system Applied algorithm GAN For the purpose of enhancement image Existing in Seawater and basic GAN (local , discriminator) discrimination and its purpose avoid Problems (local distortion) (Cong, 2024). the input to global discriminator is generated & real image and the local distortion two input image (generated & real image block). Purpose of generated image is Production image Reality (Enhanced underwater image) (Zhang, Chen, Cao, & Li, 2024).

Distortion is can't to distinguish between true and false in real & generated image use in GAN and distortion Use In both Calculation and average and convolution For the purpose of Show Results and from it Conclude matrix And this is the image Real Meaning to be compati-

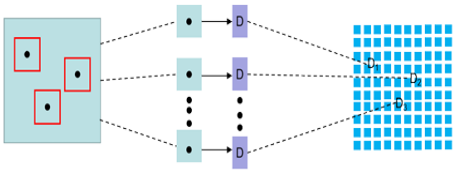

Fig 4 GAN structure.

A. OBJECTIVE OF FUNCTION

It was used in this is a system algorithm GAN And the problems that were exposed to (training) and Disappear progressively this makes Training It's not true And for you orphan Stability In training use many GAN And from her WGAN-GP (Aletti, Benfenati, & Naldi, 2021) , LSGAN , WGAN Explain losses in image Therefore Consequently That's what's done. Ap-

$$L_c{}^{WGAN-GP=E_{I,J}}[D(I,J)] - E_I[D(I,G(I))] + \lambda_{GP} E_{\bar{I}}[||\nabla_{\bar{I}} D(\bar{I})||_2 - 1)^2] \ldots \quad (7)$$

They are G is generator and D is discriminator and I,J is underwater image and GP is weighting factor

Of the disadvantages, GAN He's comparing. With the least work It's done Use it. WGAN-GP Used to measure Distance between distribution Real Data and distribution the possibilities

that It's done Created and purpose Distributed by Distance In order to Overlapping between Real Data & Data Which has been Created So that Do not reflect Distance Between them ; whenever the difference was constant It will be a gradient he hides At the same time (Zhiyong & Wenxin, 2022).

$$L_1(G) = E_{I,J}[||J - G(I)||_1] . \quad (8)$$

$$L_2(G) = E_{I,J}[||J - G(I)||_2]^2 . \quad (9)$$

Avoid Problems (progressively – explosion – Disappearance) In order to say Loss and is done measurement pixel ; Modified 8 and 9 show a loss. Equation 10

$$L^* = \min_G \max_D L_{WGAN-GP(G,D)+\lambda 1 L1(G)+\lambda 2 L2(G)} \quad (10)$$

B. GLOBAL AND LOCAL DISCRIMINATOR

Purpose him is to distinguish image Original in its entirety And with this he can't that enhancement image ; but When entering image Need to enhancement between different Parts Image ; local discriminator When Image Enhancement Choose Smaller part In the image the real one It reveals If the picture is real or not (Xiaoyuan & Wangming, Illumination-adaptive face image enhancement method based on Virtual exposure fusion, 2022) ; local discriminator After it is done Image Enhancement Specifies the image the real one (More visibility and less distortion) . Structural local discriminator divided to two and they i) Which is more real data Or data that Created ii) Estimated data Unrealistic More than one data Real and

Equation 11 and 12 shows Ratio discriminator :

$$D_{ra}(x_r, x_f) = \sigma(c(x_r) - E_{xf \sim prc(x_f)}) \quad (11)$$

$$D_{ra}(x_f, x_r) = \sigma(c(x_f) - E_{xr \sim prc(x_r)}) . \quad (12)$$

the final loss function of the D and G is :

$$L_D^G = E_{xr} \sim p_r[(D_{ra}(x_r, x_f - 1)^2 + E_{xf} \sim p_f[(D_{ra}(x_f, x_r)^2] \quad (13)$$

$$L_D^G = E_{xf} \sim p_f[(D_{ra}(x_f, x_r - 1)^2 + E_{xf} \sim p_f[(D_{ra}(x_r, x_f)^2] \quad (14)$$

Each generated and the real image size is 30 30. And disciminator D and generator G are:

$$L_D^G = E_{xr} \sim p_{rp}[(D(x_r) - 1)^2 + E_{xf} \sim p_{fp}[(D_{ra}(x_f)^2 \quad (15)$$

$$L_D^l = E_{xr} \sim p_{fp}[(D(x_f) - 1)^2 \quad (16)$$

The calculation operation of the Global Discriminator: Activates five first down sampling In order to achieve operation Existing in the image and then activation function operation to achieve "image discrimination". Every time down sampling includes one convolution and one batch normalization layer. And After the fifth down sampling operation and output re-

sult Sigmoid activation, LD the calculation process is: first four down sampling and Sigmoid activation to LID (local image discrimination) . local discrimination and global Discriminator same as the down-sampling operation (Jia, McDonnell, R, & Lloyd, 2015).

C. CONSTRUCTION

The basis of this Work (DE-GAN) network For the purpose of preservation on Original Information the image has a destiny Possible and done use In this System generator (G) Instead of CNN It was also used U-network and This is considered similar to codec with tradition code (Sun, Huo, Jiang, Gao, & Cai, 2025). U-network combine Between level Low and Higher and Keep Details Image. Consists generator on 15 layer of which 8 convolutional layers and 7 de-convolutional layers First half Be encoder and constitutes convolutional down sampling . Input Be image Original under Water and is done Application At a stage feature extraction and normalization (Jiang & Qin, Low-light image enhancement method based on U-Net generative adversarial network, 2020) . and part Second Matching to de-coder and purpose From the use of de-coder So that get on image under Water more clearness And the goal From the use of (BN) Properties Each layer for de-convolutional and network connection And figure 5 Explain generator and combination Network In Figure 6 (Xue, et al., 2024).

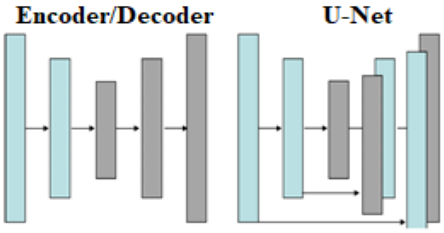

Fig 5 "encoder and decoder structure"

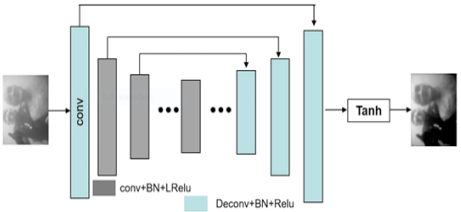

Fig 6 Generator details.

D. ADFF MODULE

Purpose of use U-Net enhancement Image in Seawater and method Good and effective but It's necessary From the presence of amelioration more because lack existence multi-level and Scale Contact . ADDF focused on every level Which is done Extracts for now and extract more information

and helps In building Image It includes between levels Precedent and current and purpose Who is it Input knowledge Weight For each level feature So that To give More weight For the purpose of It's important Integration and Figure 7 shows Combination and Equation 17 Shows feature fusion as follows (Zhiyong & Wenxin, 2021):

$$i_{xy}^{n} = \alpha_{xy}^{1} . i_{x,y}^{1\to n} + \cdots .. + \alpha_{x,y}^{n-1} . i_{x,y}^{(n-1)\to n} + \alpha_{x,y}^{n} . i_{x,y}^{n} \quad (17)$$

$$\alpha_{xy}^{1} = \frac{e^{\lambda\, 1_{axy}}}{e^{\lambda^{1}}\ axy + \cdots .. + e^{\lambda_{ax}^{n-1}{}_{xy}} + e^{\lambda_{ax}^{n}{}_{xy}}} \quad (18)$$

Was used In this system size 2 for each of the convolutional layer and DE convolutional layer

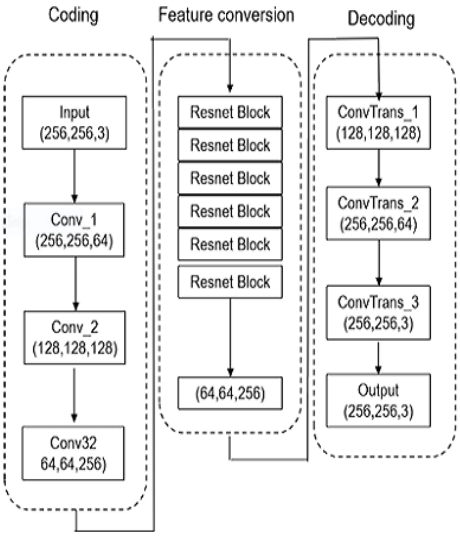

Fig 7 map of GAN

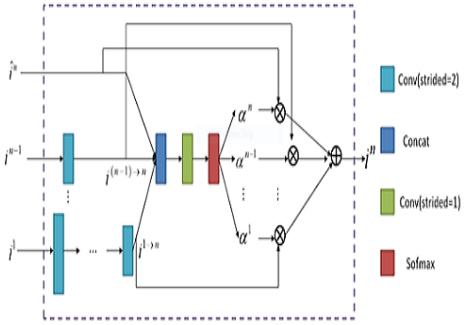

Fig 8 ADFF module of encoder

E. LOOS SIMILARITY OF STRUCTURAL

They are Shows Information Existing in Image and reflecting attributes of object and equation 19 Shows expression structural similarity (Qingjiang & Mei, 2021).

$$S(p) = \frac{2\mu_x \mu_y + c_1}{\mu_x^2 + \mu_y^2 + c_1} \cdot \frac{2\sigma_{xy} + c_2}{\sigma_x^2 + \sigma_y^2 + c_2} \quad (19)$$

P is image block to center pixel , x is under water image and it is size 12 x12 , y is generated image and it is size of 12 x 12 , C1= 0.03,C2= 0.04 . and Equation 20 Shows Similarity between generated image and input underwater image (global structural).

$$L_S^G\ (x, G(x)) = 1 - \frac{1}{N} \sum_{p=1}^{N} (s_{(p)}) \quad (20)$$

Equation 21 Shows loss Similarity between underwater image and generated image

$$L_S^1\ (\vec{x}, G(\vec{x})) = 1 - \frac{1}{M} \sum_{p=1}^{N} (S(p)) \quad (21)$$

Equation 22 Shows sum Loss For the network

$$oss = \lambda_1 L_S^G + \lambda_2 L_S^G + \lambda_3 L_S^G + \lambda_4 L_S^G \quad (22)$$

L is the loss,

Sum of all generator losses and sum of all structural similarity losses differs in weight in the same Time. The weight of the local generator loss and local structure similarity loss appropriately reduced. Succeed in acquisition Weight between local loss and global loss.

6. WORK OF RESULTS ANALYSIS

A. Assessment Work

It's been use algorithm Image enhancement under Water (Seas) and the use of Also Comparison and Analysis from objective indicators and subjective evaluation and sum images Which It's done Tested under Water 3 360 and images Which Provided from Internet.

1) TEST OF THE SID (DATASET)

Figure 4 Explain Algorithm results Which Was Meet her Comparison To view underwater images (Seas) There is Every other images non Clear And this algorithm Weak despite that there is numerous from parameter And when Was Image processing total the result appeared zero and the image non natural (unclear) i.e. Image dark. Image Which Was processed By algorithm Colors Contrast is low And it was not done Delete the image. to enhancement image (global) There is only 4 algorithms but can't that Achieves (local areas) . and purpose From this algorithm It removes colors Undesirable that's why it's been enhancement Overall image And from here it is clear that Impact Visual Appears More clarity And in this research It will appear Image more details and the image which has been enhancement by this algorithm It's the same algorithm that exists in it 4 classic . Figure 9 explain compare results . When it was done image enhancement The image became clearer than Original image Underwater this algorithm Shows Image detail & enhancement.

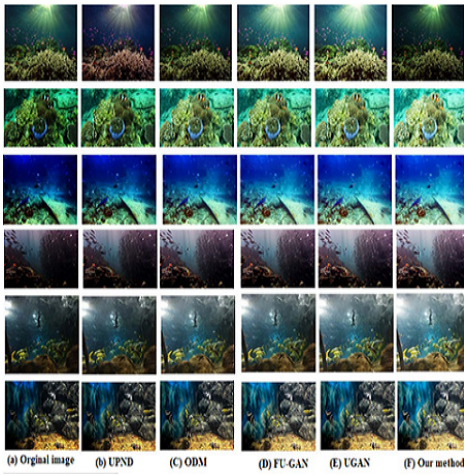

Fig 9 Compare through classical algorithm in dataset

2) OBJECTIVE FROM THE (DIARETDB AND DATASET)

To evaluate better image (Quality - accuracy)

there are 6 types of it, which are :

-UIQM & UIQE : Evaluates the best quality image Underwater

- UIQM : Image color measurement

- UICM & UICouM : assessment Image Enhancement

- UICM : Image Enhancement Quality Complete and value Higher than UICouM When Contrast The image is for the best.

- UICQE : Image Enhancement In a way comprehensive, Whenever it is value Contrast more whenever the image was better .

B. PROVE EXPERIENCES AND ANALYSIS

1) PROOF VERIFICATION

There is errors random and for this from It's urgent to reduce of which And when It's done assessment image Selection 3 600 Appeared results resolution images 0.0001 and table 1 explain Compare Algorithm . of this Search Measure Significantly comprehensive UIQM and Reduce Contrast Information UICouM . entropy measurement Quantitative scale Higher From algorithms Other And from here Show Image algorithm Enhanced Best in . This is a system (Contrast is higher) and contains more accuracy in this algorithm .and algorithm this is a system achieved better results on indicator UCIQE and Showed results more accuracy in Image underwater and when Be color Image high this don't mean that Image Contain on quality high. In this Work Contrast better and Image Information more clearness and Applied algorithm his Search remove Colors unclear and achieved better results (high contrast) and image more clearness.

Method	UIQM	UIConM	UCIQE	Entropy
UPND	3.9895	0.797 1	0.638 5	7.472 1
ODM	4.1396	0.855 5	0.579 9	7.043 4
FU-GAN	4.3071	0.916 5	0.541 0	7.473 6
UGAN	4.335	0.907 9	0.564 5	7.557 7
Our method	4.3977	0.926 9	0.583 9	7.608 9

Table 1 results different for each methods

2) RESEARCH ANALYSIS

For Prove this model In this System Will be applied Range of Operations In order to be done analysis Algorithm and Compare about road the following parts :

1) No ADFF module

2) Basic U-Net

3) Add the ADFF.

In this research It's done use ADFF module (generator) same parameter in Algorithm in this system Was used group Who is it training In order to be done Compared to dataset As shown in table 2 and figure 10 and Table 2 shows Compare between Ours-ADFF and U-Net . the gen-

erator It consists of can enhancements block and network , result residual blocks correction Colors and extract Features Image under Water (seas) and To give information About the image more clearness And from the uses of algorithm this research enhancement image Who is it where PNSR & SSIM . Table 3 Explain enhancement Contrast For the algorithm FGF. And in this Search Improved Both " Extended Maximum Entropy" and " Aver age Gradient" to the image. Figure 10 Explain Check Image When it was done Compare with "classical" algorithms.

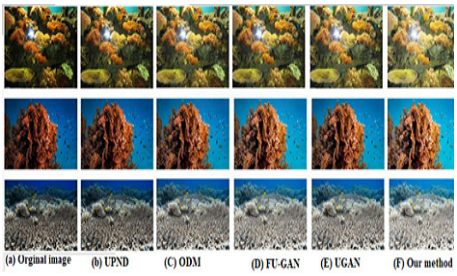

figure 10 details image with DIARETDB0 dataset

Figure 11 Explain Compare between various generator

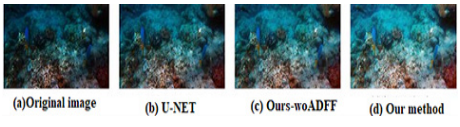

figure 11 comparison with DE- GAN under-water images

Table 2 Compare between DE-GAN and generator with image under Water in seas .

	U-Net	Ours-woADFF	Our method
SSIM	0.752	0.653	0.878
PSNR	21.641	35.1734	33.452

Table 3 Compare between images In the waters of the seas.

Data set	Evaluation index	Original	FGF	Patch-net	Our method
DIARETDB0	AG	3.57	4.57	5.67	5.67
	EN	34.82	56.46	60.46	60.46
	EME	6.73	7.88	8.21	8.21

3) MODEL SIMPLIFY TEST

In this research applied in a simplified way evaluation & testing of the structure Which has relationship With some of them It consists of k-path feedforward (MF) and stage feature fusion (SFF) and pixel encoding (PE) . Network Depth 23 layers test kit was used SID dataset. Figure 12 Explain Training In its entirety Any To give From the beginning Training to Convergence In Figure 12 during .operation Convergence value PSNR Fluctuates Significantly big despite that It's not Easy Convergence Note that Structural pixel Prove it Convergence Network.

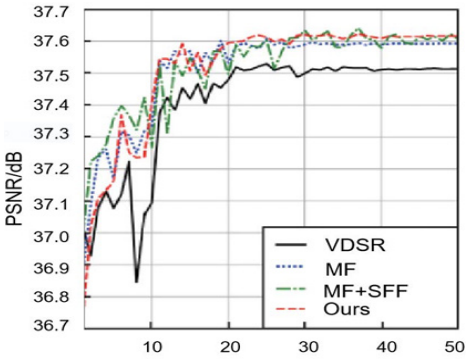

Figure 12 difference Convergence

4) MODEL OF LOSS CURVE

In this research Consists Settings parameter For the network Who is it : initial learning rate 0.01 and dropout 0.5 and mean 0 and variance 0.1 and bias 0.1 .

When arrives total Number to 20 Will sum data least speed from the speed of-Convergence. arrives to Level Low in case loss both training and verification and this network hers training Good and effective reach to the goal. figure 13 explain value Loss (Curves Convergence).

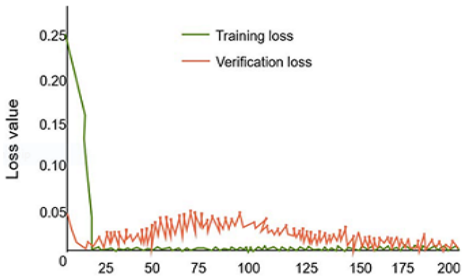

Figure 13 Values Loss that Approaching Who is it Curves Convergence

VIII. CONCLUSION

In this research an applied algorithm for underwater image optimization (seas) consists of an ADFF module and a U-Net structure. The experimental results conducted compared the underwater image optimization of the algorithm. There are other algorithms that were compared with the search algorithm for the purpose of reaching the best as shown in Figure (9,10,11). Comparing algorithms in terms of standards and visibility Self-accessing then the algorithm lighting is better than (improving information and image). and table 2 shows a comparison between SSIM and PNSR .some images in which uneven lighting but this algorithm has been used to enhance the image and provide more detail in the image.

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