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Enhancement of Pencil Sketch of Underwater Images

Kesiya Joseph[1], Nusrathulla Khan[2], Santrupti Kori[3], Veenashree[4], Chrispin Jiji[5]

UG Student, Department of ECE, The Oxford College of Engineering, Bangalore, India[1,2,3,4]

Associate Professor, Department of ECE, The Oxford College of Engineering, Bangalore, India[5]

ABSTRACT: We present an effective methodology for enhancing underwater photographs that have been deteriorated due to medium scattering and absorption. Our methodology is based on a single image and does not require any specific gear or knowledge of the underwater environment or scene organisation. It is based on the blending of two images produced directly from a color-compensated and white-balanced version of the original degraded image. To enhance the transfer of edges and colour contrast to the output image, the two pictures to fusion, as well as their related weight maps, are established. A new approach for creating pencil drawings from natural photos is proposed. The results are structurally representative and comprise a variety of natural strokes and patterns. They're achieved by blending tone and stroke forms in a novel way, which complement one other to provide aesthetically confined results.

KEYWORDS: Underwater Image processing, Enhancement, Fusion, pencil sketch

I. INTRODUCTION

The UNDERWATER ecosystem is home to a variety of unique attractions, including marine critters and fish, breathtaking landscapes, and enigmatic shipwrecks. Aside from underwater photography, underwater imaging has piqued interest in a variety of technological and scientific fields, including underwater infrastructure and cable inspection, identification of man-made things, and control of undisclosed things. Underwater photographs, unlike normal photographs, have limited visibility due to attenuation of the propagated light, mostly due to absorption and scattering effects. Light energy is significantly reduced by absorption, whereas light propagation direction is changed by scattering. They cause a hazy look and a loss of contrast, causing mist to form around distant things Objects at a distance of more than 10 metres are practically unperceivable in normal sea water photos, and colours are faded because their component wavelengths are chopped according to the water depth.Several attempts have been made to recover and improve the visibility of such degraded photos.To abstract human perception of natural scenes, pencil drawing [1] is one of the most essential pictorial languages in visual arts. It establishes a close connection to the visual record of artists. There are two types of pencil drawing synthesis methods: 2D image-based rendering and 3D model-based rendering. The majority of current research in this areauses 3D models to emulate artistic drawing methods and achieve perceptually expressive outcomes. Obtaining high-quality images is far easier than developing 3D models of a scene, thanks to the popularity of digital cameras and internet sharing [2],[3].This research, on the other hand, presents a novel method for removing haze from underwater photographs using a single image recorded with a normal camera. Our method is based on the fusion of multiple inputs, but it derives the two inputs to merge by sharpening a white-balanced version of a single native input image and adjusting the contrast.The white balancing procedure tries to remove the colour cast caused by underwater light scattering, giving the sub-sea photos a more realistic appearance. The fusion process is implemented at many scales, resulting in artifact-free blending.

Based on the fact that the hatch and tone information is paramount in making automatic pencil drawing visually appealing, and on the inherent difficulty to properly make use of it – as described above – thenovelty propose a two-stage system with important stroke and tone management and make the following contribution:To begin, we place stroke generation into a convolution framework to capture the basic characteristics of a pencil sketch and replicate quick nib movement in drawing, which distinguishes our method from other approaches. Second, we introduce tonal patterns consisting of dense pencil strokes without prominent directions to avoid artefacts induced by hatching. To change the tone, parametric histogram models are given, which use statistics from a series of sketch examples. Finally, for tone adjustment, an exponential model with global optimization is recommended, which benefits rendering in densely textured regions and object contours. The resulting pencil drawing incorporates rough strokes and tonal drawings, closely resembling the two-step human drawing process.All of the phases in our architecture are critical to building a basic but powerful drawing system that uses a single natural image as input.Extensive studies on various

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types of natural inputs, as well as comparisons with alternative approaches and commercial products, demonstrate the effectiveness of the suggested strategy.

1. **Existing art**

Over the last few years, many different methods of assessing image quality have been proposed and analysed with the aim of developing a quality metric. The Underwater Degradation Enhancement System generally explores the underwater optical form and balances the poor possessions caused by the water with the element. The states of the technique are generally considered to be intended for the improvement of a single image, since multiple images may limit the choice of performance, slow down processing speed.

Earlier work onpencil sketches and hatching is briefly reviewed. and draught drawing, which are the main components of pencil drawings.Instinctively, by treating this concern well, the underwater optic form must first consider and study.In recent decades, however, a great effort has been made to develop new objective methods for image quality that incorporate perceptual quality measurements taking into consideration the characteristics of the human visual system.This process is entirely with the actual form and answer outstanding for some underwater issues, conversely, its evaluation procedure is difficult overwhelming time, which is hard to meet, but it gives a large-scale study of the submarine environment.Fusion-based method, which combines the processing result by the color correction system and the histogram equalization method, it also makes for superior result for several underwater environments,although, it simply uses picture processing scheme as well as ignore underwater features,Therefore, the end results are subject to more or less fog, data loss as well as upgrade difficulty.To explain these problems, both processes combined and proposed a new method. Semi-inverse approach in [4] used towards perceiving foggy region so expected region rate in plain areas. At last, they meet increasedimageemploying aneasy weighted fusion. For few images, especially scenes underneath, mist publicitythe usage of semi-inverse devicemight be unsuccessful appropriate to the small dissimilarity amongstauthentic and the inverse image. This method if hazy locationpublicitynow no longer succeeds and obtains anawful performance. To remedy this problem, aneasy fusion-primarily based totally dehazed techniquethe usage of a distinctive descriptions additionally resultant from authenticimage [5], [6]. In [7], submerged beam transmission progression also intend an effectual means to defeat the backscatter trouble. By exploiting color adjustment along with dehazed process via gradient guided filter towards holding dual mechanisms independently; at last, re-establish fine effect, we use hybrid technique for enhancing the picture. The number oneimageestimates white stability process, and the following enter image via an easy linear extrude for reinforcing evaluation of hazy image. The goalpicturegreat metrics are categorised in 3 groups: complete reference, no-reference or "blind" greatevaluation and reduced-reference greatevaluation. In the prevailing case of underwater picture processing, no uniquepicture is to be had to be compared, and therefore, no-reference metrics are necessary. Within the above referred tostrategies for enhancement and restoration, most of the authors use subjective great measurements to assess the overall performancein theirstrategies. In what follows we cognizanceat the quantitative metrics utilized bya number of the authors to assess the set of rulesoverall performance and picturegreatwithinside theparticular case of underwater images. At last, the pixel-fusion scheme makes use of3 weight maps for combining that imagery for reinforcing visibility of foggy photoadditionallyprolonged fusion-primarily based totally scheme [8]. Fusion-primarily based totally dehazed system is easy, rapidin addition to meets alike end resultbecause the DCP scheme in [9] and [10]. But it isn't succeeding whilst the photoconsists of inhomogeneous haze. The motiveis thisprocedure did now no longerconsider the deepness statistics of a hazy photo. The twin descriptions attained via way of means of gamma correction via way of means ofdiverse scales for sandstorm enhancement [11]. Considering the fact in [12] that underwater imagery can differ considerably transverse dissimilar imagery with dissimilar patches during sole picture, in this paper, the above two techniques to improve the image, in that estimated PSF of blurred picture, adaptively select dictionary to pre-learned as of high excellence instance patches intended for every confined patch. LANLM much get better imagery. Finally, uses Dehazing via gradient guided filter scheme to clear lighting (color) problem of deblurred imagery.The more desirable fusion-primarily based totallytechniquethe usage ofdiverse descriptions makes use ofunmarriedphoto dehazed scheme in [13]. Fusion technique is new and greenmeant for unmarriedphoto defogging. The number onephoto is for reinforcing dissimilarity; in addition, later photoespecially for compensating colour deformation in addition tolower halo impact plus noise. While above strategies are rapidin addition to simple, they can't make exceptionalphoto. Focusing on underwater video processing algorithms, [14] recommend a technique to quantitative verify the robustness and conduct of algorithms in face of underwater noises. The precept is to degrade take a look atphotos with simulated underwater perturbations and the point of interest is to isolate and verify independently the results of the exceptional perturbations. In [15]an open dim channel scheme to increase visibility in low-intensity rate. Thirdly, gradient guided filter to enhance the details. Later, we use the soft-thresholding process to decrease noise in high-intensity rate to advance texture information. Finally, image is well enhanced via wavelet domain gradient guided filter. In order to evaluate the greatin their adaptive smoothing technique for underwater photograph denoising,[16] proposed aneasy

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criterion primarily based totally on a preferredend resultthrough [17]: for maximumproperly contrasted and noise loose images, the distribution of the gradient value histogram is intently exponential, besides for a small top at low gradients similar to homogeneous zones. They outline a robustness index amongzero and 1 that measures the closeness of the histogram with an exponential distribution. Meanwhile, [18] proposes a retinex-primarily based totallytechnique to address undersea issues, however, overall performance of this machineisn't always distinct, shadeationsolidin addition toassessment degradation nonetheless exist. The machinecan also additionallybet a uniform [19, 20] or an additionalaffordable non-uniform [21] background-radiance. Enhancement methodremoves the shadeationsolid [22, 23] with universal white balancing. This painting is enormous to the attemptbroadly speakingreceivedvia [24]. The state-of-arts are usually designed for single-photograph enhancement, considering that multi-picsmay alsorestrictoverall performancevariety and sluggish down processing speed. However, its evaluation improvement is hard and time-consuming, however it offers fullscale evaluation of undersea situation. However, it simplestmakes use ofapproach of photograph processing and so its effectsbe afflicted bygreater or much less haze, facts failure as well as over-enhancement hassle.

II. PROPOSED METHOD

As depicted in Figure 2 our new scheme primarily to Enhancethe color pencil sketch drawing of underwater image in making it look like a portrait for better details.Initially, we enhance the quality of the image using fusion method. Next, weobtain color pencil drawing of the enhancement image.

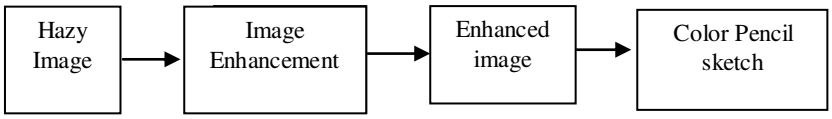

Figure 1: Block diagram of Proposed method

The underwater image enhancement approach combines white balancing and image fusion, to improve underwater images without resorting to the explicit inversion of the optical model. White balancing aims at compensating for the color cast caused by the selective absorption of colors with depth, while image fusion is considered to enhance the edges and details of the scene, to mitigate the loss of contrast resulting from backscattering. Since the color correction is critical in underwater, we first apply our white balancing technique to the original image. This step aims at enhancing the image appearance by discarding unwanted color casts caused by various illuminants. In water deeper than 30 ft, white balancing suffers from noticeable effects since the absorbed colors are difficult to be recovered. To overcome these problems, gamma correction of the white balanced image versionaims at correcting the global contrast and is relevant since, in general, white balanced underwater images tend to appear too bright. This correction increases the difference between darker/lighter regions at the cost of a loss of details in the under-/over-exposed regions. To compensate for this loss, later used sharpened version of the white balanced image, which follow the unsharp masking principle, in the sense that we blend a blurred or unsharp version of the image with the image to sharpen. The multi-scale fusion is used for minimizing the transfer of those artifacts to the final blended image The weight maps namely Laplacian, saliency and saturation weights are used during blending in such a way that pixels with a high weight value are more represented in the final image.

The enhanced output of multi-scale fusion is given to color pencil sketching approach which consists of two main steps, i.e., pencil stroke generation and pencil tone drawing. Stroke drawing aims at expressing general structures of the scene, while the tone drawing focuses more on shapes, shadow, and shading than on the use of lines. An important observation is that artists cannot always draw very long curves without any break. Strokes end often at points of curvature and junctions. Consequently, there might be crosses at the junction of two lines in human drawing, caused by rapid hand movement. Intuitively, when drawing strokes at a point, we determine the direction, length, and width in a pixel classification and link process based on a unified convolution framework. The tone distribution of a grayscale image generally differs significantly from that of pencil Sketch, when compared with tone of natural image. A Sketch tone histogram usually follows certain patterns. It is because pencil drawings are the results of interaction of paper and graphite, which mainly consist of two basic tones. For very bright regions, artists do not draw anything to show white paper. Heavy strokes, contrarily, are used to accentuate boundaries and highlight dark regions. In between these two tones, mild tone strokes are produced to enrich the layer information. Tonal texture refers to pencil patterns without obvious direction, which reveal only the tone information. One input image only needs one pattern. In human drawing,

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tonalpencil texture is generated by repeatedly drawing at the same place.The combined pencil stroke and tonal textureby multiplyingthe stroke and texture values for each pixel to accentuate important contours

III. EXPERIMENTAL RESULTS

The simulation results of underwater image enhancement are shown in figure 2 and color pencil sketch drawings of input and out images are shown in figure 3 and 4.

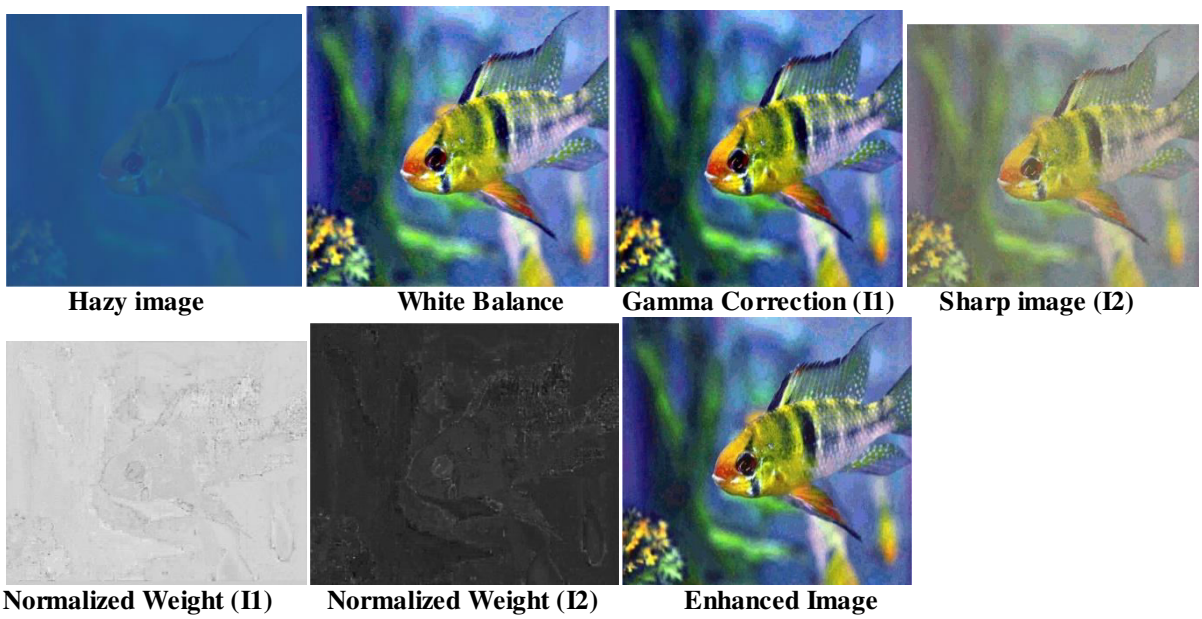

Figure 2: Enhancement of Underwater Image

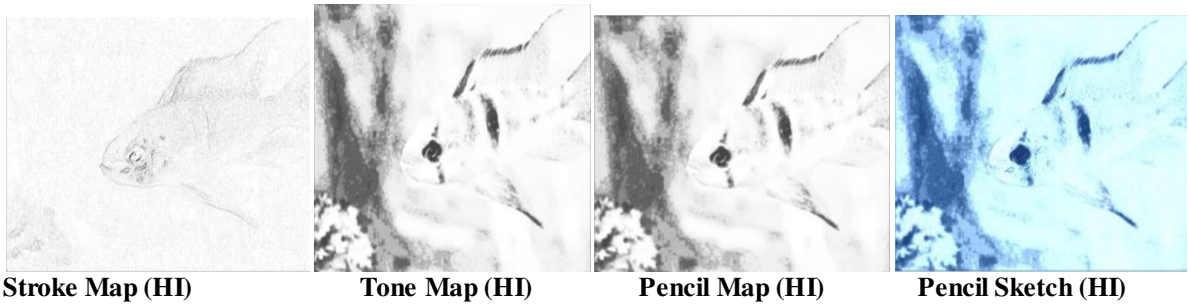

Figure 3: Color Pencil sketch of Hazy image

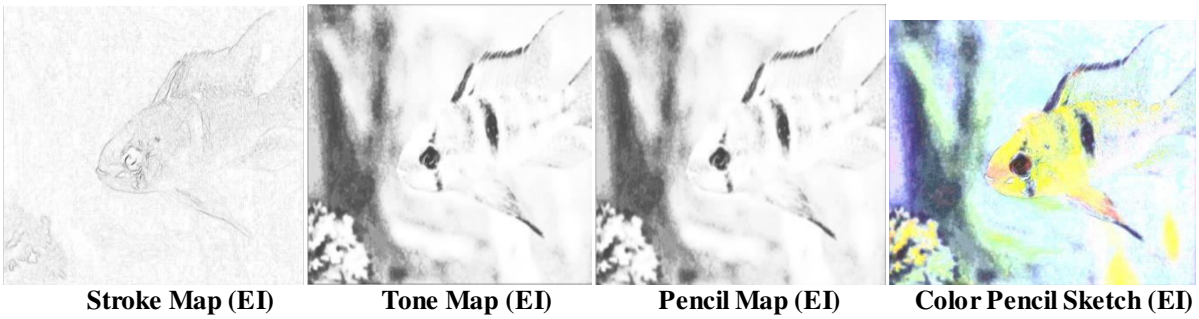

Figure 4: Color Pencil sketch of enhanced image

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IV. CONCLUSION AND FUTURE WORK

We have presented an approach to enhance underwater images. Our strategy builds on the fusion principle and does not require additional information than the single original image. We have shown in our experiments that our approach is able to enhance a wide range of underwater images with high accuracy, being able to recover important faded features and edges. A new approach for creating pencil drawings from natural photos is proposed. The results are structurally representative and comprise a variety of natural strokes and patterns. They're achieved by blending tone and stroke forms in a novel way, which complement one other to provide aesthetically confined results. The challenging work for future, although we did not discuss the computational cost of Enhancement algorithms in this article it may play a critical role in choosing an algorithm for real-time applications.

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