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# Fusion Based Strategies to Combine Hazy Images into Single Image

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**Abstract:** Haze is a physical phenomenon that considerably degrades the visibility of outside scenes. This is often in the main because of the atmosphere particles that absorb and scatter the sunshine. This paper introduces a unique single image approach that enhances the visibility of such degraded pictures. Our methodology may be a fusion-based strategy that derives from 2 original hazy image inputs by applying a white balance and a distinction enhancing procedure. To mix effectively the knowledge of the derived inputs to preserve the regions with sensible visibility, we tend to filter their vital options by computing 3 measures (weight maps): brightness level, colour property, and strikingness. To reduce artefacts introduced by the burden maps, our approach is intended in an exceedingly multiscale fashion, employing a Laplacian pyramid illustration. We tend to square measure the primary to demonstrate the utility and effectiveness of a fusion-based technique for dehazing supported one degraded image. the strategy performs in an exceedingly per-pixel fashion, that is easy to implement. The experimental results demonstrate that the strategy yields results comparative to and even higher than the additional complicated progressive techniques, having the advantage of being applicable for period applications.

**Keywords:** Dehazing, Strikingness,Fusion based, single image, Weight maps.

## 1. INTRODUCTION

The pictures of outside scenes area unit degraded by weather condition conditions. In such cases, part phenomena like haze and fog degrade considerably the visibility of the captured scene. Since the aerosol is misted by extra particles, the mirrored lightweight is scattered and as a result, distant objects and elements of the scene area unit less visible, that is characterized by reduced distinction and light colors. Restoration of pictures taken within these specific conditions has caught increasing attention in the last years. This task is very important in many out of doors applications like remote sensing, intelligent vehicles, visual perception and police work. In remote sensing systems, the recorded bands of mirrored lightweight area unit processed so as to revive the outputs.

Multi-image techniques solve the image deadheading drawback by process many input pictures, that are taken in numerous part conditions [3]. Another different is to assume that AN approximated 3D geometrical model of the scene is given. during this paper of Treibitz and Schechter different angles of polarized filters ar wont to estimate the haze effects. A more difficult downside is once solely one degraded image is obtainable. Solutions for such cases are introduced solely recently. during this paper we tend to introduce an alternate single-image primarily based strategy that's ready to accurately dehaze pictures mistreatment solely the initial degraded info.AN extended abstract of the core plan has been recently introduced by the authors in . Our technique has some similarities with the previous approaches of Tan and Tarel and Hautière ,that enhance the visibility in such outside pictures by manipulating their distinction. [2]

## 2. EXISTING SYSTEM

In distinction to existing techniques, we tend to engineered our approach on a fusion strategy. we tend to square measure the primary to demonstrate the utility and effectiveness of a fusion-based technique for debasing on one degraded image. Image fusion could be a well studied method , that aims to mix seamlessly many input pictures by conserving solely the particular options of the composite output image. during this work, our goal is to develop a straight forward and quick technique and thus, as are going to be shown, all the fusion process steps square measure designed so as to support these necessary options. the most conception behind our fusion primarily based technique is that we tend to derive2 input pictures from the initial input with the aim of convalescent the visibility for every region of the scene in a minimum of one in all them. to boot, the fusion sweetening technique estimates for every element the fascinating sensory activity primarily based qualities (called weight maps) that controls the contribution of every input to the ultimate result [1].

In order to derive the pictures that fulfill the visibility assumptions (good visibility for every region in a minimum of one in all the inputs) needed for the fusion method, we tend to analyze the optical model for this sort of degradation. There square measure 2 major issues, the primary one is that thecolor solid that's introduced because of the air light influence and also the second is that the lack of visibility into distant regions because of scattering and attenuation phenomena. the primary derived input ensures a natural rendition of the output, by eliminating chromatic casts that square measure caused by the air light


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color , whereas the distinction sweetening step yields a far better world visibility, however chiefly within the hazy regions.

However, by using these 2 operations, the derived inputs taken singly still suffer from poor visibility (e.g. analyzing figure three it are often simply determined that the second input restores the distinction of the hazy inputs, however at the value of sterilization the initial visibility of the closer/haze-free regions).

Therefore, to mix effectively the knowledge of the derived inputs, we tend to filter (in a per-pixel fashion) their vital options, by computing many measures (weight maps). Consequently, in our fusion framework the derived inputs area unit weighted by 3 normalized weight maps (luminance, chromatic and saliency) that aim to preserve the regions with sensible visibility.

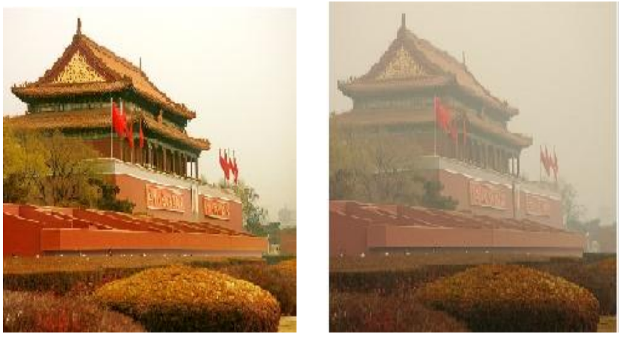
Finally, to attenuate artifacts introduced by the load maps, our approach is intended during a multi-scale fashion, employing a Laplacian pyramid illustration of the inputs combined with Gaussian pyramids of normalized weights. Our technique has many benefits over previous single image dehazing strategies.

First, our approach performs a good per-pixel computation, totally different from the bulk of the previous strategies that method patches. a correct per-pixel strategy reduces the number of artifacts, since patch based strategies have some limitations as a result of the belief of constant airlight in each patch. In general, the assumptions created by patch-based techniques don't hold, and thus further post process steps square measure needed (e.g. the method of He et al. [8] must sleek the transmission map by alpha-matting).

Secondly, since we tend to don't estimate the depth (transmission) map, the quality of our approach is not up to most of the previous ways.

Finally, our technique performs quicker that makes it appropriate for period of time applications .Even compared with the recent effective implementation of Tarel and Hautière our technique is ready to revive a hazy image in less time, whereas showing additional visually plausible ends up in terms of colours and details (see figure 1). Our technique has been tested extensively for an oversized set of various hazy pictures (the reader is brought up the supplementary material).

Results on a spread of hazy pictures demonstrate the effectiveness of our fusion-based technique. perform a quantitative experimental analysis supported the live of Hautière et al. . the most conclusion is that our approach is a smaller amount susceptible to artifacts, yielding terribly similar results with the physically-based techniques like the technique of Fattal, He et all., Nishino et al. and Kopf et al.We believe that this can be a key advantage of our technique. [5]



(a) (b)

Fig.1. Without Hazy Picture (fig.a) and With Hazy Picture (fig.b)

## 3. DEHAZING BY MULTI-SCALE FUSION

We presented a fusion-based algorithm that solves the problem of single image dehazing. We have shown that by choose appropriate weight maps and inputs, the fusion strategy can be used to effectively dehaze images. The experimental results demonstrate that our algorithm can produce visually pleasing dehazing results and is faster than previous techniques.

The challenging problem is when only a underwater single degraded image is available. Solutions for such cases have been introduced only recently. There are two major problems, the first one is the color cast that is introduced due to the air light influence and the second is the lack of visibility into distant regions due to scattering and attenuation phenomena. The problem is to estimate from the hazy input I the latent image J when no additional information about depth and air light are given.

**Steps:**

1)Input:Underwater hazy images as data set
2)Perform Future Extraction method
3) Measure the weight of the image
    i) Luminance weight map
    ii) Chromatic weight map
    iii) Saliency weight map
or by using
    i) Gaussian Pyramid
    ii) Laplacian Pyramid
4)Perform Future Extraction method for new image
5)Do fatal and tarel calculations

*Laplacian pyramid* A Laplacian pyramid is a technique in image processing and uses the concept of pyramids. It is very similar to Gaussian pyramid with the alteration that it uses a Laplacian transform instead of a Gaussian.

*Gaussian pyramid* A Gaussian pyramid is a technique used in image processing, especially in texture synthesis. The technique involves creating a series of images which are weighted down using a Gaussian average (Gaussian blur) and scaled down. When this technique is used multiple times, it creates a stack of successively smaller images, with each pixel containing a local average that corresponds to a pixel neighborhood on a lower level of the pyramid.

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*Grey world* Gray world is among the simplest estimation methods. The main premise behind it is that in a normal well color balanced photo, the average of all the colors is a neutral gray. Therefore, we can estimate the illuminantcolor cast by looking at the average color and comparing it to gray. Visual saliency is the perceptual quality that makes an object, person, or pixel stand out relative to its neighbors and thus capture our attention. Visual attention results both from fast, pre-attentive, bottom-up visual saliency of the retinal input, as well as from slower, top-down memory and volition based processing that is task-dependent.

The *luminance weight map measures* the visibility of each pixel and assigns high values to regions with good visibility and small values to the rest. Since hazy images present low saturation, an effective way to measure this property is to evaluate the loss of colourfulness.

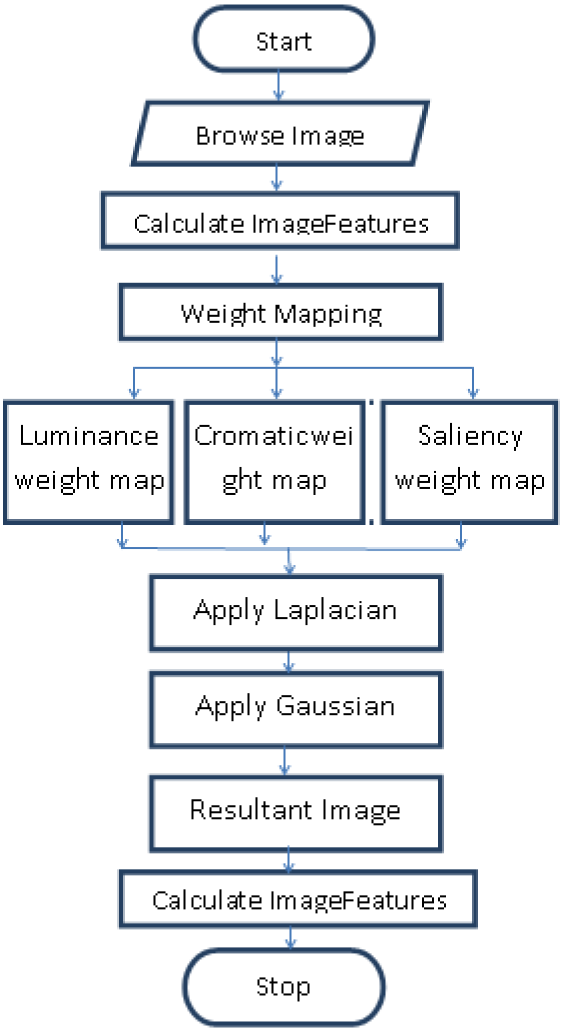


Fig.2. Flowchart of Dehazing Algorithm.

The *chromatic weight map controls* the saturation gain in the output image. This weight map is motivated by the fact that in general humans prefer images characterized by a high level of saturation. Since the color is an inherent indicator of the image quality, often similar color enhancement strategies are also performed in tone mapping.

*1. Image Dehazing Algorithm*

**Input :**The Training texture $g^O$

Output : The output imgeg$^{SYN}$

1: randomise the output imgeg$^{SYS}$

2: Analysis Pyramid = decompose($g^O$)

3: **repeat :**

4: MatchHistogram($g^{SYS}$, $g^O$)

5: SysnthesisPyramid = decompose($g^{SYS}$)

6: for each level i in the synthesis pyriomid, SynthesisPyriomid[i]

Do

7: MatchHistogram(SysnthesisPyramid[i], AnalysisPyriomid[i])

8:End for

9: $g^{SYS}$ = collapse(SynthesisPyramid)

10: Until A couple of iteration.

## 4. RESULTS AND USES

**RESULT**

*Input Image* : Haze is an atmospheric phenomenon that significantly degrades the visibility of outdoor scenes. This is mainly dueto the atmosphere particles that absorb and scatter the light. Thispaper introduces a novel single image approach that enhances the visibility of such degraded images.

*Weight mapping* : Byapplying a white balance and a contrast enhancing procedure.To blend effectively the information of the derived inputs topreserve the regions with good visibility, we filter their importantfeatures by computing three measures (weight maps): luminance,chromaticity, and saliency.

*Pyramids:* To minimize artifacts introduced bythe weight maps, our approach is designed in a multiscale fashion,using a Laplacian pyramid representation. We are the firstto demonstrate the utility and effectiveness of a fusion-basedtechnique for dehazing based on a single degraded image. Themethod performs in a per-pixel fashion, which is straightforwardto implement.

*Result:-* The strategy performs in a for every pixel design, which is clear to execute. The exploratory results exhibit that the strategy yields results near to and shockingly better than the more mind boggling cutting edge methods.

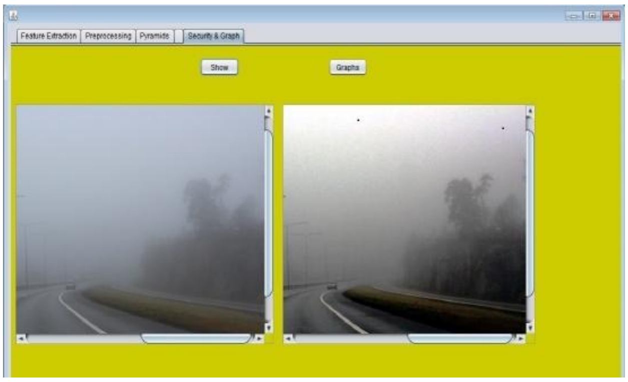

Fig.3. Final Result of haze and Dehazed image.

**APPLICATIONS**

1. Haze-free long-distance
2. Satellite images enhance cartography
3. Archaeology, and environmental studies
4. Military and security applications.
5. Improved consumer photography.

## 5. CONCLUSION

In this paper we have exhibited that a combination based methodology can be utilized to viably upgrade cloudy and foggy pictures. To the best of our insight, this is the first combination based technique that has the capacity take care of such issues utilizing one and only corrupted picture. We have demonstrated that, by picking fitting weight maps and inputs, a multi-scale combination methodology can be utilized to successfully dehaze pictures. Our system has been tried on an expansive information set of characteristic foggy pictures. The technique is speedier than existing single picture dehazing methodologies also, yields exact results.

## REFERENCES

[1] R. Achanta, F. Estrada, P. Wils, and S. Susstrunk.Salient region detection and segmentation. International Conference on Computer Vision Systems, 2008.

[2] S. Avidan and A. Shamir. Seam carving for content-aware image resizing. ACM Transactions on Graphics, 26(3), 2007.

[3] N. Bruce and J. Tsotsos. Attention based on information maximization. Journal of Vision, 7(9):950–950, 2007.

[4] C. Christopoulos, A. Skodras, A. Koike, and T. Ebrahimi. The JPEG2000 still image coding system: An overview. IEEE Transactions on Consumer Electronics, 46(4):1103– 1127, 2000.

[5] C. Christoudias, B. Georgescu, and P. Meer.Synergism in low level vision.IEEE Conference on Pattern Recognition, 2002.

[6] J. L. Crowley, O. Riff, and J. H. Piater.Fast computation of characteristic scale using a half octave pyramid. International Conference on Scale-Space theories in Computer Vision, 2003.

[7] S. Frintrop, M. Klodt, and E. Rome.A real-time visual attention system using integral images.International Conference on Computer Vision Systems, 2007.

[8] D. Gao and N. Vasconcelos. Bottom-up saliency is a discriminant process. IEEE Conference on Computer Vision, 2007.

[9] J. Han, K. Ngan, M. Li, and H. Zhang. Unsupervised extraction of visual attention objects in color images. IEEE Transactions on Circuits and Systems for Video Technology, 16(1):141–145, 2006.

[10] J. Harel, C. Koch, and P. Perona.Graph-based visual saliency. Advances in Neural Information Processing Systems, 19:545–552, 2007.

[11] S. S. Hemami and T. N. Pappas.Perceptual metrics for image quality evaluation. Tutorial presented at IS&T/SPIE Human Vision and Electronic Imaging, 2007.

[12] X. Hou and L. Zhang. Saliency detection: A spectral residual approach. IEEE Conference on Computer Vision and Pattern Recognition, 2007.

[13] Y. Hu, X. Xie, W.-Y.Ma, L.-T.Chia, and D. Rajan. Salient region detection using weighted feature maps based on the human visual attention model.Pacific Rim Conference on Multimedia, 2004.

[14] L. Itti and P. F. Baldi. Bayesian surprise attracts human attention. Advances in Neural Information Processing Systems, 19:547–554, 2005.

[15] L. Itti and C. Koch.Comparison of feature combination strategies for saliency-based visual attention systems. SPIE Human Vision and Electronic Imaging IV, 3644(1):473–482, 1999.

[16] L. Itti, C. Koch, and E. Niebur.A model of saliency-based visual attention for rapid scene analysis. IEEE Transactions on Pattern Analysis and Machine Intelligence, 20(11):1254– 1259, 1998. [17] T. Kadir, A. Zisserman, and M. Brady.An affine invariant salient region detector.European Conference on Computer Vision, 2004.

[17] B. C. Ko and J.-Y. Nam. Object-of-interest image segmentation based on human attention and semantic region clustering. Journal of Optical Society of America A, 23(10):2462– 2470, 2006.

[18] C. Koch and S. Ullman. Shifts in selective visual attention: Towards the underlying neural circuitry. Human Neurobiology, 4(4):219–227, 1985.

[19] T. Liu, J. Sun, N.-N.Zheng, X. Tang, and H.-Y.Shum.Learning to detect a salient object.IEEE Conference on Computer Vision and Pattern Recognition, 2007.

[20] D. G. Lowe. Distinctive image features from scale-invariant feature points. International Journal of Computer Vision, 60:91–110, 2004.

[21] Y.-F. Ma and H.-J.Zhang.Contrast-based image attention analysis by using fuzzy growing.In ACM International Conference on Multimedia, 2003.

[22] D. Marr. Vision: a computational investigation into the human representation and processing of visual information. W. H. Freeman, San Francisco, 1982.

[23] E. Niebur and C. Koch. The Attentive Brain, chapter Computational architectures for attention, pages 163–186. Cambridge MA:MIT Press, October 1995.

[24] B. Olshausen, C. Anderson, and D. Van Essen.A neurobiological model of visual attention and invariant pattern recognition based on dynamic routing of information. Journal of Neuroscience, 13:4700–4719, 1993.

[25] U. Rutishauser, D. Walther, C. Koch, and P. Perona. Is bottom-up attention useful for object recognition? IEEE Conference on Computer Vision and Pattern Recognition, 2, 2004.