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IMAGE DEHAZING USING HSV COLOR SPACE

Dr. P Shanmugapriya[1], V S Roshana[2], M S Sneka[3], J Sravani Sowmya Shri[4] , V Vinodhini[5]

[1]Electronics and Communication Engineering, Saranathan College of Engineering.[2]Electronics and Communication Engineering, Saranathan College of Engineering.[3]Electronics and Communication Engineering, Saranathan College of Engineering.[4]Electronics and Communication Engineering, Saranathan College of Engineering. [5]Electronics and Communication Engineering, Saranathan College of Engineering.

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Abstract - The captured images are impaired in cloudy or foggy situations, resulting in decreased visibility, contrast, and colour fidelity. The air particles that attenuate and scatter the source radiation are to blame for this image deterioration. The degree of degradation is affected by several circumstances, including different air particle densities, their wavelengths, and distances from the acquisition instrument. For visible-band images, the currently employed image dehazing techniques either directly estimate the dehazed image or are dependent on prior assumptions to rebuild the transmission map. Traditionally, blurry images are recovered using the atmospheric scattering model (ATSM). Airlight and scene transmission are two unknown aspects or characteristics in ATSM that need to be calculated. The quality of the dehazed image is significantly influenced by how accurate these estimates are. The first parameter is the main topic of this essay. It adds a fresh method based on the HSV colour space for calculating the airlight. The haziest opaque region of the image is located using the HSV colour space. As a result, the amount of airlight in the chosen area isdetermined.

Keywords-Dehazing, Atmospheric Scattering Model, Color Spaces, HSV, Haze

1. INTRODUCTION

Pattern recognition, biometrics, content-based image retrieval, medical image processing, image inpainting, and other sectors all benefit from digital image processing (DIP).Multimedia security and dehazing. Visibility is a significant issue in DIP that image- based systems must address. The visibility of a scene is affected by the weather, which affects how well outdoor image processing-based systems, such as those used for object detection and recognition, visual surveillance, traffic monitoring, intelligent transportation, etc., operate. A considerable percentage of the light reflected by the environment as well as a tiny portion of the light reflected directly from an object's surface are both captured by the camera. The air particles scatter and absorb light that is reflected from an object's surface. Inclement weather causes this scattering and absorption to increase, which leads to inaccurate irradiance measurements. Additionally, bad weather degrades photos and videos, which causes objects to lose contrast and visibility through. Applications based on computer vision work flawlessly with noiseless input. Due to the fading visuals and videos, many programmes work poorly in bad weather. Therefore, image dehazing is necessary for applications based on computer vision. A hazy image is transformed into a haze-free image using dehazing algorithms . Dehazing is frequently performed using an atmospheric scattering model (ATSM). ATSM explains how photos are produced in bad weather.

2. EXISTING SYSTEM

Markov Random Field (MRF) is suggested for haze reduction in the current system. The contrast maximising strategy can generate some spectacular results, but it frequently results in oversaturated photos. To develop a linear model that uses a supervised learning approach to learn the model's parameters to estimate the scene depth of a hazy image with a colour attenuation prior. By investigating the built-in boundary restriction, an efficient 2nitializes2d2 dehazing method may be used to restore the haze-free image. Before estimating the transmission map and using soft matting to refine it, consider the current dark channel. Although the results are visually striking, this method can have quite a high level of time and spatial complexity. By using a guided filter to estimate the transmission map, they further enhance their methodology.

A collection of random variables with a Markov property and 2nitializes2d by an undirected graph is known as a Markov random field (commonly abbreviated as MRF), Markov network, or undirected graphical model. In other words, if a random field meets the Markov properties, it is said to be a Markov random field. In terms of how dependencies are represented, a Markov network, also known as an MRF, is comparable

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to a Bayesian network. However, Markov networks are undirected and have the potential to be cyclic, whereas Bayesian networks are directed and acyclic. In this way, a Markov network can depict some dependencies that a Bayesian network cannot (such as cyclic dependencies); yet, it cannot depict some dependencies that a Bayesian network can (such as induced dependencies). The underlying graph of a Markov random field may be finite or infinite.

Because it can therefore be represented by a Gibbs measure for an appropriate (locally specified) energy function, the term "Gibbs random field" is also used when the joint probability density of the random variables is strictly positive. The model is the prototypical Markov random field; in fact, the Markov random field was first introduced as the model's default environment. A Markov random field is used to mimic a variety of low- to mid-level image processing and computer vision applications in the field of artificial intelligence. The previous dark channel contained statistics for clear outdoor photos. It is founded on the crucial finding that many local patches in outdoor, haze-free photos contain some pixels with very low intensity in at least one colour channel. The dark channel before is based on the following finding on photographs taken outside during a clear day: at least one colour channel in the majority of the non-sky patches contains some pixels with extremely low and nearly zero intensities. In other words, the lowest intensity in such a region is quite low.

The saturation of the patch decreases sharply while the color of the scene fades under the influence of the haze, and the brightness value increases at the same time producing a high value for the difference. According to the above color attenuation prior, the difference between the brightness and the saturation is utilized to estimate the concentration of the haze. In the atmospheric scattering model, the calculation of scene depth and atmospheric scattering coefficient generally requires additional information such as the vanishing points from the infinite plane. The location confirmation of vanishing points relies on the subjective judgment or is realized through the image processing algorithm (e.g., Hough transform, Curvelet transform). In many cases, vanishing points are difficult to be accurately estimated, which may cause the bad image visibility restoration.

3. PROPOSED SYSTEM

An end-to-end system, DehazeNet. The mapping relationships between hazy image patches and their medium transmissions are directly learned and estimated. By automatically learning each of these components from beginning to end, DehazeNet outperforms existing dehazing methods. We establish linkages between the components of DehazeNet and the assumptions and priors employed in those methods. Our approach can be broken down into three steps: calculating the skylight and adjusting colour through white balance; calculating the atmospheric colour space using the local extrema method and recovering the image visibility by inverting the colour space scattering model; and controlling the visibility using a multi-scale tone manipulation algorithm.

Start by estimating the colour space and white balance, then move on to a coarse estimate of the atmospheric colour space, and ultimately restore the image using local extremes. A fresh approach to creating edge-preserving picture decompositions on multiple scales, We demonstrate that the ability to extract information at different sizes is constrained by the bilateral filter-based base-detail decomposition approaches currently in use. We have developed a straightforward interactive tool for adjusting the contrast and tone of details at various scales. We first create a three-level decomposition of a picture using the CIELAB lightness channel (coarse base level b and two detail levels). The first (non-iterative) structure is used for this. After that, a set of sliders for adjusting the base layer's exposure and the boosting factors for the base medium and fine detail layers are displayed to the user.

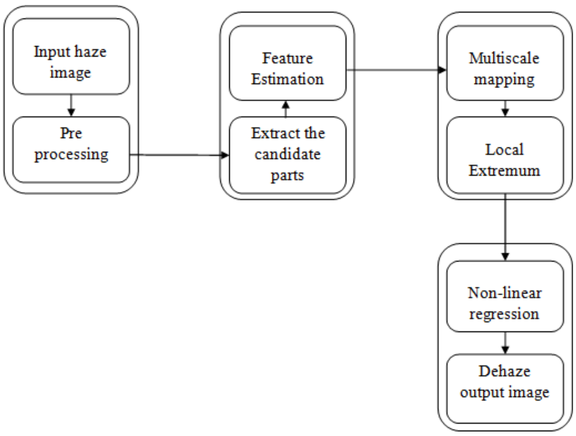

Fig .1. Block Diagram of Proposed Method

Block diagram description: First, extract the candidate sections in haze picture feature extraction starts from an initial set of measured data and builds derived values (features). This is the most crucial stage in recovering the haze free images after the input haze image has undergone pre- processing, or training set of input.

Image enhancement: Image enhancement techniques in Image Processing Toolbox enable you to increase the signal- to-noise ratio and accentuate image features by modifying the colors or intensities of an image.The toolbox includes specialized filtering routines and a generalized multidimensional filtering function that handles integer image types, offers multiple boundary-padding options, and performs convolution and correlation.

Using predefined filters and functions you can:

- Filter with morphological operators
- Deblurred and sharpen
- Remove noise with linear, median, or adaptive filtering
- Perform histogram equalization
- Remap the dynamic range
- Adjust the gamma value
- Adjust contrast

Feature extraction: Existing methods make a number of assumptions in order to handle the poorly presented picture dehaze problem, and on the basis of these assumptions, theyare able to densely extract haze-relevant features (dark channel, hue disparity, and colour attenuation) from the image domain. Densely extracting these haze-relevant characteristics is akin to applying the proper filters to a hazy input image before applying nonlinear mappings. Motivated by extreme colour channel processing of the haze-relevant characteristics as well as estimation of the features supplied to the multiscale mapping.

Multiscale mapping: Start by estimating the colour space and white balance, then move on to a coarse estimate of the atmospheric colour space, AND ultimately restore the image using local extremes. We have developed a straightforward interactive tool for adjusting the tone and contrast of details at various scales. This tool densely computes the characteristics of an input image at several spatial scales, which has been shown to be successful for haze removal. Scale invariance can also be achieved with multi-scale feature extraction.

Local Extremum: Under each pixel, the neighbourhood maximum is taken into account to combat local sensitivity. Additionally, the local extremum is in agreement with the presumption that the medium transmission is locally constant, and it is frequently applied to every feature map pixel in order to reduce transmission estimation noise and maintain resolution for use in picture restoration.

Image Deblurring: The blind, Lucy-Richardson, Wiener, and Initializes filter deconvolution techniques, as well as conversions between point spread and optical transfer functions, are all examples of image deblurring algorithms in the Image Processing Toolbox. These features aid in removing blur brought on by out-of-focus lenses, camera or subject movement during image capture, climatic circumstances, brief exposure times, and other causes. Multidimensional photos can be used with all deblurring techniques.

Image Analysis: The extraction of relevant information from photos, such as recognising colours, counting items, detecting forms, or measuring object attributes, is known as image analysis. For image analysis applications including statistical analysis, feature extraction, and property assessment, the image processing toolbox offers a complete set of reference-standard methods and visualization capabilities.

Image Segmentation: Region boundaries in a picture are determined by image segmentation algorithms. I can investigate a variety of picture segmentation techniques, such as progressive methods, automatic thresholding, edgebased techniques, and morphology-based techniques, such as the watershed transform, which is frequently used to separate related objects.

Geometric Transformations: Transformations can be used to rotate images, scale them down, fix geometric deformities, and register images, among other things. Simple operations like resizing, rotating, and cropping are supported by the Image Processing Toolbox, as are more difficult affine and projective 2D geometric transformations. A versatile framework for designing and utilising unique geometric transformations and interpolation techniques for N-dimensional arrays is also providedby the toolbox.

4. EXPERIMENTAL RESULTS

Dataset: With reference to the training data, 10 haze-free patches are randomly selected from the photos gathered from the Internet in order to analyse the convergence and test the architecture of DehazeNet. We create 10 hazy patches by equally sampling 10 random transmissions for each patch. As a result, 100 synthetic patches are produced altogether for DehazeNet training. DehazeNet 5nitializes the filter weights of each layer by drawing random numbers, and the biases are set to 0. Every 100 iterations, the learning rate drops by half, from 0.005 to 3.125e-4.

DehazeNet is trained on a PC 780 GPU using the aforementioned parameters (in 500,000 iterations with a batch size of 128). DehazeNet runs without GPUs even though it is built on CNNs and can virtually ensure real-time performance.

The full dehazing framework is tested in MATLAB 2014A using just one CPU (an Intel i7 3770 at 3.4 GHz), and it takes about 1.5 seconds to analyse a 640x480 image.

Fig.2. Input Dataset Haze image

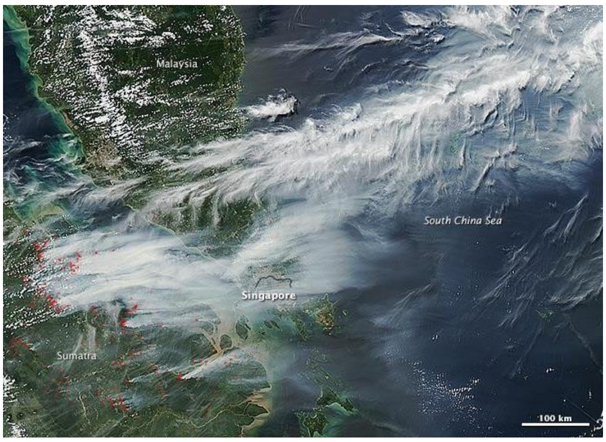

Fig.3. Output dataset dehaze image

Peak signal-to-noise ratio: Peak signal-to-noise ratio (PSNR), which is sometimes shortened, is an engineering term for the comparison of a signal's maximum achievable power to the power of corrupting noise that impairs the representation of the signal's fidelity. Due to the high dynamic range of many signals, PSNR is typically stated in terms of the logarithmic decibel scale. The quality of reconstruction of lossy compression codes (for example, picture compression) is most frequently assessed using PSNR. In this instance, the original data is the signal, while the error brought on by compression is the noise. PSNR is a proxy for the perception of reconstruction quality by humans when comparing compression codecs. Even though a greater PSNR typically denotes a higher-quality reconstruction, this may not always be the case. The range of validity of this metric must be carefully considered because it can only be used to compare results from the same codec (or codec type) and similar content. Fig.4. Input Fog Image Fig.5. HSV Output Fig.5. Output Dehaze Image

$$
\begin{aligned}
PSNR &= 10 \cdot \log_{10}\left(\frac{MAX_I^2}{MSE}\right) \\
&= 20 \cdot \log_{10}\left(\frac{MAX_I}{\sqrt{MSE}}\right) \\
&= 20 \cdot \log_{10}(MAX_I) - 10 \cdot \log_{10}(MSE)
\end{aligned}
$$

Fig.4. Input Fog Image

Fig.5. HSV Output

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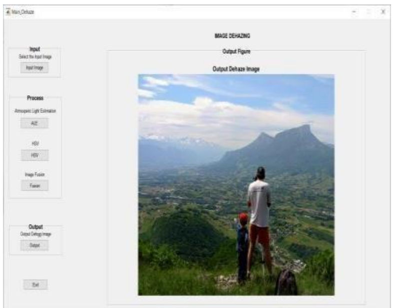

Fig.5. Output Dehaze Image

5.CONCLUSION

Images taken in cloudy conditions need to be processed to increase their contrast and colour integrity. Dehazing, often known as haze reduction, is an important pre- processing step for computer vision and video applications. In the literature, a variety of methods for dehazing indoor and outdoor photographs have been suggested. In this paper, a method for improving atmospheric airlight by utilising the HSV colour space is described. By comparing the brightness and saturation of each part of the input hazy image, the suggested approach can identify the area that is the most opaque to haze. As a result, the airlight is estimated for the chosen area. The suggested method makes use of theconventional DCP technique for the transmission map. In other words, the suggested course of action prioritised enhancing the airlight.

We put forth a brand-new defogging technique based on local extrema that simply makes the assumption that the depth map is typically smooth everywhere but the edges. We employ a method based on local extrema to estimate the atmospheric veil, which was inspired by methods in empirical data analysis and morphological image analysis. Using a multi-scale tone manipulation method, which is highly successful in regulating the degree of local contrast at various scales, we then improve the visual effects after obtaining the results of multi-scale restoration.

Even though we were successful in using haze removal approaches, more research needs to be done on extensibility. In other words, it is impossible to think of ambient light as a universal constant that will be discovered alongside medium transmission in a single network. Additionally, webelieve that an end-to-end mapping between haze and haze- free images can be optimised directly without the need for a medium transmission estimate using a deeper neural network to build an atmospheric scattering model.

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BIOGRAPHIES

Dr. P Shanmugapriya, was born in Tamilnadu, India. She is currently working as Assistant Professor, Department of Electronics and Communication Engineering, Saranathan College of Engineering, Trichirapalli, Tamilnadu, India. She published papers in reputed international journals.

V S Roshana,
Student,ECE,
Saranathan College of Engineering

M S Sneka, Student,
ECE,
Saranathan College of Engineering

J Sravani Sowmya Shri,
Student, ECE, Saranathan College of Engineering

V Vinodhini,
Student,ECE,
Saranathan College of Engineering