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Analysis to Defog The Foggy Images

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ABSTRACT *In human lives images have an important role. To analyze traffic, satellite images are used, in developed cities traffic analysis is done through CCTV cameras. Images captured under bad weather conditions suffer low contrast so their quality degrades with the changes in atmosphere. The main reason behind the image degradation is atmospheric scattering, which is light received from scene points while capturing an image, is absorbed and scattered by a complex medium which includes fog, mist and haze. To carry out meaningful scene analysis, extract useful information or to detect image features it is imperative to remove effects of bad weather from these images. The Open CV tool is used to analyze the noise over the foggy images with numpy interface and python programming language. Author also posses one of most superior simulation tools as MATLAB to process the investigation.*

INTRODUCTION

Digital image processing is the processing performed on digital images by the use of computer algorithms. It allows a much wider range of algorithms to be applied to the input data and avoid problems such as the build-up of noise and signal distortion during processing. [1]

Fog is a collection of liquid water droplets or ice crystals suspended in the air at or near the Earth's surface. Poor visibility not only degrades the perceptual image quality but it also affects the performance of computer vision algorithms such as object detection, tracking, surveillance and segmentation.[2] Under foggy viewing conditions, image contrast is often degraded by atmospheric aerosols, which makes it difficult to quickly detect and track moving objects in intelligent transportation systems. [3]

Poor visibility in foggy climate stems from the variety to facilitate particles in atmosphere spread and take in light from the surroundings and light reflected from the scene points. Earlier research industry and inventor proposes a lot of approach and methodology for fog removal over the foggy images. Various researchers have proposed multiple algorithms and research methodologies to recover the originality of images affected from unwanted atmospheric conditions. As a lot of approaches have already been proposed by researchers to restore the original images.

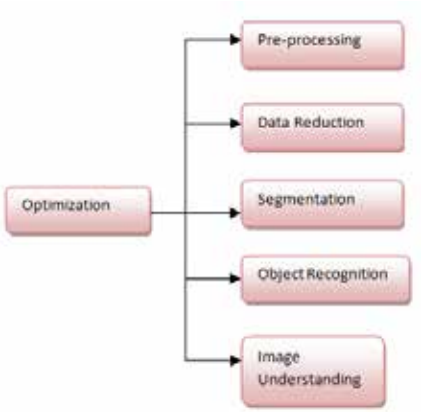

Figure: 1 Image processing chain

We have considered the above problem and two objectives are derived as:

- Sensible investigation behind the foggy image and techniques to remove the fog from foggy images.
- Experimental approaches follows to capture the reality over given methodology by different tools.

TABLE – 1
Pronounced and isolating cases for noise

S. No.	Techniques	
1	Image Segmentation	Partitioning image into parts that are coherent according to some criterion.
2	Image Compression	The objective of image compression is to reduce irrelevance and redundancy of the image data.
3	Edge Detection	Identifying details in a very electronic digital impression where the look brightness alterations sharply.
4	Image Enhancement	The rationale aim of graphic advancement tactics should be a method in order that the outcome is more desirable as opposed to initial impression for a specific diligence.
5	Recognition	Consists of locating the positions and possibly orientations and scales of instances of classes of objects in an image (object detection) and classifying them (object classification).

FOG ANALYSIS

Fog removal algorithms become more useful for many vision applications. Most of the existing researchers have neglected many issues and also no technique is better for different kind of circumstances. The existing methods have neglected the use of gamma correction and histogram stretching to reduce the noise problem which will be pre-

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sented in the output image of the existing fog removal algorithms. To reduce the problems of existing literature an effective fog-free methodology for removing fog from input image has been proposed by Jyoti Sahu. [4]

Landge Rupali et al [5] presented a new technique for automatically detect blurry images and separate them for later processing. Research method is targeted to detect blurry images and delete or separate them from digital camera storage, so that it will allow saving external memory and deleting unnecessary low-quality images. The method is reliable in terms of high accuracy, low computation cost and easy to implement.

Changwon Jeon et al [6] give the idea about distortions from fog obscure contrast in image frames and propose a contrast enhancement procedure for fog degraded images using relative depth estimation by incorporating time difference. Representative experimental results show that the proposed algorithm is effective for contrast enhancement of fog degraded images. Author proposed and demonstrated an effective model for depth estimation and used it for contrast enhancement. The experimental results indicate that the proposed depth estimation model produced satisfy defogging performance.

S.Palaneeswari and K.Fathima Begam [7] improved the quality of Medical or Satellite image. A technique has been proposed based on Discrete Wavelet Transform with Singular Value Decomposition. In this transform decompose the image into four sub bands, out of four bands one is low frequency and remaining are high frequency. Then the modified image is reconstructed by using inverse DWT considering the adaptive histogram equalization.

Thangamani Veeramani et al [8] addressed the problem of motion blur in a foggy scene and how to restore foggy motion-blurred images using depth cues derived from fog itself. Initially, the address restoration of images blurred primarily due to in-plane translational camera motion. This is followed by a scheme for handling general camera motion blur with a projective blur model. Author demonstrate that foggy road scene images can be segmented into road, left, right and sky planes, and that each of these planes can be deblurred individually.

Yong-Qin Zhang et al [9] proposed simple but powerful algorithm based on median filtering using low-rank technique for visibility enhancement from a single hazy image. Since the computational complexity of the low-rank technique is low, it is shown that the proposed approach for haze removal is fast, and can even achieve better results than the state-of-the-art methods in a single image dehazing.

Jianfang Jia & Hong Yue [10] presents a new method to improve the clarity of foggy images using an optical imaging model and wavelet decomposition technique. The original RGB image is converted to a YUV color space, and the luminance component *Y* is processed with wavelet decomposition into a low-frequency sub band and a number of high-frequency sub bands. Problems of image blur and uneven illumination are handled in the low-frequency sub band only, and a high-pass filter is designed to enhance the image details in high-frequency sub bands. Experimental results demonstrate that algorithm can handle the problem of image blurring caused by atmospheric scattering effectively, and has a better real-time performance compared with a standard model-based procedure.

Detecting objects of interest and obtaining their clear visual appearances are critical requirements for visual surveillance systems. Nan Dong at al [11] presented a novel object detection method for extracting foreground objects of interest from weather degraded images, and enhancing the extracted regions visibility at the same time.

Fan Guo et al [12] presents an algorithm to remove fog from a single image using a Markov random field framework. The method estimates the transmission map of an image degradation model by assigning labels with a MRF model and then optimizes the map estimation process using the graph cut-based α-expansion technique. The algorithm was implemented in two stages. First, the transmission map was estimated using a dedicated MRF model and a bilateral filter. Second, once the map was inferred, the restored image could be obtained according to the image degradation model. The algorithm is controlled by just a few parameters that are automatically determined by a feedback mechanism. Results from a wide variety of synthetic and real foggy images demonstrate that the proposed method is effective and robust, yielding high contrast and vivid defogging images.

Kaiming He et al [13] discuss about a powerful prior, called dark channel prior, for single image haze removal. The dark channel prior is based on the statistics of the outdoor images. Since the dark channel prior is a kind of statistic, it may not work for some particular images. When the scene objects are inherently similar to the atmospheric light and no shadow is cast on them, the dark channel prior is invalid.

The work done related to foggy images and their restoration process considering dehaze is reviewed from different researcher's opinion. The brief idea about the denoising process and technique support to achieve the defogged image is analysed from different articles and concluding their proposal for methodological parameters of applying approaches.

DISCUSSION

To the improvement of image quality, several techniques are proposed for contrast enhancement of images. A lit bit of enhancement is possible into Singular Value Decomposition (SVD) and Discrete Wavelet Transform (DWT). [7]

To overcome these constraints of our current method, we intend to incorporate better edge-preserving image filtering method with low complexity and other techniques. [9] It is still difficult to defog heavily foggy images taken from a far distance of the scene. This is because information for image restoration is insufficient under this situation. For the same reason, the proposed algorithm could be inadequate when applied to nocturnal conditions. [10]

Future, the work described here could be improved and extended in the following areas. First, the detection speed should be improved in order to detect objects in real-time. Second, video fog removal is also a promising research field, which can supply a clear surveillance record for the observer under bad weather situation [11]. Kaiming He etal [13] intend to investigate haze removal based on these models in the future. But our method has the same problem as

It is invalid when the scene objects are inherently similar to the atmospheric light and no shadow is cast on them. Speed of our algorithm has not yet satisfied the demand

of real-time process. Image defogging is an important issue in computer vision. [12]

Proposed solution:
We remove the fog form foggy image via different tools and technique to analysis the reality into the practical environments. Author uses Matlab tools for simulating the fog removal process over haze removal technique from images. Author also uses the sum practical approach into python programming language supportive to numpy and opencv environments.

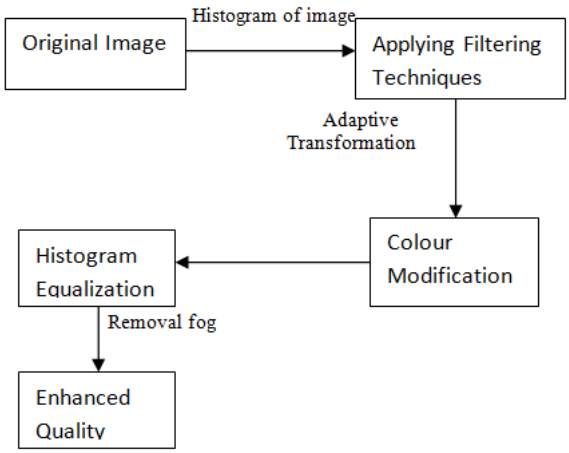

Figure. 2 Flow Diagram of Proposed Method

According to the proposed method, basic image processing for the wavelet transformation as filter bank is processed. Histogram is calculated for the original foggy image which represents the number of pixels for each intensity value. Wavelet transformation is applied in order to capture the concrete wavelets that are discretely sampled, that is noise is removed by wavelet analysis method

The image is further improved by removing the periodic noise by using Fourier transformation performed through magnitude spectrum and finally author examines the magnitude spectrum and set vertical components around DC component to a very small value. Finally for image originality, flicker elimination is managed.

Above process will improve the quality of image and noise is reduced thereby providing enhanced quality of image.

CONCLUSION AND FUTURE SCOPE

Images are more important for human life day to day. The quality of image is affected from environmental conditions including their capturing method, storing technique, and representing behavior. Maximum road accidents in India occur through poor visibility of object. The fog changes the contrast of object as differed from originality. The overall statement is targeted to analyze the reality behind the foggy images and their restoration. Different algorithms and methodologies are proposed by researcher to restore the originality of images. As lot of algorithms are already available into research industry and there is no need to propose new algorithm every time. Author studies about the environmental factors affecting the originality of images. Available filtering techniques are used to reduce the effect of noises over image. Author uses MATLAB as well as opencv tools for reducing fog from foggy images using mathematical formulation as Laplace series to find out the magnitude of images and histogram of image are created for their equalization system. Haze removal process reduces the fog from images and finally gains the enhanced context of image.

Future Scope
By following the proposed method over the foggy images, the images can be defog thus the contrast will be enhanced. Researchers are invited to enhance the work of analyzing all the terms relevant to noises and their types research scholar are encouraged for simulating the maximum sample for their work accuracy with different context of images.

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