ENHANCEMENT OF WEATHER DEGRADED IMAGES WITH IMPROVISED ALGORITHM

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Abstract— **In this paper, reported algorithms for fog and rain removal are reviewed. Fog reduce the visibility of scene and thus performance of various computer vision algorithms which use feature information. Formation of the fog is the function of the depth. Estimation of depth information is under constraints problem if single image is available. The algorithm helps to devise the system which removes rain from images and videos and to improve the various vision- based algorithms. Rain is a noise that impairs videos and images. Such weather conditions will affect stereo correspondence, feature detection, segmentation, and object tracking and recognition. In video surveillance if any problem is found due to weather conditions the object cannot be tracked well.**

Index Terms—**introduction, literature survey, proposed methodology, conclusion and future work, simulation and result, references.**

I. INTRODUCTION

For many applications of computer vision, Poor visibility in bad weather is a major problem. The input images have clear visibility, Most automatic systems for observation, intelligent vehicles, outdoor object recognition etc., assume. Unfortunately, this is not always true in many condition, therefore enhancing visibility is an unavoidable task. Optically, poor visibility in bad weather is due to the substantial presence of atmospheric particles that have significant size and distribution in the participating medium. Light from the atmosphere and light reflected from scattered by those particles and object are absorbed, causing the visibility of a scene to be degraded. In the literature, a few approaches have been proposed. The first approach is to use polarizing filters or more images of the same scene that have different degrees of polarization (DOP).The main idea of this approach is to define the numbers of macromolecule units of images .and we are using 2 other filters like median and wiener filter. it is use to filtering images and clean rain and fog of these images .

A. What is fog?

Fog is actually water droplet that have packed in from the air. When air has been warm and humid during the day, dematerialize water molecules are spread throughout it (figure 1). Fog is a physical phenomenon caused by tiny dusts or droplets of water in the air. Such environment causes poorer performance on vision based surveillance system than normal condition. Then, when the temperature go down , the cooling air causes the water molecules to turn from a fog (a gas) into liquid droplet . these droplets are so tiny they can hang in the air . but they are heavy enough to lie low near the ground. Poor visibility in bad weather is due to the sub-stantial presence of atmospheric particles that have significant size and distribution in the participating medium. Light from the atmosphere and light reflected from an object are absorbed and scattered by those particles, causing the visibility of a scene to be degraded.

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B. What causes fog?

Fog is cause by tiny water droplets undecided in the air. The thickest fogs tend to occur in manufacturing areas where there are many pollution particles on which water droplets can produce. Fog is also a terrible weather, because it will affect road transportation, aviation and navigation, power systems, industrial and agricultural production as well as people's everyday lives in different degrees.

C. Types of fog

A fog which are collected mostly or completely of water droplets are normally classified according to the physical process which produces saturation or near-saturation of the air. The main types of fog are: Radiation Fog, Advection Fog, Upslope Fog , Freezing Fog , Evaporation or Mixing Fog, Ice fog e.g.

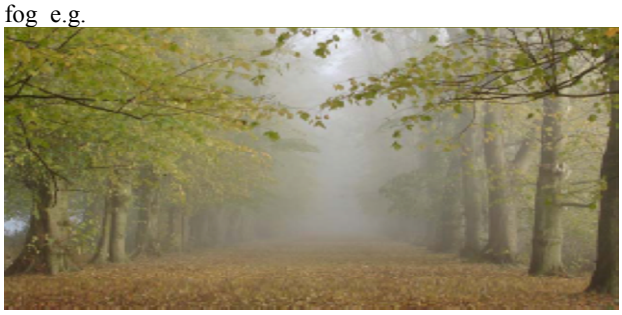

Figure 1. An image of fog.

D. What is rain?

Rain is a form of precipitation, a product of the compression of impressive water vapour that is deposit on the earth's surface. It is forms when divide drop of water fall to the earth's face from clouds .not all rain reach the surface; some evaporate while decreasing during dry atmosphere. When nothing of it reach the land. It is called verge, an occurrence frequently seen in hot dry waste regions. Rain is the major component of the dynamic bad weather. Individual rain drop acts as spherical lens. Intensities produced by rain have strong spatial structure and it depends strongly on background

brightness. When light passes through it get refracted and reflected which make them brighter than background. But when it falls at high velocity, it gets motion blurred. Thus the intensity of the rain streak depends on the brightness of the drop, background scene radiances and the integration time of the camera. Analysis of rain and snow particles is more difficult.

Figure 2. An image of rain

II. LITERATURE SURVEY

Xu, et al. (2009) [1] has examined that images degraded by fog undergo from poor contrast. In order to remove this effect a contrast limited adaptive histogram equalization (CLAHE)-based technique was proposed. To clip the histogram this method establish a maximum value and redistributes the shorted pixels equally to each gray level. This algorithm is performed in three steps; firstly the color images captured by camera in foggy is converted from RGB (Red, Green and blue) color space to HSI space. The reason behind the conversion is the HSI (Hue, Saturation and Intensity) represents colors similarly how the human being eye sense color. The HSI color represent striking color form for image processing applications. Second, the intensity component of the image is processed by CLAHE.

S G. Narasimhan (2002) [2] This is also one of the major reasons for accidents in air, on sea and on the road. Thus, it is very necessary to make these vision algorithms free from weather changes. In foggy weather degradation, invisibility is caused by attenuation and airlight. A light beam travels from a scene point through the atmosphere, the light intensity gets attenuated due to the atmospheric particles, and this phenomenon is called attenuation which decreases the contrast in the scene as well as variation of scene color, which finally leads to a poor visual perception of the image. Light coming from the source is scattered by fog and part of it travels toward the camera and the remaining part is scattered in different direction. This phenomenon is called airlight . Airlight adds whiteness into the scene. It is noted that effect of fog is the function of the distance between the camera and the scene.

Wang, et al. (2010) [3] has explored that haze removal from the image depend upon the unknown depth information. This algorithm is based on the atmospheric scattering physics-based model. In this on selected region a dark channel prior is applied to obtain a novel estimation of atmospheric light. This model is based upon some observation on haze free outdoor image. The intensity of dark channel calculated gives rough approximation of the thickness of haze.

Kang, et al. (2012) [4] This paper has proposed a single image base rain taking away frame work by properly formulate rain removal as an image decomposition problem based on MCA (morphological component analysis). Before applying a proposed method image is decomposed into low and high-frequency parts using a bilateral filter. By using sparse coding and dictionary learning algorithms the high frequency part is decomposed into rain component and non-rain component. Sparse coding is a technique of finding a sparse representation for a signal with a small number of nonzero or significant coefficients corresponding to the atoms in a dictionary. After this pre-processing step the proposed MCA (morphological component analysis)-based image decomposition to the HF part that can be further decomposed into the rain component.

Tripathi, et al. (2012) [5] has studied that fog creation is due to air-light and reduction. Air-light increases the whiteness and reduction increase the contrast in the scene. So a method is proposed which use two-sided filter to recover scene contrast and for the estimation of light. In this algorithm both pre and post processing steps are performed. Histogram equalization is used as pre processing to increase the contrast of the image prior to fog removal and also help to get better estimation of air-light map. Histogram stretching is used as post processing for increasing the contrast of fog removed image.

John P Oakley and Hong[6] Bu have suggested a method of enhancement by correcting contrast loss by maintaining the color fidelity. This method gives good contrast restoration but does not provide much visibility enhancement.

S.G. Narasimhan, and S.K. Nayar(2003) [7] If input is only a single foggy image, then estimation of the depth information is under constrained. Generally, estimation of depth requires two images. Therefore, many methods have been proposed which use multiple images .

III. PROPOSED METHODOLOGY

Dark Channel Estimation is used for the estimation of atmospheric light in the dehazed image to get the more proper result. This technique is used for non-sky patches, as at least one color channel has very low intensity at some pixels. The low intensity in the dark channel is mainly due to two factors:-

1. Colourful objects or surfaces (green grass, tree, flowers etc)
2. Dark objects or surfaces (dark tree trunk, stone etc)

Conventionally, we proposed the fog and rain removable algorithm to detect the fog and rain in the images and we can use same algorithm to remove fog and rain in the videos.

PROPOSED ALGORITHM

Step I. Read the Input image

Step II. Now CLAHE on L*a*b color gap operation will be applied to balance the effect of the light and colors.

Step III. Now Dark channel prior will come in action to reduce the effect of fog from digital image.

Step IV. Now adaptive gamma correction will be applied as a post processing operation to enhance the brightness of the system.

Step V. Now we will get the final image which has been visibly restored.

In order to implement the proposed algorithm; design and implementation has been done in MATLAB using image processing toolbox. In order to do cross validation we have also implement the histogram equalization and non linear enhancement technique is showing the various images which are used in this research work.

IV. SIMULATION AND RESULT

We have done our simulation work in matlab R2012a. The experiment is done by taking the images that contain fog and rain. After applying our algorithm we found that the images are free from fog and rain. The same process is applied for videos and the results are obtained. The image containing the rain falling to the pool. The image is taken in static background.

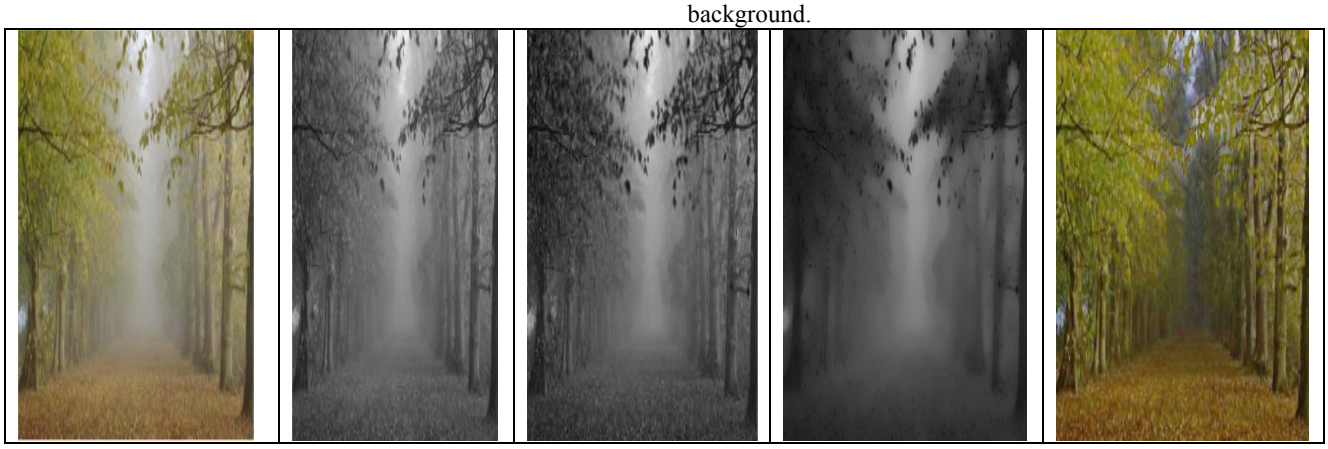

Figure 3. (a) An image plagued by fog. Restored image(b), restored image (c) , restored image(d) , (e) the result of enhancing visibility using the method introduced in this paper

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Figure 4. (a) An image plagued by rain. (b) the result of enhancing visibility using the method introduced in this paper.

CONCLUSION AND FUTURE WORK

We analyze and compare the experimental results in visual effects, speed, and objective evaluation criteria. We have proposed simple but powerful algorithm based on median filtering using low-rank technique for visibility enhancement from a single hazy image. Though comparing the results, we demonstrate the advantage and disadvantage of these methods. 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. The proposed work does not assume the size, shape and orientation of the rain drops. It works in any rain conditions and also in case of reflected rain drop and scene containing text information.

1. Incorporation of additional method to deal with more dynamic degration sources like rain or snow.
2. Improving time or space complexity of existing methods.
3. Application of algorithms on video stream.
4. Improvement older methods global histogram equalization or scene depth method or wavelet method.
5. Images degraded by fog.
6. Integration of artificial intelligence algorithms with self beaning for automatic approximation of various filter parameters.
7. Applications of biologically inspired algorithms to image processing efficiency and yield better result.
8. Implementation of video processing by linked frame approach so as individual frame processing may be reduced.

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