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VIDEO DE-HAZING USING WAVELET AND COLOR DEPTH ESTIMATION ANALYSIS

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ABSTRACT

The project presents that the Hazy Frames on Video Enhancement based on stationary wavelet based multi scale decomposition, principal feature analysis with morphological filtering approaches. Here, the proposed approach will be compared with auto adapted LUM filter and soft threshold to evaluate an image quality. Firstly, the hazy image can be used to decompose the frame separation of each image by using stationary wavelet transform, and then obtain the low frequency component and high-frequency components of each and every frames, Principal feature (Eigen value) will be separated from low frequency and it is modified with certain enhancement factor and eventually carry on wavelet restructuring to the processed components.

Keywords: stationary wavelet based multi scale decomposition, adaptive LUM filter, contrast limited adaptive histogram equalization, principal feature decomposition, morphological filtering.

1. INTRODUCTION

The hazy removal technique divided into three categories such additional information approaches, multiple image approaches, single-image techniques. Two methods can be used for high computational complexity. Recently single image technique is used for this de-hazing process because of its flexibility and low cost. The restoration model is proposed with utilization of median filter and adaptive gamma correction technique and dark channel prior method. This approach overcomes the problems such as color distortion, artifacts and insufficient depth information. The dark channel prior is to estimate scene depth in a single image and it is estimated through get at least one color channel with very low intensity value regard to the patches of an image. The transmission map will be estimated through atmospheric light estimation. The median filter and adaptive gamma correction are used for enhancing transmission to avoid halo effect problem.

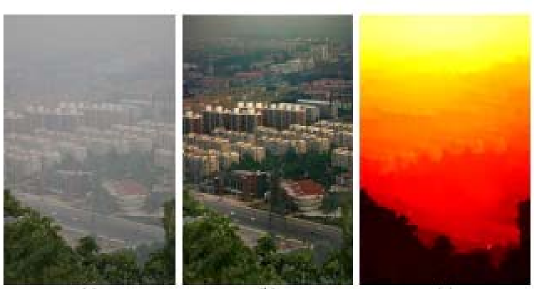

Figure-1. (a) Haze input video. (b) Removal of haze free video. (c) Recovered depth map.

Haze removal (or dehazing) video are wanted intensely for two techniques namely consumer/computational photography and computer vision applications. Firstly haze can be removed slightly raise the visibility of the scene and then color shift affected the air light decomposition. The haze-free image is more feeling but that desire the experience of recovered depth map. Secondly most haze removal techniques from low-level video analysis to high-level video techniques can be identified its object recognition, and then assume that the input video is used in scene of the hazy technique can be reduced the radiance. Hazy removal technique (e.g., feature detection, filtering, and photometric analysis) suffered from the biased, low- contrast video. Lastly, the haze removal can produce depth information map and normally affect the hazy removal technique and hazy video removal. Haze or fog used for depth scene. The haze bad image affects the removal is a challenging problem. The haze is ultimately dependent on the unknown depth information. The main problem is too constrained if the given hazy input video is only used to LUM filter and median filter to remove the noise and distortion .Then many techniques can be proposed by using multiple images or videos. Haze removal methods mainly used to remove the polarization techniques from two or more videos with degree of polarization might be different. Then multiple hazy videos may be constraint of different scene under different conditions. Depth based methods can be normally recovered the depth information used by 3D videos or images recognizes their haze removal algorithm However, besides the geometric and photometric variations, hazy images or videos can be needed to match their degraded size by the haze removal, a common atmospheric phenomenon. Obviously, Videos is mainly used for sensing applications and then many cases the distance between different sensors and the surface of earth is significant. Smoke, fog, and dust are the certain particles used for atmospheric phenomenon used the clarity dims their removal of hazy images. A hazy scene is characterized by an important attenuation of the color that depends their distance to the scene objects. As a result, the original contrast is degraded and the scene features gradually fades as they are far away from the camera sensor.

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2. LITERATURE SURVEY

Dubok park et.al proposed single image dehazing with image entropy and information fidelity .The light can be estimated quad-tree subdivision using transformed hazy images. Drivers often turn on the headlights of their vehicles and streetlights are often activated, resulting in localized light sources in images capturing road scenes in these conditions. Additionally, sandstorms are also weather events that are commonly encountered when driving in some regions. In sandstorms, atmospheric sand has a propensity to irregularly absorb specific portions of a spectrum, thereby causing colour-shift problems in the captured image**.**

Kang, *et al*. (2012) has proposed a single image based rain removal frame work by properly formulating rain removal as an image decomposition problem based on MCA (morphological component analysis). It is a new method which allows us to separate features contained in an image when these features present different morphological aspect. Before applying a proposed method the image is decomposed into the low and high-frequency parts using a trilateral 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. The dictionary learning of the proposed method is fully automatic and self-contained where no extra training samples are required in the dictionary learning stage.

Jean-Philippe Tarel *et al* proposed Vision enhancement in homogeneous and heterogeneous fog hotographers. HOM One source of accidents when driving a vehicle is the presence of fog. Fog fades the colors and reduces the contrasts in the scene with respect to their distances from the driver. Various camera-based Advanced Driver Assistance Systems (ADAS) can be improved if efficient algorithms are designed for visibility enhancement in road images. The visibility enhancement algorithm proposed in is not optimized for road images. In this paper, we reformulate the problem as the inference of the local atmospheric veil from constraints. The algorithm in thus becomes a particular case. From this new derivation, we propose to better handle road images by introducing an extra constraint taking into account that a large part of the image can be assumed to be a planar road. Jian sun and Xiaoou Tang proposed the Single image haze removal using dark channel prior. Haze (or fog, mist, and other atmospheric phenomena) is a main degradation of outdoor images, weakening both colors and contrasts. We propose a simple but effective "dark channel prior" to remove haze from a single input image. The dark channel prior is a kind of statistics of outdoor haze-free images. It is based on a key observation - most local patches in outdoor haze-free images contain some pixels whose intensity is very low in at least one colour channel. Using this prior with the haze imaging model, we can directly estimate the thickness of the haze and recover a high quality haze-free image. Results on a variety of hazy images demonstrate the power of the proposed prior. Moreover, a high quality depth map can also be obtained as a by-product of haze removal.

Srinivasa G.Narasimhan and Shree K.Nayar are proposed by the paper called as Interactive (De) weathering of an image using physical models. Degradation of images by the atmosphere often restricts imaging applications to good visibility conditions Enhancement of such images is a difficult task due to the complexity in restoring both the luminance and chrominance while maintaining good colour fidelity. One particular problem is the fact that the level of contrast loss depends strongly on wave-length; shorter wavelengths i.e. Blue are more affected. In this paper, a novel method is presented for the enhancement of colour images. This method is based on the underlying physics of the degradation and the parameters required for enhancement are estimated from the image itself. The proposed method is tested using synthetic images to explore the limitations and reliability of the method under different visibility conditions. Enhancement is per- formed on real images taken using an airborne camera at a height of approximately 1000 meters in hazy conditions for which the visibility is approximately 10 kilo meters. Significant improvements in terms of contrast visible range and colour fidelity are evident when compared to existing methods.

Billy Chen *et al* proposed the deep photo, model based photograph enhancement and viewing. In this paper, we introduce a novel system for browsing, enhancing, and manipulating casual outdoor photographs by combining them with already existing geo referenced digital terrain and urban models. A simple interactive registration process is used to align a photograph with such a model. Once the photograph and the model have been registered, an abundance of information, such as depth, texture, and GIS data, becomes immediately available to our system. This information, in turn, enables a variety of operations, ranging from dehazing and relighting the photograph, to novel view synthesis, and overlaying with geographic information. We describe the implementation of a number of these applications and discuss possible extensions. Our results show that augmenting photographs with already available 3D models of the world supports a wide variety of new ways for us to experience and interact with our everyday snapshots.

Matlin, *et al*. (2012) has discussed in this paper a method in which noise is included in the image model for haze formation. All images contain some amount of noise due to measurement error. A specific denoising algorithm known as Block matching and 3D filtering which has used a block matching and collaborative Wiener filtering scheme for removal of noise is used. After pre-processing step this algorithm is divided into two steps a haze estimation step and haze restoration step. Dark channel prior is used for haze estimation. At last image is restored in last step. In some cases when first step of denoising is not successful then a Simultaneous Denoising and Dehazing via Iterative Kernel Regression is used.

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3. PROPOSED METHODOLOGY

The hazy videos removal has been concluded for four main types namely Separation, Pre-processing, atmospheric scattering model and estimate the air light is shown in the Figure-2. This method is used to reduce the process time which is used to remove the hazy from the given input.

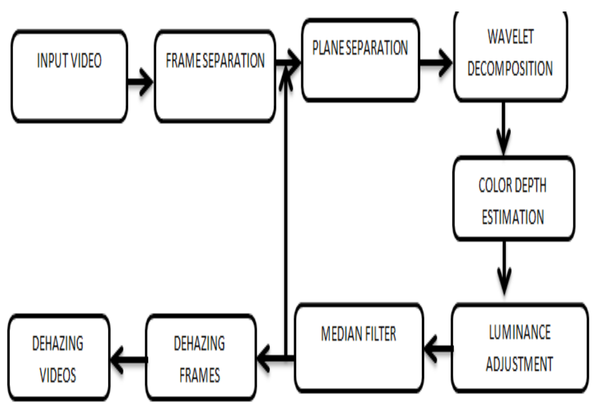

Figure-2. Flow chart of the work.

A. Preprocessing

The objective of the pre-processing is used to remove all the low frequency noise, intensity variation, and resizing process which is used to normalize the hazy images to separate the frame and planes respectively
Basic steps in pre-processing step are:

1) Gray scale conversion

- Original Hazy image is converted to gray scale image for easy implementation.
- It used for decrease the data size and computational time.
- All input image size is resized to 256 x 256 for gray scale conversion.

2) Filtering

- In filtering, Median filter is often used for the non-linear digital filter technique.
- It removes the salt and pepper noise by improving the performance of the given input video.
- It is used to reduce both the noise and distortion
- It used to improve the results in later stages

B) Separation of frames and planes

The separation of frames and planes can be used for almost always progressive. Then the 3 planes of pixel values (Y, U, and V) can be separated and each frame their pixel can be established their depth through their interlaced scanning. Pixel depth can be initiated their each geometry of each plane: width x height. Chrominance is generally subsampled and the planes can be related with each other.

Frame rate can be approximately found their input videos and plane also separated by using 2 chrominance samples for every 4 luminance samples, odd lines only and Chrominance can be sub divided in both directions.

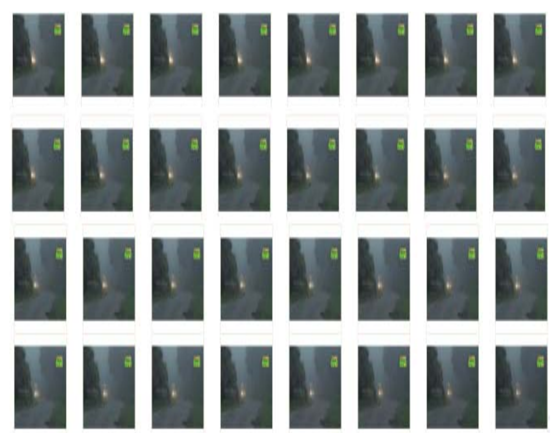

Figure-3. Seperation of frame in input hazy video.

C) Stationary Wavelet Transform (SWT)

The Stationary wavelet transform (SWT) is a wavelet transform mainly designed to rescue the translation of less value by discrete wavelet transform (DWT). It is removed by using the down samplers and up samplers in the DWT and then up sampling the filter coefficients by a factor of $2^{(j-1)}$ in the jth level of the algorithm. The SWT is the scheme as the output of each level of SWT contains the same number of samples as the input. So for a decomposition of N levels there are a redundancy of N in the wavelet coefficients.

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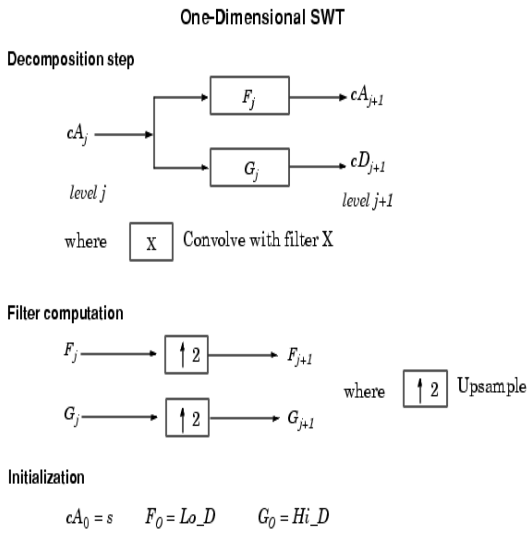

Figure-4. SWT transform.

SWT has been employed in order to preserve the high-frequency components of the image. SWT separates the image into different sub band images, namely, LL, LH, HL, and HH. Low frequency sub band contains overall brightness of an input and high-frequency sub band contains the edge information of input image. There is no down sampling process while separating high frequency coefficients from an image. This transform is used to preserve edge details and textures of an image and Daubechies type wavelet filter is used here for determine the detailed Coefficients.

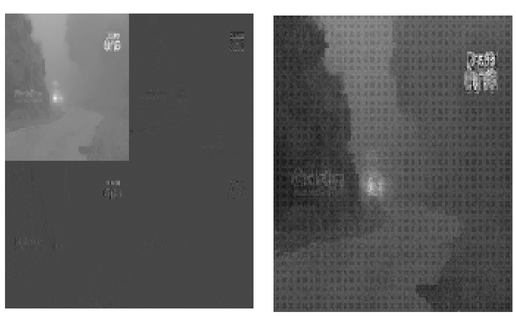

Figure-5. SWT TRANSFORM output to remove the salt and pepper noise.

The two different methods to remove the hazy scene in the input videos namely,they are

a) Classical DWT is not shift invariant: This means that DWT of a translated version of a signal x is not the same as the DWT of the original signal.
b) Shift-invariance is important in many applications such as Change Detection ,Denoising and Pattern Recognition
c) The decimation can be carried out by choosing the odd indices. It performs all possible DWTs decomposition of the input signal and can perform both 2J decompositions for J decomposition levels.

ε-decimated DWT are all shifted versions of normal DWT applied to the shifted sequence by coefficients yielded. Apply high and low pass filters to the data at each level mainly not decimate with each other methods. It modified their filters at each level by padding them with zeros. Finally computationally more complex than any other wavelet techniques to remove the hazy scenes

D) Brightness region analysis

The Brightness of an image will be adjusted by modifying Low frequency sub bands coefficients with its singular values The Enhancement factor will be determined from find ratio between singular value of histogram equalized image LF band and singular value original LF band.
It is defined by

$E_{factor} = S_{hist}./ S_{original}$
The singular values will be modified by,
$S_{modified} = S_{hist} * E_{factor}$
An Enhanced Low frequency band will be obtained by,
$E_{LL} = U^* S_{modified} *V'$ U, V - orthogonal matrices.

E) Adaptive gamma correction

In proposed an efficient method to modify each and every histograms and digital hazy images can perform their contrast and intensity of the given input. It normally used a different role to perform their digital image processing, computer vision, and pattern recognition. It automatically transformed their technique that improves the brightness of dimmed images. Gamma correction and probability distribution of luminance pixels used to remove the haze removal of the video or image.

Figure-6. Gamma correction filtering method.

Finally, One source of difficulties when processing outdoor images is the presence of haze, fog or smoke which fades the colors and reduces the contrast their objects to find the intensity and performance. We introduce a novel algorithm and variants for visibility restoration from a single image.

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4. PERFORMANCE ANALYSIS

A. Estimation of air light

It Collected statistics of air light colors from 100+ natural images (daylight and twilight hazy scenes). Manually select 32x32 pixel patches with “full haze”. Air light colors are scattered around a 28.9658 degrees line in hue-saturation plane, and most are close to the origin (=> low saturation).

It can extract patches of 13x13 pixels from hazy image according to the following criteria: The patch contains same transmission with each pixels and hue but with methods to identify their performance (=> same direction for R but different magnitudes). The pixels in the patch do not have too low or too high transmission (avoid degenerate cases)

It extracts their patches of 13x13 pixels from hazy image according to the following criteria: They used two techniques namely patch contains pixels with same transmission and hue but with different shades (=> same direction for R but different magnitudes) namely

a) The pixels in the patch do not have too low or too high transmission (avoid degenerate cases)
b) Pixels in the patches do not have too low saturation (hue would not be reliable).
c) Pixels in the patches are not too dark or too bright in average, and variance should not be too high (noise) or too low (homogeneous areas with no shades).

Figure-7. Day light and twilight hazy scenes.

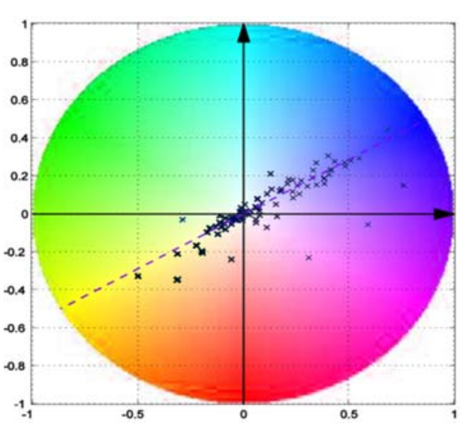

Figure-8. Scattered saturation plane.

B. Root mean square error

Root-Mean-Square Error (RMSE) is mainly used to measure the differences between values (sample and population values) and predicted by a model or an estimator and the values can normally observe the measurement values. The RMSD explained the sample standard deviation of the differences between predicted values and observed values.

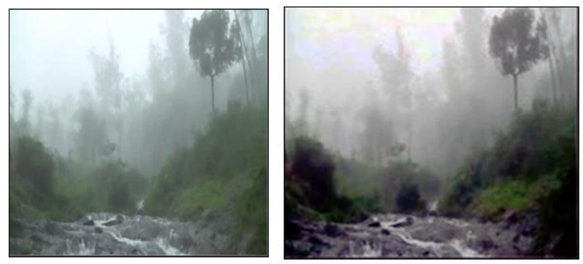

Figure-9. (a) Hazy image (b) Hazy removal image**.**

C. Peak signal to noise ratio

Peak signal-to-noise ratio, often abbreviated PSNR, is mainly used for the ratio between the both maximum possible power of a signal and the power of corrupting noise that mainly affects the fidelity of its representation. Many signals used to very wide dynamic range, PSNR can expressed normal can identify the logarithmic scale to perform the haze removal images.

Figure-10. (a) Hazy image with high PSNR (b) Hazy removal image with Low PSNR.

5. CONCLUSIONS

This work has done in Colour Depth Estimation based hazy scene removal, contraststretching on histogram equalization and resolution enhancement purpose wavelet transform. in visibility restoration purpose weather mapping process on multispectral images analysis.In Proposed method we done modification work on hazy scene removal on dark channel prior is to estimate scene depth in a single image and it is estimated through get at least one color channel with very low intensity value regard to the patches of an image. The transmission map will be estimated through atmospheric light estimation. The median filter s used to remove the noise and adaptive gamma correction is used for enhancing transmission to remove their halo effect technique. Finally visibility restoration module uses the both average color difference values and enhanced transmission to restore an image with better quality.

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