Modified Method to Remove Haze with Enhancement of Light in an Impervious Manner

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Abstract
In cartography imaging technology, the images capturing while foggy weathers are complicated for object detection to a certain extent. GPS and navigation systems are moreover comes under same group for facing such problems. We presented an approach to analyze and remove haze in a frame and enhance light for every pixel. Larger size and numerous data images with colour are accepted. In real time execution, the contrast enhancement is achievable through refine atmospheric light, dark channel prior and transmission map. The main aim for our method to improve accuracy and to less the execution time to complete contrast enhancement for identifying objects while navigation.

Keywords: Atmospheric Light, Dark Channel, Dehaze, Contrast Enhancement.

1. Introduction
In cartography imaging technologies, the image captured while surrounding with bad weathers like haze, fog, mist, clouds etc., are degraded as well as comprehensive with dark, haziness and difficulty for object detection. The haze is formed by aerosol comprises with air and mist. The formation of haze is of different reasons to occur with atmosphere. In real time image capturing with haze is like a visibility of white mask and every pixel is to intensify.

While, analysis of frames with haze are intensify with dark channel, atmospheric light and scene transmission. Haze free images are accomplishment of averaging and normalization of above inscribed parameters.

The problems of haze affected in different technologies in real time. List of technologies are cartography images, surveillance systems, navigation and satellite images.

The enhancement of effected by poor weather conditions is called de weathering and scheme for removal of haze is known as dehaze. This problems of difficulties occurred in some of Applications such as aerial photography, driving assistance and visual surveillance. Dehaze is a descriptive problem especially for removing the weather effect caused by suspended aerosol and water drops.

The aim for analysis of haze is to remove in a frame with impervious way. For that reason we analyze image contained with haze to focus on parameters included on it.

The degradation process of foggy image while capturing is affected with the linear combination of two components: attenuated scene reflectance and intensified atmospheric light. The transmission map is the removed element which influences the transmission of scene reflectance and atmospheric light.

The light in the nature is scattered with haze of bad weather conditions is described in a frame captured while navigation.

2. Literature review
While image analysis on cartography images like satellite images, navigation systems and outdoor visions with bad weathers conditions are difficult for scene detection. Such weathers are degraded with dark and intense mask on frames to be formed at the time of capturing. They are several researchers are also worked on this scheme.
The previous methods they ascertain to resolve issues of cartography images encapsulated with haze are as follows.

Xi Wei et.al [1] describes a method to enhance contrast in low light images derived from luminance map of a vision. Then noise reduction technique, applied to remove haze and for improving visibility through image with the method of advanced guided filtering based on gradient information and median filtering.

Mohammad Shorif Uddin et.al [2] improves a method to describing the image features and to improve values to make possible to dehaze images. It’s to be considered with the dark channel priority and intense values incorporated within the image. They automate the patch values with prior dark channel estimation achieve haze elimination.

Ancuti et.al [5] proposed a method, a novel strategy to enhance images degraded by the atmospheric phenomenon of haze. This single-based image technique does not require any geometrical information and restoring the visibility of hazy image by enhancing the contrast of the degraded image. The degradation of the finest details and gradients is constrained to a minimum level. Using simple formulation that is derived from the lightness predictor contrast enhancement technique, restore lost discontinuities only in regions that insufficiently represent original chromatic contrast of the scene. The parameters of simple formulation are optimized to preserve the original colour spatial distribution and the local contrast.

Meng et.al [8] proposed a method, they describe the image of haze and regularizing with boundaries are weighted with L_1 – normalization technique. The model works with variable splitting and normalization of high quality haze less image to be obtained without scope of contrast enhancement.

K. He et al. [14] presented a method fascinating with *dark channel prior* for single image dehazing. The method comes from an inspection of local patches in a haze images often holds with some low intensity values of pixels combined with a soft-mating operation with attain for compelling a haze-free images with eminent quality.

L. Kratz et al.[15] proposed a method, the image which includes a factorial Markov random field, the scene variance and depth are two statistically independent dormant layers. The algorithm is employed for to factorize the image and put emphasis on mask.

3. Methodology

In nature, haze is seems like a mask covered with objects while capturing frames. This problem causes difficulties while in identification of objects in real time during navigation.

3.1 Haze image analysis

The input image contains haze and other parameters are integrated with frame and for each pixel. I(x, y) is the input frame which holds t(x, y)-transmission map and J(x, y)–dark channel combines with A- atmospheric light.

Based on analysis of frame, the image is described and formulated as follows:

\[ I(x, y) = t(x, y) J(x, y) + (1- t(x, y)) A \] - (1)

Where \( x \) and \( y \) depicts width and height of frame intensified with colour. The scheme of our process allowed for large images with huge memory.

3.2 Dark channel estimation

The image which scattered light with haze is covered with dark. The darkness concealed in the frame must be removing to get wholesome image. In that way we express the darkness including in a scene and its mathematical representation as follows:

\[ J_{dark} = \sum_{x=0}^{n} \sum_{y=0}^{n} \min(x: x + \sigma - 1, y: y + \sigma - 1); \] - (2)

Where \( J_{dark} \) - is the dark intensity of image, min-minimum filtering is used for estimate intensity, \( \sigma \) - defines patch size and its value taken as 15.

3.3 Atmospheric light

The darkness included image contained a quantity of atmospheric light. While analysis, the intensity values are categorized as low and high values. Low intensity values are nearly approximated with light.

The light in the scene is estimated through the following representation:

\[ \text{Light} = \text{zeros}(1, 3) + I(x*y); \] - (3)
Where A- represents atmospheric light as combination of light and inversely proportionate with number of pixels in frame.

### 3.4 Transmission Map

The term describes for recovery and removal of atmospheric light, dark channel and scene radiance. Atmospheric light and scene radiance is corrected with parameter $\Omega$. Using the parameter the radiance in the frame will be corrected.

Although the transmission map is a supplementary function make use of finding superior transmission using complete edge information and it is improved by adaptive gamma correction to get improved visibility from hazy images.

### 3.5 Dehaze

Subsequently, the frame after the estimation of dark channel, atmospheric light and transmission map will get transparent computational values. To utilize that measures the frame to be analyse as a consequence.

The frame finalizes with correction of above parameters to get dehazed. Maximum filter is used for round off darkness. The multiple usage of filter is to correct the darkness intensified in frame at numerous times until completely removed.

### 3.6 Contrast Enhancement

In our strategy, we use simple formulation to enhance contrast for each and every pixel in processed frame. Each pixel is intensified with low and high dark values. While analyzing frames, we correct the values of dark to enhance light.

The formula employed in our paper for increase light in image is entitled as follows:

$$ c(x, y) = \sum_{i=1}^{n} \frac{D(x, y) - ax_{i}y_{i}}{\beta x_{i}y_{i} - ax_{i}y_{i}} $$  \hspace{1cm} (7)

Where, $c(x, y)$ is the obtained contrast enhance image after execution of above formula, $D(x, y)$ is the dehaze image obtained from equation. $a, \beta$ are the constant values used for enhancement of light in the image.

### 3.7 Error Image

Difference between Input haze image and contrast enhanced image is entitled as error image.

The obtained error image shows a clear variation transpires in the image which operates with our following strategy. This phenomenon shows the strategy which can change the frame and its fine details to be measured with the comparison of input image with the analysed resulting frame. The process shows us to the known strategy which cannot affect the frames during analysis.

This model estimates clear idea to the strategy, whether it is compatible for feature analysis or something else.

### 3.8 Matching Points with Feature Extraction

The matched point descriptor is followed by the principle of feature descriptor with local variable pointer using SIFT algorithm.

The function to the SIFT is compared to other descriptors is significant. Its integration of primitively localized in sequence with the distribution of gradient associated features are similar to generate unique power while fending out the consequence of localization errors in terms of scale otherwise named as space.

The proposed SURF descriptor is based on similar properties, with a complexity stripped down even further. The feature extraction function takes out of feature vectors, also known as descriptors, from a binary or intensity image 5. The function develops the descriptors from pixels surrounding an attention point. These pixels describe and match features specified by a single-point location. The function extracts feature vectors from an input intensity or binary image.

### 4. Flow Chart of the Work

The overall approach is defined as step by step in the form of flow diagram. This scheme starts with hazy image and ends with resultant image obtained with several parameters portrayed in below diagram.
5. Results

Dehaze images in an impervious manner without affecting data. In figure (a) shows the input image contains haze. While analysis of haze and its incorporated terms like atmospheric light, darkness and transmission map are extracted and it show evidence of dehazed image fig (b).

The dehazed image also integrates with some darkness. It shows signs of Incompatible consequences while identifying objects. As an effect, we presented a contrast enhancement scheme and its result is shown in fig (c) and its error image is displays as fig (d).

5.1 PSNR and MSE Values

The PSNR (peak signal noise ratio) and MSE (mean square error) values for input haze image and output contrast enhanced image and those equations are expressed as followed manner.

\[
PSNR = 10 \log_{10} \left( \frac{u^2}{MSE} \right) \tag{11}
\]

In the above formulation enclosed with MSE (Mean square error) equation and it is defined as:

\[
MSE = \frac{1}{M \times N} \sum_{x=0}^{N-1} \sum_{y=0}^{N-1} (Error \ Image)^2 \tag{12}
\]

While real time execution of our method, the outcome images which shows as input 1 and output 1 image is taken as first image contained PSNR and MSER vales. The values taken for four different test images and its tabulation are included below.

<table>
<thead>
<tr>
<th>Input</th>
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<tr>
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6. Conclusion

This paper entitles a method for efficient dehazing and effective contrast enhancement in impervious manner. Data included in frame does not affect with our exploited method. The scheme allows substantial data contained images with large size. Contrast enhancement is made through dehazed image with round off particulars atmospheric light, dark channel and transmission map. The core idea to exploit this method for improves accuracy and save execution time while navigation.

References


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