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Satellite Image Dehazing and Steganography Using Novel Method

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ABSTRACT

Remote detecting pictures have been broadly utilized as a part of different fields including horticulture, forestry, hydrology, and military. Boundless utilization of remote detecting pictures is predicated on brilliant pictures. Be that as it may, remote detecting is normally powerless against climate impacts. When all is said in done, remote detecting pictures are taken at an extensive separation from the world's surface.

Pictures and recordings have turned out to be essential parts of our day by day lives either specifically by survey them or in a roundabout way by extricating the data contained in these media and applying this data towards the accomplishment of different objectives. In the field of PC and machine vision, haze and haze prompt picture debasement through different corruption components including yet not constrained to differentiate constriction, obscuring and pixel contortions. This restricts the effectiveness of machine vision frameworks, for example, video observation, target following and acknowledgment, break discovery in prescription, satellite remote detecting and as of not long ago driverless vehicle innovation. Different single picture dull channel dehazing calculations have expected to handle the issue of picture right of passage in a quick and proficient way. Such calculations depend upon the dull channel earlier hypothesis towards the estimation of the climatic light, which offers itself as an essential parameter towards dehazing. However, the nearness of haze and mist in gained pictures represents a test to guaranteeing picture quality and subsequently inquire about work that looks to address haze and mist evacuation is very much propelled and it is trusted that picture dehazing in light of dim channel earlier utilizing guided channel might be the same answer for the issues specified previously.

Keywords:- Dehazing, Stegnography

I. INTRODUCTION

We propose a novel earlier - dull channel earlier, for single picture haze evacuation. The dull channel earlier depends on the insights of sans haze open air pictures. We find that, in a large portion of the neighborhood areas which don't cover the sky, it is all the time that a few pixels (called "dull pixels") have low power in no less than one shading (rgb) channel. In the haze picture, the power of these dull pixels in that channel is primarily contributed by the air light. Consequently, these dim pixels can specifically give precise estimation of the haze's transmission. Based on the dim channel earlier, we propose a basic yet powerful technique for haze evacuation. Uses delicate tangling strategy to refine the transmission, refine the climatic cloak with a low pass Gaussian channel. With a specific end goal to take out the shading twisting and oversaturated zones in the reestablished pictures, we recomputed the transmission, after that to enhance the sharpness; visual striking quality and expectation upgrade the picture utilizing a guided filter.

II. EXISTING METHOD

A.IMAGE DEHAZING

Remote sensing images are widely used in various fields. However, they usually suffer from the poor contrast caused by haze. In this letter, we propose a simple, but effective, way to eliminate the haze effect on remote sensing images. Our work is based on the dark channel prior and a common haze imaging model. In order to eliminate halo artifacts, we use a low-pass Gaussian filter to refine the coarse estimated atmospheric veil. We then redefine the transmission, with the aim of preventing the color distortion of the recovered images. The main advantage of the proposed algorithm is its fast speed, while it can also achieve good results. The experimental results demonstrate that our algorithm produces visually appealing dehazing images and retains the very fine details.

B.STEGANOGRAPHY

The frequency domain based methods such as Discrete Cosine Transform(DCT), Discrete Fourier Transform(DFT),Discrete Wavelet Transform(DWT). There is need to development of other algorithm for enhanced security. LSB embedding technique has weak resistance to attacks. So to overcome this drawback researchers found a useful way for hiding information in area of the image that are less exposed to compression, cropping and image processing.

III. PROPOSED METHOD

A.Input Image

Satellite images are one of the most powerful and important tools used by the meteorologist. They are essentially the eyes in the sky. These images reassure forecasters to the behavior of the atmosphere as they give a clear, concise, and accurate representation of how events are unfolding. Forecasting the weather and conducting research would be extremely difficult without satellites.

B.Dehazing Technique

The dehazing technique used in our project is dark channel prior(DCP). 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 color 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.

C.Atmospheric Light And Transmission map

To know the colour of the light that is being reflected by the pixels is called the atmospheric (or ambient) light.

D.Transmission

The final thing we need is the transmission. This is an estimate of how much of the light from the original object is making it through the haze at each pixel.

E.Steganographic Technique

Steganography is the art and science of writing hidden messages in such a way that no one apart from the intended recipient knows of the existence of the message. This can be done by concealing the existence of information within seemingly harmless carriers or covers (text, image ,video , audio ,etc.).

F.3-Level decomposition using 2D Haar DWT

By using 2D haar DWT technique we decompose the image into 3 levels and embed the secret image into the cover image.

Finally, we get dehazed image with embedded secret image.

IV. FLOW CHART

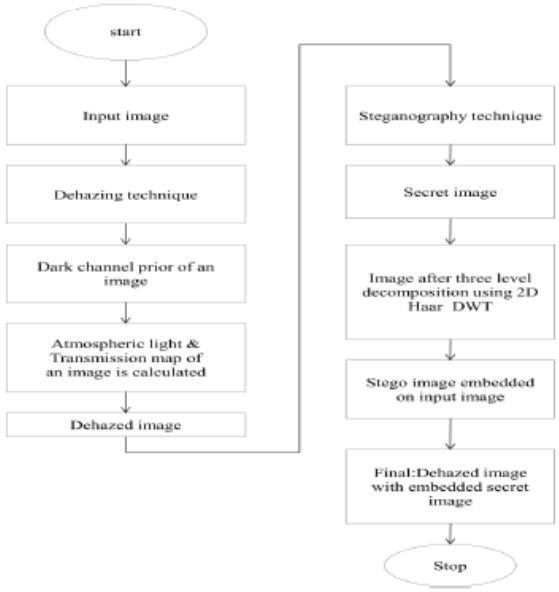

Fig. 1: Flowchart of proposed system

V. ALGORITHMS

A.IMAGE DEHAZING

DARK CHANNEL PRIOR USING GUIDED FILTER

Guided Filter, removes the noise but will not blur edges. i.e., it makes edges sharp. A novel explicit image filter called guided filter. Derived from a local linear model, the guided filter computes the filtering output by considering the content of a guidance image, which can be the input image itself or another different image. The guided filter can be used as an edge-preserving smoothing operator like the popular bilateral filter, but has better behaviors near edges.

a) Dark Channel Construction
b) Estimate the Atmospheric Light and Coarse Veil
c) Refine the Atmospheric Veil using Gaussian
d) Extract the Haze-Free Image

e) Guided Filter

B.STEGANOGRAPHY

WAVELET TRANSFORM METHOD

A wavelet is a 'little wave', which has its vitality amassed so as to give a device for the investigation of transient, non-stationary or time-fluctuating wonders. By part a flag into segments that were not unadulterated sine waves, it is conceivable to gather the data in both time and recurrence spaces. This is the possibility that would eventually be known as wavelets. These brief term limited vitality capacities transform the flag under scrutiny into another portrayal. This transformation of the flag is called wavelet transform.

a) Discrete wavelet transform

b) Two Dimensional Discrete Wavelet Transform (2-D DWT)

C.THE INVERSE DWT OF AN IMAGE

The filtering procedure is just the opposite - we start from the topmost level, apply the filters column wise first and then row wise, and proceed to the next level, till we reach the first level.

a) Perform three level 2D-Haar DWT decomposition.
b) Take the secret image (SI) and turn it into black and white.
c) Perform Embedding process
d) Perform three level 2D-Haar Inverse DWT (IDWT) for reconstruction to obtain the stego image
e) Perform Extraction process.
f) Calculate RMSE and PSNR values in order to check for the visual quality of the stego image.

VI. RESULTS

Fig shows the dark channel image where all the pixels in the image is converted to either to 0 or 1 based on the minimum and maximum values taken in the source code. Using this dark channel image we calculate the maximum intensity values in the image.

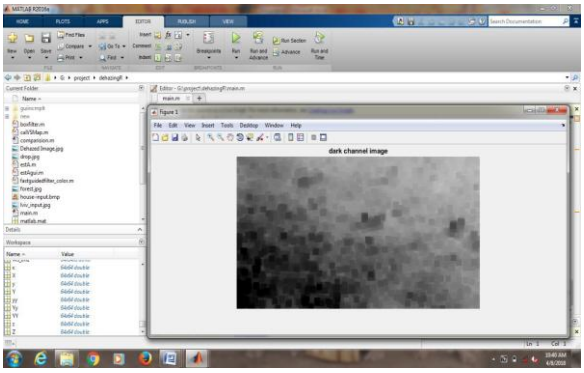

Fig.2 : Dark channel image

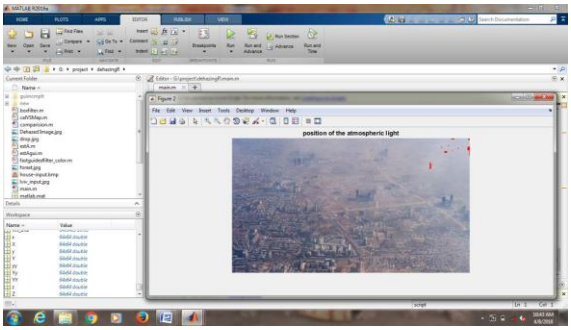

Fig .3: Position of atmospheric light

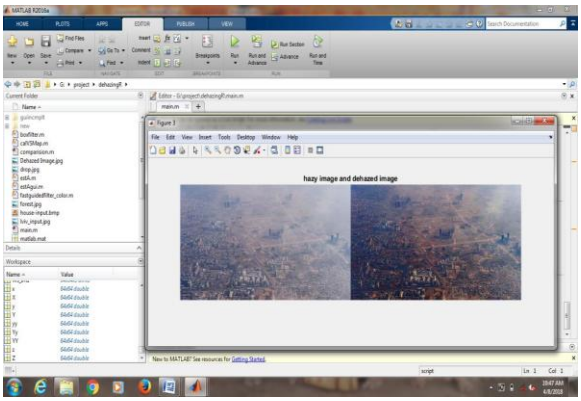

Fig .4: hazy and dehaze image

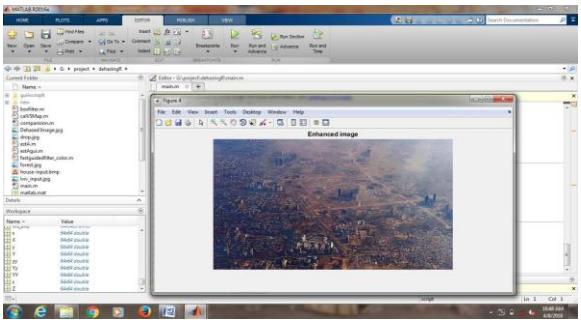

Fig .5: Enhanced image

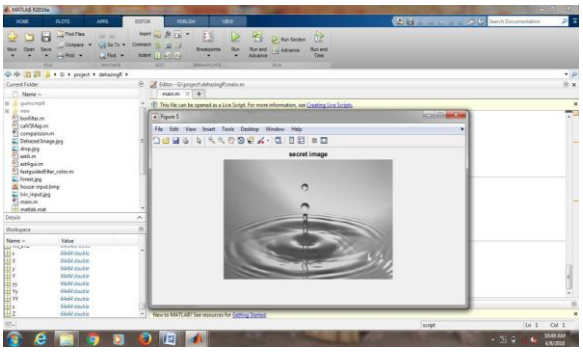

Fig .6: Secret image

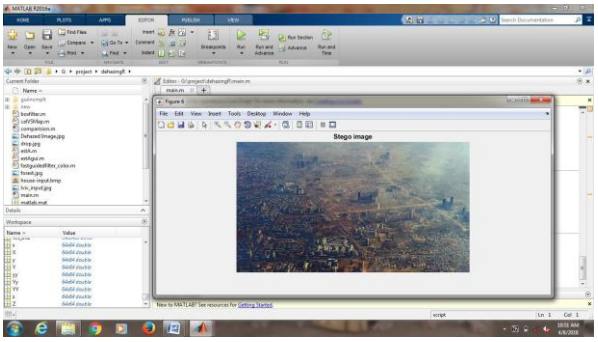

Fig.7: Stego image

RMSE

Root Mean Square Error (RMSE) measures how much error there is between two data sets. In other words, it compares a predicted value and an observed or known value. It's also known as Root Mean Square Error.

Calculate the root mean square error of the corresponding pixels in the reference image I and the extracted image F.

$$RMSE = \frac{\sum_{i=1}^{M}\sum_{j=1}^{N}[I(i,j)-F(i,j)]^2.}{M * N|} \quad \text{....(1)}$$

RMSE=0.3789…..(2)

PSNR

Peak signal-to-noise ratio, often abbreviated PSNR, is an engineering term for the ratio between the maximum possible power of a signal and the power of corrupting noise that affects the fidelity of its representation. Because many signals have a very wide dynamic range, PSNR is usually expressed in terms of the logarithmic decibel scale.

The PSNR is the most commonly used as quality of reconstruction of extracted image. It is defined as,

$$PSNR = 10\ \log_{10}\left(\frac{255^2}{RMSE}\right)$$

Where, 255 is the maximum pixel value of the image when the pixels are represented using 8-bit per samples.

PSNR=36.5933.

Parameters	Input image	Enhanced image
PSNR	31.1271	36.5933
RMSE	7.1102	0.3789

VII. CONCLUSION

It is a straightforward, yet successful, strategy for remote detecting picture Haze expulsion. This dehazing strategy functioned admirably without delivering radiance ancient rarities and was quick. In view of the dim channel earlier, consequently separate the worldwide climatic light and generally appraise the environmental shroud. We at that point refined the climatic shroud utilizing a low-pass Gaussian channel.

Here The picture information concealing procedure in light of 2D Haar DWT has been proposed. The stego-picture is looking consummately in place and has high PSNR esteem low RMSE esteem. Thus, a unintended onlooker won't know about the very presence of the mystery picture. The separated mystery picture is perceptually like the first mystery picture.

The benefit of steganography over the cryptography is it doesn't raise any doubt and message can't be traded over the correspondence channel.

VIII. FUTURE SCOPE

In future work, the steganography can also be used to enforce on a digital medium. For example, steganography can be used to hide information in a music/audio file or in a video file. When an unauthorized user plays the file, the information can be extracted and checked against the permission for that file. In future work we would like to test our method on videos.

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