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Research Article

Image Enhancement Model Using Dehazing Algorithm Application

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Abstract: Image enhancement and classification of hazy images are widely important at various aspects.Noise removal and blur removal play a vital role in medical and imaging concepts all over the world. Detection and treatment of viral infections, genetic problems, diagnostic confirmation and multiple disorder classifications in the medical domain, finding abundant resource generators and crime scene identification in analytic prospects. In such scenarios, theimage enhancement patterns form a major crux. Several aspects have to be taken care whilst classifying and dehazing the images to perform a complete clear image with the properties matching to the original content.Dehazing algorithms has been the technical epitome of modern times. This paper deploys Haze Removal in images using dehazing and image segmentation. MATLAB image processing is being used in the paper.

Keywords: Image Enhancement, Segmentation, MATLAB, Dataset Processing, Dehazing

1. Introduction

Every Imageis characterized with their unique attributes.Image properties such as blur, noise, dentation and residuals are among those. The need of haze removal in images and classification is very big in business worldand thus the advancement of affirmative innovations in the emerging field of image segmentation is of great business potential. Significant applications of image enhancement such as DNA pattern recognition involves bio science, law requirement and observation, identification check, criminal examinations, identification of a particular person among a bunch and much more.

Fig.1 Image enhancement market demands

The above figure details the applications of market predictions of imaging applications cum restoration marketsand the worldwide market potential in this field of emerging science. Unlike specialized applications, the concept of image enhancement and recognition has a huge potential worldwide, thus illustrated from the figure below.

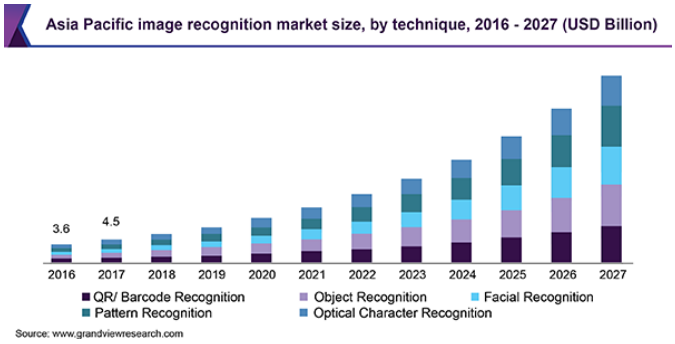

Fig.2 Market potential in figures – Image enhancement

Starting from 130M, the potential of DNA analysis is predicted to be closed to 1000M in the 2022

2. Existing Systems

Existing methods are proposed to save the images as original data and are processed using Python or other imaging tools. Still,these methods are not cost effective. Moreover, enhancement output images obtained in these methods are not variant and also not effective during various conditions. We require an effective image enhancement cum haze removal solution that is indeed accurate is in lieu with the properties of the original image and also retains its clarity.

Several other papers have proposed making use of various filters and DWT. These are accurate to a certain extent, but updated technologies such as image segmentation using algorithms can prove more accurate results, which is the need of the hour. This level of accuracy is essential for minor medical applications, which on the other side may prove to have adverse results as they may be prompted to be used for diagnostic and operational benefits.

Existing image enhancement procedures take inputs.Processing of the same is done using specific algorithms. Also, features of the same are extracted and then classified as per the comparison results with the existing datasets. This can even sometimes prove wrong or inadequate as this is totally relied on the existing datasets and the decision is made based only on the available datasets, which may prove to be wrong. Moreover, updates on the datasets are not provided as in this case.Emerging imaging concepts require image enhancements in a span of less than milliseconds, so that the same can be applied for viral applications. Essential requirement is the accuracy level of the enhanced image compared to the original score.

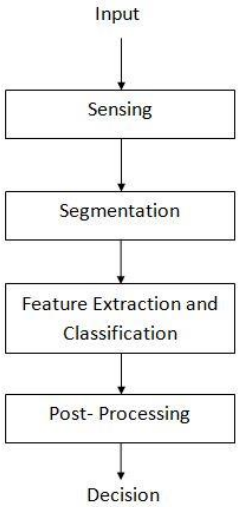

Fig.3 Existing Methods of Image Enhancement Systems

As per the existing methods, the obtained input image is processed, segmented and feature extracted and the comparatively noise or blur removed image is obtained. This does not significantly remove the haze in the image to the desired extent. The pixels of the original images are reduced to the below desired level, so that the image

size is brought down significantly, thus resulting in a damaged or broken image with the reduced haze. This is not desirable in case of medical applications as accuracy of the original is mandatory.

3. Proposed Methodology

We propose to inculcate image segmentation methods for manipulating, analyzing and enhancing the images that can be used for haze removal. The process flow of the image enhancement model creation using dehazing consists of several stages. They are preprocessing, filtering, edge detection, feature extraction, processing, comparison & prediction.

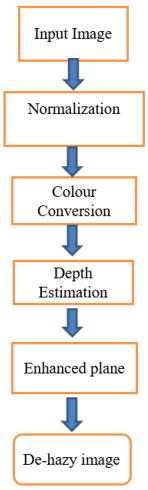

Fig.4 Block diagram of the proposed method of de hazing application development

A. Database creation:

The process of capturing and storing the input imagesin the specified pattern forms the first step towards the image enhancement model creation. The input images must be in a compatible format, so that the images do not get reduced to pixels while the pre-processing is done before the commencement of the comparison to the enhanced image. Datasets are updated from time to time and the featured, compared datasets are again added to the datasets to form a complete reliable data source for comparative analysis.

Fig .5 Screenshot of the front end GUI of image enhancement application

B. Pre Processing:

Pre Processing form the major crux of the implementation of the project. Though conventional methods are being used, it is the algorithm that makes it different from the existing papers.

Pre Processing of any image is the steps taken to normalize the images, so that the image can be processed on a later stage. Pre Processing involves normalization, color conversion from RGB and producing the image in the desired format so as to be compared and applied to get the de hazed image as desired.

Any input image cannot be processed or fed as input to any other filters. It has to be preprocessed, i.e. converted to binary formats that is within the permissible limits and can be processed swiftly and accurately

without disturbing the features of the same. Filtering is done to remove noise and permit the same as per the reliable frequency levels in terms of signal processing.

Fig.6 Screenshot of the Pre Processing block

C. Depth Estimation

Depth Estimation is done to the input image to make it comparable and to realize the pixel value of the input image so as to retrieve the de hazed dataset, so that the image processed is done comparatively without any hassles or loss. Smoothing, blurring of the image to remove noise,finding gradients, non-maximum suppression, double thresholding, edge tracking by hysteresis is all a part of the depth estimation that are being deployed in a project.

C.DWT feature extraction& Enhanced plane model

Discrete wavelet parameters, reduces the previously continuous basis set of wavelets to a discrete and orthogonal/ orthonormal set of basis wavelets.

$\psi m,n(t) = 2m/2\ \psi(2mt - n)$; m, n $\in Z$ such that $-\infty < m, n < \infty$

The 1-D DWT is given as the inner product of the signal x(t) being transformed with each of the discrete basis functions.

$Wm,n = < x(t), \psi m,n(t) >$; m, n $\in Z$

The 1-D inverse DWT is given as:

$$x(t) = \sum_m \sum_n W_{m,n}\psi_{m,n}(t) \quad ; m, n \in Z$$

The processed image with the applied filters, DWT with the feature extracted, we get a comparable image so as we can apply the same to the segmentation model, so as to compare and make the decision.

D. Dehazing Image Application

Gray level co-occurrence matrix features isfrom the input images and the preprocessed image is subtracted suitably to reduce the noise levels in the images. This will return the value of the original image in correlation to the existing properties of the image that is being processed.

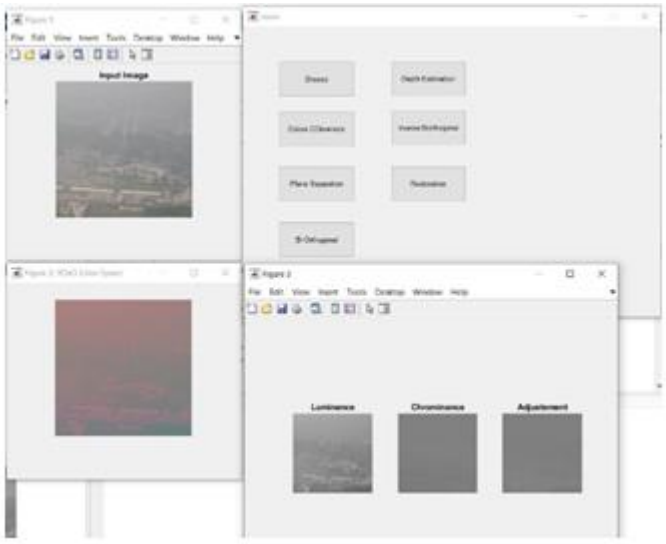

Fig.7 Feature extraction of the input image

As depicted the input nodes x1, x2 and x3 are processed simultaneously with the coherent hidden nodes and then classified as class nodes. The class nodes are basically the preprocessed input image and the dataset to which the input image is compared to. Algorithmic matches lead to Z – the decision node. This is the comparative decision that implies that the image properties are matching to or not matching to the existing pattern and hence results arrived at.

The Image dehazingimplications are done at nodal levels comparatively than that of the image levels in the existing systems, which make this paper unique, reliable and more accurate.

4. Data Inputs & Processing

Input image data and existing datasets are a major criterion in the paper. Feature extraction expects to decrease the number of highlights in a dataset by making new features from the current ones. This new diminished arrangement of the feature should then have the option to outline the vast majority of the data contained in the first arrangement of the feature. The existing datasets are obtained by the strenuous updates and the same can also be used as the input data for verification purpose

Fig.8 Feature extraction of the input image

The preprocessed data are being tested under various luminance conditions. The perfect match that correlated with the input parameters lesser than the noise of the image is the desired output image. As the images are segmented before the application of the filter, the enhanced image does not get reduced in the pixel level or in other words the quality of the image.

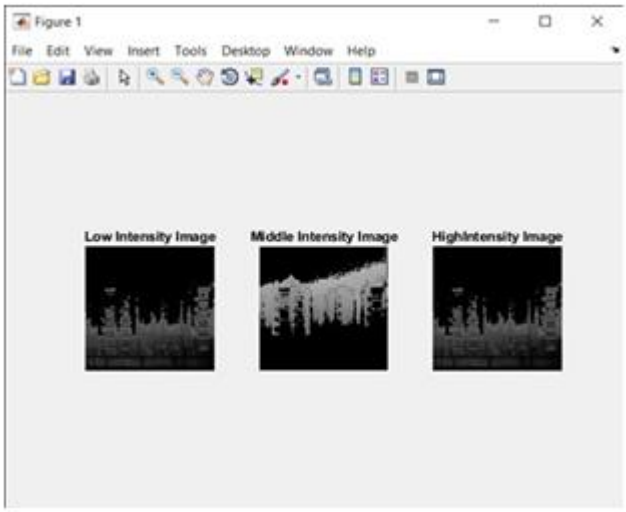

Fig. 9 Output images for various intensity levels

5. Software System Requirements

A. Matlab

MATLAB has been used in the paper. MATLAB is extensively used for Image processing and classification applications. It is an extensive tool specifically deployed for Image and Signal processing. The MATLAB tools allows to write preprocessing algorithms, compare with the existing datasets and apply NxN algorithms between different multiple images and processes.

6. Results And Future Enhancements

As per the requirement, the datasets are preloaded in the database and any of the comparative images is used as the input image for verification purpose. Up to 1000 images can be compared based on the speed and capacity of the system.

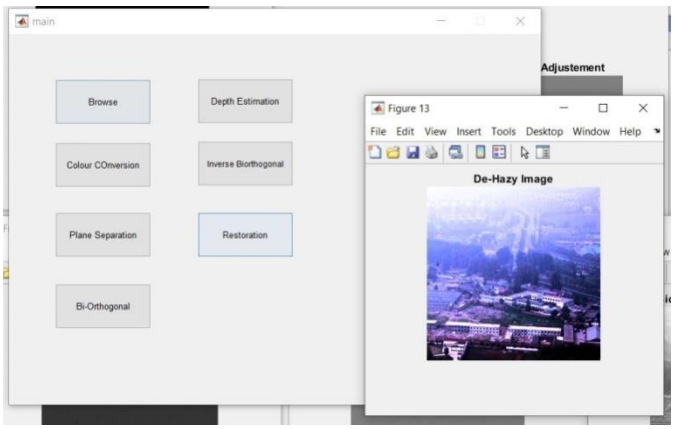

Fig.10 Dehazed image result

The paper is accurate and reliable in terms of the algorithms which are being deployed. Future enhancements of the paper shall comprise of deploying different algorithms that may get updated from time to time and also comparing with the large amount of datasets. Henceforth, as the time consumption is also a factor to be considered, it has to be noted that the accuracy is the major factor that has to be considered in medical and criminal applications.

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