Color Image Enhancement by Brightness Preservation using Histogram Equalisation Technique

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Abstract **This project improves a new hybrid image enhancement approach driven by both global and local processes on luminescence and chrominance components of the image enhancement of image quality is a primary requirement before visual based information can be used in various real world in engineering applications.This approach also increases the visibility of the specified portions or aspects of the image whilst better maintaining image color and it was compared with other well-known image enhancement technique. Colour enhancement process consists of a collection of techniques that seek to improve the visual appearance of an image or to convert the image to a form a better suited for analysis by a human or machine.The principle objective of image enhancement is to modify attributes of an image to make it more suitable for a given task and specific observer. Enhancement Technique input image "better" image application specific. Image quality enhancement is an important requirement for real world and engineering application for faithful reproduction of scene information, degradation results in loss of contrasts which is rectified based on employing histogram equalisation. To maintain the brightness of the corrected image for representing the corrected scene characteristics. Our work focus on adjusting the image intensity values and output brightness is maintained close to the input image.The novelty of the proposed method is that color image enhancement is based on modification of a virtual histogram distribution,which is new way to integerate color and brightness information extracted from salient local features,for global contrast enhancement.**

INTRODUCTION

DIGITAL IMAGE PROCESSING

Digital image processing image is the use of computer algorithms to perform image processing on digital image.As a subcategory or field of digital signal processing has many advantages over analog digital processing.It uses much wider range of algorithms to be applied to the input data and can avoid problems such as building up of noise and signal distortion during processing. Since images are defined over two dimension digital image processing may be modelled in the form of multidimensional systems.

In particular digital image processing is the only practical technology for classification, feature extraction,pattern recognition, projection, multi scale signal ananlysis. Some techniques which are used in igital image processing include pixelisation, linear filtering, principal components analysis, independant component analysis, hidden markov models, anisotropic diffusion, partial differential equation, self-organizing maps, neural networks, wavelets.

Image processing toolbox, provides a comprehensive set of reference standard algorithms and graphical tools for image processing, analysis, visualization and algorithm development. You can restore noisy or degraded images, enhance images for improved intelligibility, extract features ,analyze shapes and textures and two images. Most toolbox functions are written in the open MATLAB language, giving you the ability to inspect the algorithms, modify the source code and create your own custom functions. Image processing toolbox supports engineers and scientist in areas such as biometrics, remote sensing, surveillance, gene expression, microscopy, semiconductor testing, image sensor design, color and materials science. It also facilitates the learning and teaching of image processing technique.

Image processing toolbox supports images generated by wide range of devices, including digital cameras, frame grabbers, satellite and airborne sensors, medical imaging devices, microscopes and telescope s and other scientific instruments. you can visualize, analyze and process these images in many data types, including single and double precision floating point and signed or unsigned 8,16,32 bit integers. MATALB supports standard data and image formats including JPEG, TIFF, PNG, HDF, HDF-EOS, FITS. Microsoft Excel, ASCII and binary files. It also supports multiband image formats, such as LANDSAT. Low level I/O functions enable you to develop custom routines for working with my data format.

This worksheet is on introduction on how to handle images in MATLAB. When working with images in MATLAB, there are many things to keep in mind such as loading an image using the right format, saving the data as different data types, how to display an image, conversion between different image formats etc. This worksheets presents some of the commands desgined for these operations.

Most of the commands require you to have the image processing tool box installed with MATLAB. To find out if it is installed ,type over at the MATLAB prompt. This gives you a list of what tool boxes that are installed on your system. There is an extensive online manual for the image processing toolbox that you can access via MATLABS help browsers .Most images you find on the internet are JPEG images which is the name for one of the most widely used compression standards for images .

Our project involves preprocesing for removing the noise in the images based on median filter .We use HAZE removal technique rain streak, Contrast Limited Adaptive Histogram Equalization (CLAHE) methods for enhancing the contrast of the image.

EXISTING SYSTEM

In existing method it uses linear adjustment of the final histogram inorder to minimize the difference between mean brightness between the input and enhanced image it removes the separation process of images into sub groups and simplifies the equalization process. For meeting the balancing condition it uses rationalised choice of threshold for formulating .This technique is integerated with pipelined framework for eliminating colourfulness and saturation reductions. It has a drawbacks of having a minimum input and output brightness error and also reduction in saturation.

Another method introduced a new hybrid image enhancement approach driven by processes on luminance and chrominance .This approach is based on the parameter controlled virtual histogram distribution method ,can enhance simultaneously the overall contrast and sharpness of an image and also increases the visibility of the specified portion or image whilst better maintaining image color and it was compared with other well known image enhancement technique .

Another approach introduced the parameter to increase the visibility of specified features, portion or aspects of the image. If the parameters are set upto default values this method will work as a automatic process. It was new way to integeratecolor and brightness information extracted from salient local features for global contrast enhancement .

PROPOSED APPROACH

In this method the input image is preprocessed for removing noise based on median filter then the HAZE removal and rain streak is used for removing the rain weather impact on the images. Then we apply CLAHE ,in thistechnique the image is captured by camera in foggy condition is converted from RGB to HSV.

RAIN STREAK REMOVAL

So far, the research works on rain streak removal found in the literature have been mainly focused on video-based approaches that exploit temporal correlation in multiple successive frames includes in literature. Nevertheless, when only a single image is available, such as an image captured from a digital camera/camera-phone or downloaded from the Internet, a single-image based rain streak removal approach is required, which was rarely investigated before?

Moreover, many image-based applications such as mobile visual search, object detection/recognition, image registration, image stitching, and salient region detection heavily rely on extraction of gradient-based features that are rotation- and scale-invariant. Some widely-used features (descriptors) such as SIFT (scaleinvariant feature transform), SURF (speeded up robust features) ,and HOG (histogram of oriented gradients) are mainly based on computation of image gradients.

The steps for removal of rain streak
Step 1:Pre-processing
Step 2: Patch extraction close to the camera.
Step 3: Partitioning
Step 4: Removal of rain streak
Step 5: Noise Removal
Step 6: Remove Blur

HAZE REMOVAL TECHNIQUE

Dark Channel Prior:

Dark channel prior (Wang, Yan et al, 2010) is used for the estimation of atmospheric light in the dehazed image to get the more real result. This method is mostly used for non-sky patches; in one color channel have very low intensity at few pixels. The low intensity in the dark channel is predominant because of three components:

Colourful items or surfaces

- Shadows(shadows of car, buildings etc)
- Dark items or surfaces(dark tree trunk, stone)

As the outdoor images are usually full of shadows the dark channels of images will be really dark. Due to fog (airlight), a foggy image is brighter than its image without fog. So we can say dark channel of foggy image will have higher intensity in region with higher fog. So, visually the intensity of dark channel is a rough estimation of the thickness of fog. In dark channel prior we use pre and post processing steps for getting good results. In post processing steps we use soft matting or trilateral filtering etc. Let J(x) is input image, I(x) is hazy image, t(x) is the transmission of the medium. The attenuation of image due to haze can be expressed as: ( ) ( ) ( ) (1) The influence of fog is Airlight effect and it is shown as: ( ) (( )) (2) Dark channel for an random image J, shown as J dark is defined as: ( ) ( ) (( )) (3) In this Jc is the color image comprising of RGB components, ( ) depicts a local patch which has its origin at x. The low intensity of dark channels is because of shadows in images, color objects and dark objects in images. After dark channel prior, we need to estimate transmission t(x) for proceeding further with the solution. After estimating the transmission map depth map is generated. Assume Atmospheric light A is also known. Figure (2) illustrates the Haze removal results. Top is input haze images. Middle is restored haze-free images.

CLAHE

Contrast limited adaptive histogram equalization short form is CLAHE (Xu, Zhiyuan et al, 2009). Constrast Limited Adaptive Histogram Equalization (CLAHE) is used for enhancement of low contrast images. This method does not need any predicted weather information for the processing of fogged image. Firstly, the image captured by the camera in foggy condition is converted from RGB (red, green and blue) color space is converted to HSV (hue, saturation and value) color space. The images are converted because the human sense colors similarly as HSV represent colors. (a) (b) Fig 3 shows (a) input image (b) output image Secondly value component is processed by CLAHE without effec use histogram equalization to a contextual region. The original histogram is cropped and the cropped pixels are redistributed to each gray-level. In this each pixel value is reduced to maxima of user selectable. Finally, the image processed in HSV color space is converted back to RGB color space.

HISTOGRAM EQUALISATION

Histogram equalization is one of the well-known enhancement techniques. In histogram equalization [3], the dynamic range and contrast of an image is modified by altering the image such that its intensity histogram has a desired shape. This is achieved by using cumulative distribution function as the mapping function. The intensity levels are changed such that the peaks of the histogram are stretched and the troughs are compressed. If a digital image has N pixels distributed in L discrete intensity levels and nk is the number of pixels with intensity level ik and then the probability density function (PDF) of the image is given by Equation (1). The cumulative density function (CDF) is defined in Equation (2). ( ) k i k n f i N = (1) 0 () () k kk i j j Fi fi = = ∑ (2) Though this method is simple, it fails in myocardial nuclear images since the gray values are physically far apart from each other in the image. Due to this reason, histogram equalization gives very poor result for myocardial images.

CONCLUSION

An approach had been presented in this paper that directly specifies a profile for histogram equalization based image contrast enhancement. The proposed method makes use of a linear adjustment of the target histogram taking into account to minimize the difference between the mean brightness between the input and enhanced image. This method removes the need to separate the image into sub-groups and simplifies the equalization process to a single run. Furthermore, a rationalized choice of threshold was formulated where a balancing condition was met. Thus, fulfilling the requirement for minimum input-output brightness error. The process was integrated into a pipelined framework that catered for mitigating colorfulness and saturation reductions. Experiments on a large data set of natural images reveals that although there is no single technique that can perform best in all performance criteria, results had shown thatthe technique developed in this work is able to provide color image enhancement that is both qualitatively and quantitatively satisfactory.

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