Image Defogging and Contrast Enhancement Using Image Processing Techniques for Surveillance Applications

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***Abstract*- Environmental factors such as fog and haze affect the image quality and make it unsuitable for automated systems, such as, intelligent vehicles, surveillance with clear visibility for processing and decision making. Dark channel prior (DCP) method is used to estimate atmospheric light for the purpose of image defogging. DCP based image defogging method with improved transmission map to avoid blocking artifacts. The transmission maps are computed for RGB color spaces. After that the haze removed image is divided into three transmission maps called R, G, and B channels. They are separated and utilized to compute an enhancement process. After the separation to computes the enhancement process for these three color maps separately. By combining all these three enhanced color maps it computes the final enhancement.**

I.INTRODUCTION

The term digital image refers to processing of a two dimensional picture by a digital computer. An image given in the form of a transparency, slide, photograph or an X-ray is first digitized and stored as a matrix of binary digits in computer memory. This digitized image can then be processed and/or displayed on a high-resolution television monitor. For display, the image is stored in a rapid-access buffer memory to produce a visually continuous display.

A digitizer converts an image into a numerical representation suitable for input into a digital computer. Some common digitizers are

1 Microdensitometer
2 Flying spot scanner
3 Image dissector
4 Videocon camera
5 Photosensitive solid- state arrays.

An image processor does the functions of image acquisition, storage, preprocessing, segmentation, representation, recognition and interpretation and finally displays or records the resulting image. The following block diagram gives the fundamental sequence involved in an image processing system. The first step in the process is image acquisition by an imaging sensor in conjunction with a digitizer to digitize the image. The next step is the preprocessing step where the image is improved being fed as an input to the other processes. Preprocessing typically deals with enhancing, removing noise, isolating regions, etc. Segmentation partitions an image into its constituent parts or objects. The output of segmentation is usually raw pixel data, which consists of either the boundary of the region or the pixels in the region themselves. Representation is the process of transforming the raw pixel data into a form useful for subsequent processing by the computer. Description deals with extracting features that are basic in differentiating one class of objects from another. Recognition assigns a label to an object based on the information provided by its descriptors. Interpretation involves assigning meaning to an ensemble of recognized objects. The knowledge about a problem domain is incorporated into the knowledge base. The knowledge base guides the operation of each processing module and also controls the interaction between the modules. Not all modules need be necessarily present for a specific function. The composition of the image processing system depends on its application. The frame rate of the image processor is normally around 25 frames per second. Mathematical processing of the digitized image such as convolution, averaging, addition, subtraction, etc. are done by the computer. The secondary storage devices normally used are floppy disks, CD ROMs etc. The hard copy device is used to produce a permanent copy of the image and for the storage of the software involved. Digital image processing refers processing of the image in digital form. Modern cameras may directly take the image in digital form but generally images are originated in optical form. They are captured by video cameras and digitalized. The digitalization process includes sampling, quantization. Then these images are processed by the five fundamental processes, at least any one of them, not necessarily all of them. Image enhancement operations improve the qualities of an image like improving the image's contrast and brightness characteristics, reducing its noise content, or sharpen the details. This just enhances the image and reveals the same information in more understandable image. It does not add any information to it. Image restoration like enhancement improves the qualities of image but all the operations are mainly based on known, measured, or degradations of the original image. Image restorations are used to restore images with problems such as geometric distortion, improper focus, repetitive noise, and camera motion. It is used to correct images for known degradations. The main objective of this project is to remove the haze present in the input images by using different image processing techniques. Haze removal techniques helps in recovering the contrast and color of the scene. These techniques have found many applications in the area of image processing such as consumer electronics, object detection, outdoor surveillance etc.

II. LITERATURE SURVEY

Haze Removal using the Difference-Structure-Preservation Prior Linyuan He, Jizhong Zhao Associate Member, IEEE, Nanning Zheng Fellow, IEEE, and Duyan Bi.

In this paper, the goal of the developed algorithm is to obtain an optimal transmission map as well as to remove hazes from a single input image. To solve the problem, we meticulously analyze the optical model and recast the initial transmission map under an additional boundary prior. For better preservation of the results, the difference-structure-preservation dictionary could be learned such that the local consistency features of the transmission map could be well preserved after coefficient shrinkage. Experimental results show that the method preserves the natural appearance of the image.

III. EXISTING SYSTEM

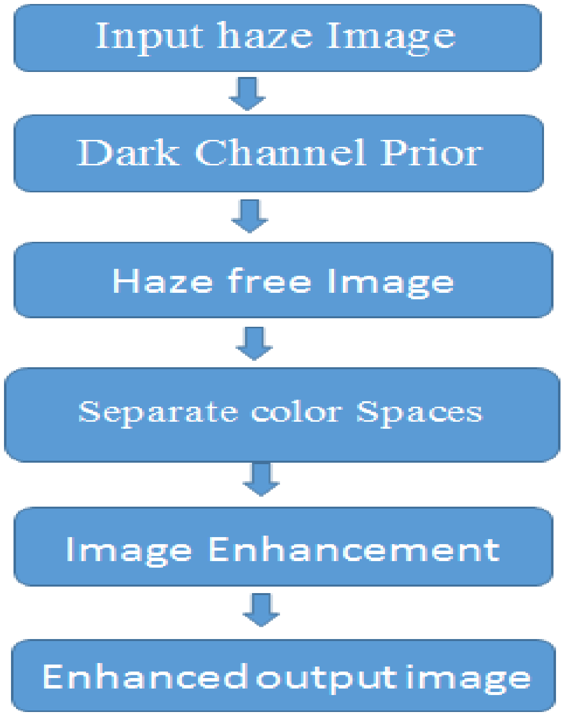
In Existing state-of-the-art image defogging methods using fail to show optimal performance for the task of image defogging. Their results are either low in contrast or compromised by artifacts. Existing image defogging methods. Structural similarity (SSIM), fog effect (FE), anisotropic quality index (AQI), and degradation score (DS). Here haze noise only removed from the imageThere is no further improvement of defogged image leads to less quality of output image. Here haze noise only removed from the image.

IV. PROPOSED SYSTEM

In proposed system, Approximate DCP method is used to remove haze from the single image. RGB2NTSCconverts the red, green, and blue values of an RGB image to luminance (Y) and chrominance (I and Q) values of an NTSC image. NTSC2RGB converts the luminance (Y) and chrominance (I and Q) values of an NTSC image to red, green, and blue values of an RGB image. Here image defogging and contrast enhancement gives better quality of output image when compared to the existing system. In this process we not only remove the haze pattern but also improve the contrast of the defogged image.

(a)haze image (b) O/P image

V. FLOW CHART



VI.PROJECT DESCRIPTION

The perceptual quality of outdoor scene images is important for understanding and analyzing the environment to perform automated tasks such as navigation, object detection and recognition. Scattering or absorption of light in adverse weather due to fog and haze can greatly restrict the visibility of outdoor scenes. Therefore, images taken in such weather conditions suffer from lower contrast, faded colors and luminance imbalance, resulting in objects far from camera almost invisible. The fog effect depends on the depth of the object in a scene, i.e., the objects farther from the camera lose more information. The models used to reconstruct enhanced images are categorized into two types, physical and non-physical models. Physical model is designed for observing physical causes that degrade the image and based on this model an inverse process is proposed to reduce the degradation level. Non-physical models are based on image processing techniques that enhance the image contrast and color reconstruction without taking into consideration the factors which caused degradation.

VII. RESULT

In this work, image defogging method has been proposed based on the dark channel prior (DCP). Existing state-of-the-art image defogging methods using DCP fail to show optimal performance for the task of image defogging. Their results are either low in contrast or compromised by artifacts. We have proposed a DCP based image defogging method with improved transmission map to avoid blocking artifacts. The transmission maps are computed for RGB color spaces. After that the haze removed image is divided into three transmission maps called R, G, and B channels are separated utilized to compute an enhancement process. After the separation to computes the enhancement process for these three color maps separately. By combining all these three enhanced color maps it computes the final enhancement. The proposed method achieved better results with lower fog effect, similarity index, degradation score and higher enhancement quality.

Image with haze

Haze removed image with contrast enhanced

VIII. CONCLUSION AND FUTURE WORK

Thus the proposed method estimates fog more accurately and the reconstructed images have better color contrast. In future, with more time and with more comprehensive research the proposed system can be made more accurate. Also new image enhancement algorithms can be added so as to give the better results.

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