International journal of basic and applied research

www.pragatipublication.com

ISSN 2249-3352 (P) 2278-0505 (E)

Cosmos Impact Factor-5.86

DECIPHERING VISUAL CLUTTER: SINGLE IMAGE DEHAZING WITH DEEP LEARNING

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***Abstract* – Drivers know to take it slow and keep their distance from other cars during snow, ice and rainstorms. When it comes to different types of inclement weather, fog often gets overlooked as a serious hazard.Fog is a large cloud of water droplets that forms when air comes in contact with the ground and then cools. This phenomenon is responsible for 38,000 crashes, 15,000 injuries and 600 fatalities every year. These clouds greatly decrease visibility, frequently in the morning and evening.Fog may distort your perception of speed, as you cannot see other objects moving in relation to your vehicle. Therefore traffic in foggy weather conditions is a very important issue and has been widely researched within the field of computer vision. A Video Dehazing software is introduced to counter these problems and thereby reduce the number of accidents. For the project previous image dehazing that are developed over the past decade are reviewed and analyzed. At first,the techniques are categorized into three categories: image enhancement based methods, image fusion based methods and image restoration based methods. Various quality evaluation methods are implemented to make sure the project is capable of removing haze or fog. Finally, extensive experiments determine the performance of proposed system.**

***Keywords*– Image Dehazing , Image Enhancement.**

I. INTRODUCTION

Driving in extreme weather conditions can be challenging and may affect normal driving routine of most of the people. That mostly affects your ability to command yourself on the driving position , which is extremely limited in adverse climate like rain, fog, ice, snow, and dust. Fog is one in all the scariest things to drive in, especially if you're not familiar in driving in such conditions. it's a dense "cloud bank" that rests on the bottom. To drive in foggy weather conditions either you have to drive slowly and carefully otherwise use the most commonly used method and implement fog lights.Over the years its seen that the use of fog lights haven't reduced the amount of accidents.

It is easy to think you'll see tolerably to proceed through patchy fog. However, if you try to do that thick fog can appear suddenly and you may loose sight of the surrounding on either side of the vehicle. Using the high- beams will only decrease the visibility. High-beams will reflect back and forth and may cause glare.Fog makes it very difficult to judge the speed of the vehicle. Checking the speedometer to know the speed every time is not a recommended method and certainly not an easy task .In such heavy fog the sole solution is , don't continue driving until the fog lifts and visibility improves which can be time consuming. The normal solution can not be effective for driving safely through the roads in these adverse climatic conditions .This is where our project includes a big role in producing better results and henceforth an entire solution to the present scenario.Our project is predicated on locally adaptive processing imaged dehazing technique. Fundamental task in many image processing and vision applications is image enhancement. Restoration of hazy images which requires specific strategies is a tough challenge and therefore a variety of solutions have emerged to solve this problem.

Initially, for remote sensing systems several dehazing techniques are developed, where the input information is given by a multi-spectral imaging sensor installed on the Landsat satellites. Different strategies processes recorded six- bands of reflected light to yield enhanced output images. For homogeneous scenes the well-known method of Chavez [1] is suitable , where haze is removed by subtracting an offset value determined by the intensity distribution of the darkest object.Another category of methods, uses multiples images or other additional equipments. These techniques uses multiple input images taken in different atmospheric conditions.Our project is based on dehazing foggy images and videos using image processing.The OpenCv library is used and three main functions ,image/video manipulation, masking and thresholds is used to dehaze images and video.

II. PROBLEM DEFINITION

As per the official record, as many as 866 people were killed thanks to foggy climate in 1,246 road accidents

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www.pragatipublication.com
ISSN 2249-3352 (P) 2278-0505 (E)
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reported in 2017, while 768 sustained injuries. In 2016,602 people were killed and 660 injured thanks to fog.The suspension of very fine moisture droplets within the air produces fog.The droplets will scatter the light and leads to a loss of contrast and a dense white background. The smaller the droplets thicker the fog and results in roadways becoming even more blanketed. As a result, it will adversely affect the car drivers vision, and the possibility of car accident increases even more.Fog distorts drivers' perception of speed and will have a tough time distinguishing between a stationary object and a moving one which might easily end in severe accidents.Foggy conditions will be further exasperated by faulty logic.

Using fog lights is that the existing solution. The yellow or green lights reflect back less light than simply your normal white lights. White lights contain all the colours (more wave- lengths), and experts have found that one wavelength (yellow, green or blue) will allow less reflection.However Fog lights don't assist you see further up the road in fog. In fog or other low visibility conditions, you ought to activate your main headlights. Fog lights should be activated additionally to your dipped headlights when visibility falls to but 100m.

Therefore traffic in foggy climate is a crucial issue and may be a widely researched in field of computer vision. i'm proposing a method to dehaze video in real time to boost the vision of the drivers. i'm introducing a software which might assist the drivers in foggy conditions.The software captures real time ,divides the video into frames
, dehaze , then merge the frames and produce clear dehazed video ,thereby reducing the danger of accidents in foggy conditions.

III. RELATED WORK

Demand for haze removal algorithm is increasing day by day as a result of increasing of pollution, mist and haze in the environment. Vision has to be improved through the technical ways of MATLAB or Python which don't seem to be yet fitting best with any atmosphere.The do and don'ts about the fog removal algorithms are formulated after conducting a survey so that vision in vehicles are often proper and noise free .Through proper estimation of sunshine and mixing the transmission map has improved extended windows concept in combination with DCP. There are two ways of haze removal i.e., multiple images fog removal method and single image fog removal method. For multiple images fog removal, image fusion techniques are used.Following are the dehazing techniques:

1. Polarization Based

Polarization-based dehazing methods are a part of the multi-image group loving two differently polarized filters they usually use two input images, one after another, to provide one dehazed image. Airlight is a minimum of partially polarized as this fact is employed during this technique, and also the trans- mission mechanism of the item is un-polarized. To remove haze, a minimum of two images with different polarization filter states are necessary.Looking on the gap and density of the haze previous image dehazing models may amplify the noise. To suppress noise and improve the dehazing perfor- mance, an imaging model is modified based on an iterative approach. Depth-chromaticity compensation regularization for the transmission map and chromaticity- depth compensation regularization for dehazing the image is offered by the iterative process.These two joint regularization schemes and also the relationship between the transmission map and dehazed image is utilized in the iterative process with polarization.Polarized images of various scenes in numerous days are collected to verify the effectiveness of algorithm. In comparison with iterative image polarization technique increases visibility in extreme weather without amplifying the noise.

2. Fusion Based

It requires multiple images of constant scene. There is high complexity of time to get rid of haze. Thus, the fusion based technique is multiple image dehazing technique that takes lesser time and just one image per scene.Image fusion technique aims to blend different input images and preserve only the features which are required by the composite output image . Deriving two input images from the original input with the aim of recovering the visibility for each region of the scene in a minimum of one among them is the main concept behind fusion based image dehazing. Furthermore, the fusion enhancement technique estimates weight maps for every pixel that controls the contribution of every input to the ultimate result.There are mainly two problems, the first one being color casts that are introduced because of the airlight influence and the second is the lack of visibility into distant regions because of scattering and attenuation phenomena.

3. Dark Channel Prior

Using stronger assumptions resulted in the success of re- cently developed techniques like Single image dehazing [2], and Visibility in bad weather from a single image [3] compared to earlier dehazing methods . He, Sun and Tang developed a really promising new single image technology in 2010 called the Dark channel prior . Sincr this method doesn't believe significant variance on transmission or surface shading within the input image the output image is rarely affected by halos than in [Tan, 2008]. Dark Channel Prior is a statistical based assumption of haze-free outdoor images. It is noted that most of the local regions means non-sky regions, and a few pixels have a really low intensity fairly often in a minimum of one among its color channels (RGB). The dark pixels in the hazy image will determine the air light, since the air light is apparent on a dark object.

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4. Fattal's Method

In 2008 Fattal introduced a new uality of hazy images by single image dehaztechnique which drastically improved the qing and gives it a refined image formation model. According to Fattal this technique will allow us to resolve ambiguities in the data by searching for a solution in which the resultant shading and transmission functions are locally, statistically uncorrelated. For approximating the color of the haze an analogous standard is used.

5. Locally Adaptive processing

This algorithm [4] allows estimation of the transmission function of the scene without introducing noticeable edge artifacts and overprocessing effects to the restored scene. This is possible because only the pixels having similar depth values inside a sliding window are taken into account. Furthermore, the transmission function using the proposed estimator can be more accurately estimated than that of with the DCP or CAP algorithms.This system is based on an embedded CPU/GPU architecture that exploits massive parallelism for high-rate image processing.

IV. PROPOSED SYSTEM

By using OpenCV as framework a method is introduced for dehazing foggy video in real time by using image processing.It can dehaze already taken video as well as videos taken in real time effectively.The code consists for three main functions , for image/video manipulation, masking and thresholds.

- The cv2.VideoCapture function from the OpenCV library is used to record real-time video.The cap.read(objectname.read) can used read frames one by one from the input video.These frames are then dehazed one by one.
- Color digital images are made of pixels, and pixels are made of combinations of primary colors represented by a series of code. A channel in this context is the grayscale image of the same size as a color image, made of just one of these primary colors. For instance, an image from a standard digital camera will have a red, green and blue channel. A grayscale image has just one channel.
- An RGB image has three channels: red, green, and blue. RGB channels roughly follow the color receptors in the human eye, and are used in computer displays and image scanners.If the RGB image is 24-bit (the industry standard as of 2005), each channel has 8 bits, for red, green, and blue—in other words, the image is composed of three images (one for each channel), where each image can store discrete pixels with conventional brightness intensities between 0 and 255.
- In digital image processing, thresholding is the simplest method of segmenting images. From a grayscale image, thresholding can be used to create binary images. Thresholding is done to segment the images in to two regions , dark and light region based on the threshold values that is obtained in the manipulation function(). This is typically done in order to separate "object" or foreground pixels from background pixels to aid in image processing. Most frequently, we use thresholding as a way to select areas of interest of an image, while ignoring the parts we are not concerned with. It is used to make the image easier to analyze.

- An "unsharp mask" is actually used to sharpen an image, contrary to what its name might lead you to believe. Sharpening can help you emphasize texture and detail, and is critical when post-processing most digital images. Unsharp masks are probably the most common type of sharpening. An unsharp mask cannot create additional detail, but it can greatly enhance the appearance of detail by increasing small-scale acutance.The sharpening process works by utilizing a slightly blurred version of the original image.

This is then subtracted away from the original to detect the presence of edges, creating the unsharp mask (effectively a high-pass filter). Contrast is then selectively increased along these edges using this mask
— leaving behind a sharper final image.Haze can be removed from image using unsharp mask.Normally that mask is used for sharpening an image, but it has more uses. Figure 1 gives the block diagram of the RTVFD. The modules in this model are Camera module,Video to frame splitter module,Dehazing module and Frame merging module

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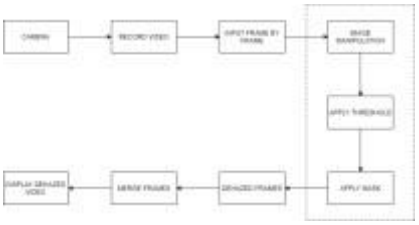

Fig. 1. Block diagram of RTVFD.

V. EXPERIMENTAL SETUP

The program is coded in Python and OpenCv library is utilized for the project.OpenCV is a huge open-source library for computer vision, machine learning, and image processing. OpenCV supports a wide variety of programming languages like Python, C++, Java, etc. It can process images and videos to identify objects, faces, or even the handwriting of a human. When it is integrated with various libraries, such as Numpy

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ISSN 2249-3352 (P) 2278-0505 (E)

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which is a highly optimized library for numerical operations, then the number of weapons increases in your Arsenal i.e whatever operations one can do in Numpy can be combined with OpenCV.

DDPAI Mini2P Car Dash Camera is used to capture the hazy input video at real time when the Optical fog sensor senses haze or fog. It records a distortionless 2K 1440p ultra HD Video recording which is 78 percent higher than that of 1080p resulting in crystal clear videos.Video Recording starts automatically when the car ignition is turned on. It has a spherical 140 Wide Angle Lens which results in wide field of view and zero distortion in the video.Video no longer has the fish-eye effect that is normally seen on other wide angle lens cameras.This result in better viewing experience. It has a screen proportion of 16:9 general mode and 2:4:1 movie mode.Another feature of the Camera module is that it offers a Super night mode which adopts super large aperture F1.8, 20 percent more light intake than F2.0. It has a WDR Wide Dynamic Range and Premium 4MP Omnivision OV05A10 Image Sensor, DDPAI mini2P is able to realize a star-level night vision for exceptional quality low light videos.

A good quality processor is required for the faster re-sults.NVIDIA's embedded Tegra K1 SoC (CPU+GPU+ISP on a single processor) is available directly in chip form, or as various 3rd-party embedded modules. They typically come preinstalled with Linux4Tegra OS (basically Ubuntu 14.04 with pre-configured drivers).Besides the quad-core 2.3GHz ARM Cortex-A15 CPU and the revolutionary Tegra K1 GPU, the Jetson TK1 board includes similar features as a Raspberry Pi but also some PC-oriented features such as SATA, mini- PCIe and a fan to allow continuous operation under heavy workloads.

Fig. 2. Output 1

VI. CONCLUSION AND FUTURE WORK

Introduced an efficient method to dehaze fog in real time. This method was assessed in terms of precision of image dehazing for restoring real-time foggy videos. The obtained results shows superior performance of the proposed method comparing with well known existing methods such as the dark channel prior and the color attenuation prior. According to the obtained experimental results, the proposed method can effectively reduce the impacts of fog at high rate from real time video input with high accuracy and without introducing noticeable overprocessing artifacts.

VI. RESULTS

The proposed method is tested for restoring videos which are degraded by haze or fog. Experiments are done to evaluate the quality of dehazing as well as real time performance of the proposed method.The real-time operation performance is characterized in terms of the frames per second (fps) that the digital system is able to process.The results of the proposed method are shown in Figure 2 and Figure 3.

Fig. 3. Output 2

REFERENCES

[1]. P. Chavez, "An improved dark-object subtraction technique for at- mospheric scattering correction of multispectral data,"Remote Sens. Environ., vol. 24, no. 3, pp. 459479, 1988..

[2]. R. Fattal, (2005) "Single image dehazing", ACM Trans. Graph., vol. 27, no. 3, pp. 72, Aug. 2008.

[3]. R. T. Tan, (2015) "Visibility in bad weather from a single image",

[4]. Proc. IEEE Comput. Vis. Pattern Recognit., pp. 1-8, Jun. 2008..

[5]. Victor H. Diaz-Ramirez, (2017) "Real-time haze removal in monocular images using locally adaptive processing", Journal of Real-Time Image Processing..