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Spatial Filtering Techniques to Enhance Traffic Images in Kerala – A Study

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ABSTRACT
This paper proposes a method to enhance traffic images that may be noisy due to traffic images that have been disturbed/ dislocated by environmental factors. The paper suggests a study of proposal to restore traffic images caught by photographic systems of Kerala that have been dysfunctional due to defective equipment or by environmental factors like rain, storm and moist. The images enhanced can be used for further processing like traffic jam management, violating traffic rules, identifying vehicle number etc.
Keywords:- RL

I. INTRODUCTION

In a state like Kerala weather conditions vary very frequently. So the images caught by our traffic photographic sensing systems are prone to noise. Image enhancement fusion techniques play a very important role in image processing. In recent years, varieties of image fusion algorithms have been developed. Road accidents and violation of traffic rules are more in Kerala. Images caught by photographic systems are blurred in rainy days. Road traffic cab is monitored using video observation system. Two major problems/issues are identified in relation to traffic imaging.

- This system has many limitations mainly because video and images may not be seen clearly due to meteorological reasons like thunder storms, heavy rain or fog.
- Moreover, it is also often noticed that there is more than one vehicle in the captured photograph, travelling in the same and / or opposite directions.

The aim of image enhancement is to improve image perception of human viewers as well as the image quality evaluated under different application purposes. An image taken from a real-life scene can be divided into several regions or segments according to the need for enhancement. Most images taken from scenes with disparately distributed illumination show the high contrastive variations.

A traffic image or series of images are required to be detected through Photographic Detection Devices in order that specific offences associated with them are tracked down. In other words, the clearer the image, the easier will it be to process the problem and adjudicate the same.

II. RELATED WORK

Lee et al [1] developed an image processing system based where morphological filters are used to remove salt and pepper noise.

Mayank Tiwari and Bhupendra Gupta [2] used spatial gradient based bilateral filter and minimum MSE filtering which does not depend on prior information about amount of noise present in the image.

Oliver Whyte et al. [3] used Richardson- Lucy (RL) Algorithm for deblurring. They used noisy/ blurry image pairs in their work to remove blur caused by camera shake and enhance them.

B. Gatos et al. [5] extracted CCs basedon an efficient binarization and enhancement techniquefrom the candidate binary image.

Chakrabarti et al. [6] in their paper proposed methods for separating the blur and sharp regions in an image.

The Standard median filter and mean filter are used to reduce salt and pepper noise and Gaussian noise respectively. Chang-Yanab et al. suggested in their paper, when salt and pepper and Gaussian noises exist in the same image, it is desirable to use only one filter either mean or median[8].

The standard median filter [7] is a simple rank selection filter that attempts to remove impulse noise by changing the luminance value of the center pixel of the filtering window with the median of the luminance values of the pixels contained within the window.

Although the median filter is simple and provides a reasonable noise removal performance, it removes thin lines and blurs image details even at low noise densities.

The weighted median filter [9] and the center-weighted median filter [10] are modified median filters that give more weight to the appropriate pixels of the filtering window.

These filters have been proposed to avoid the inherent drawbacks of the standard median filter by controlling the tradeoff between the noise suppression.

III. PROPOSED METHOD

Conversion of traffic images to gray scale and enhancing

The traffic images captured are converted to gray scale image. The gray scale image is enhanced by applying power law (Gamma) transformations

$S=cr^{\gamma}$……(1)

Here r in the intensity level of pixels and c and r are constants. This transformation was chosen since many devices used for image capture respond to power law. Gamma correction is the process to correct power law response[4]. C can be chosen as 1 and γ can be experimented with 3.0, 4.0 and 5.0. Giving γ 3.0 and 4.0 can enhance traffic images that are caught during moist or rainy seasons.

Identifying type of noise

The next step is to identify if the image is noisy. During bad weather conditions like rain, storm or moist there is great chance for Gaussian noise or salt and pepper noise. Gaussian noise may occur in images due to electronic circuit noise and even poor illumination that can happen on stormy, rainy and moist days.

Histograms can be plotted for enhanced images to identify type of noises in the images.

Various restoring techniques

In this paper few spatial image filters are compared to remove Gaussian and Impulse noise in a traffic image. Arithmetic mean filters and geometric mean filters are well suited for removing Gaussian noise among mean filters. If $S_{x,y}$ represent a set of coordinates in a rectangular subimage of size m×n, which is centered at (x,y). the arithmetic mean filter computes average values of pixels in the area defined by $S_{x,y}$. the value of restored image f at(x,y) is

$$F(x,y)=\frac{1}{mn}\sum_{(s,t)\in Sxy} g(s,t) \quad \text{……(2)}$$

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$$F(x,y)=\left[\prod_{(s,t)\in Sx,y} g(s,t)\right]^{mn} \quad \text{……..(3)}$$

Adaptive filters whose behavior changes based on statistical character of pixels in the image inside the filter region can also be used to remove Gaussian noise which works similar to arithmetic and geometric mean filters, but produces a sharper image [4].

If image possess salt noise harmonic mean filters can be used to restore them whose operation is given by

$$F(x,y)=\frac{mn}{\sum_{(s,t)\in Sxy} g(s,t)} \quad \text{…….(4)}$$

If the noise is known to be dark or light contraharmonic mean filters works well, this is based on equation

$$F(x,y)=\frac{\sum_{(s,t)\in Sx,y} g(s,t)Q+1}{\sum_{(s,t)\in Sx,y} g(s,t)Q} \quad \text{……..(5)}$$

Adaptive median filter works well to restore images with salt and pepper noise.

Once the noisy images are filtered they can be further processed. Segmentation and object recognition from images are done to get process traffic images and make decisions

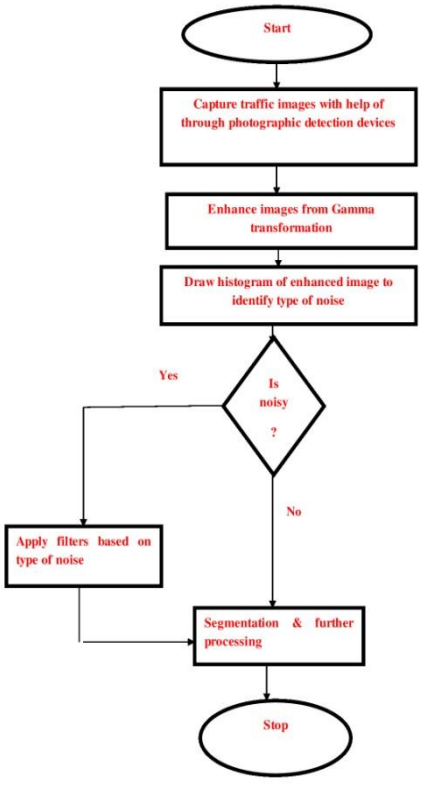

Fig. 1 A flowchart showing the proposed method

IV. CONCLUSIONS

In this paper a study of various restoration techniques and a method to preprocess traffic images caught in Kerala were suggested. The real time data set need to be collected and above steps need to be studied and analyzed and mathematical tools need be incorporated the to learn the quality of method.

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