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Image Based Fog Detection System

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Abstract: ***Edge detection means to detect edge or any discontinuous points in an image. It is very helpful in image processing and solves complexity. Many image processing application uses edge detection to obtain information. The edge detection has been used by Object recognition, target tracking, segmentation, data compression, matching, such as image reconstruction and so on uses edge detection for their process.***
Keywords**: *fog detection, image processing, advance driver assistance system***

I. INTRODUCTION

Our atmosphere contains huge quantities of particles, compromising outdoor photography. We get hazy or foggy scenes; this reduces visibility of objects and their contrast, and makes detection of objects within the scene more difficult. However, due to recent developments in computer vision, it is now possible to improve outdoor images and remove the haze layer. Many computer vision applications can benefit from haze free images. These techniques are physically sound and based on theories from meteorology and other disciplines. Unfortunately, these techniques are so costly in terms of complexity that they are not suitable for real-time applications. For its evaluation, a new measure for the degree of dehazing is introduced. This thesis shows that real-time dehazing is possible. Its validity and effectiveness is evaluated with video material from airport ground surveillance. These results enable real-time image dehazing for new applications like high resolution, high frame rate outdoor surveillance, on board vehicle camera applications and many more.

II. LITERATURE SURVEY

The California Department of Transportation has developed a fog detection and warning system based on an array of sensors able to detect fog. This system is able to inform the drivers on Highway 99 about the visibility conditions, fog density and maximum speed that they should travel freeway and the necessary information for the drivers is displayed on Changeable Message Signs.
Fog can be detected and removed with the help of image processing also. Bronte developed a method for fog detection based on the computation of the vanishing point. Hautiere developed a method for contrast restoration by using an onboard camera and the flat world hypothesis. These methods are real time and require only the presence of road and sky is performed.
Sandeep focused on the different image enhancement techniques. Neha propose Image Resolution Enhancement by Wavelet Transform Based Interpolation and Image Fusion. In that it presents a resolution method for enhancing digital gray images.

III. METHODOLOGY

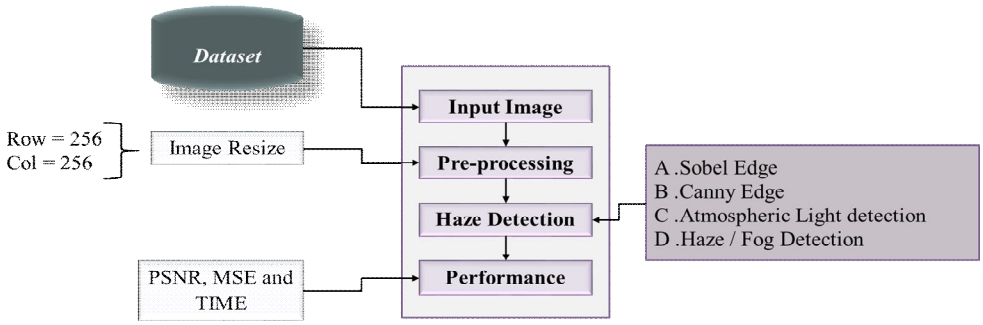

Fig. 1 Block diagram

A. Input Image

The first stage of any vision system is the image acquisition stage and after the image has been obtained various methods of processing can be applied to the image to perform different tasks. First Capture the Input Image from source file by using uigetfile and imread function; if image has not been captured satisfactorily then the intended tasks may not be achievable.

B. Pre-Processing

Image resizing is necessary when you need to increase or decrease the total number of pixels, whereas remapping can be done when you are correcting for lens distortion or rotating an image. Resizing an image is done using software to add or subtract pixels, and is called resampling. When an image is resampled it increases or decreases the width and height of the image in pixels. There are other ways to resize an image; it can be done by cropping it to a smaller size also.

C. Haze Detection

Haze is nothing but dust, smoke and other dry particles which disturb the clarity of the sky. In the World Meteorological Organization manual fog, ice fog, steam fog, mist, haze, smoke, volcanic ash, dust, sand and snow are nothing but horizontal obscuration. It may appear brownish or bluish and mist tends to be bluish-grey Depending upon the direction of view with respect to the sun. It is often thought as a phenomenon of dry air, mist formation which is a phenomenon of humid air. However, its particles may act as a condensation nucleus for the subsequent formation of mist droplets; such forms of haze are known as "wet haze."

Here sobel edge detector used for edge detection algorithms where it creates an image emphasizing edges. Next is canny edge detector which is an operator that uses a multi-stage algorithm to detect a wide range of edges in images. It is a technique which is used to extract structural information from different vision objects and reduce the amount of data to be processed. It is widely applied in various computer vision systems.

D. Estimations

Cpu time returns the total CPU time (in seconds) used by your MATLAB application from the time it was started.

This can overflow the internal representation and wrap around.

1) *PSNR & MSE:* Peak signal-to-noise ratio term for the ratio between the maximum possible power of a signal and the power of corrupting noise that affects the fidelity of its representation, because many signals have a very wide dynamic range. PSNR is usually expressed in terms of the logarithmic decibel scale and is most commonly used to measure the quality of reconstruction of lossy compression codecs. The mean squared error (MSE) of an estimator (of a procedure for estimating an unobserved quantity) measures the average of the squares of the errors—that is, the average squared difference between the estimated values and what is estimated.

$$MSE = \frac{1}{m\,n}\sum_{i=0}^{m-1}\sum_{j=0}^{n-1}[I(i,j) - K(i,j)]^2$$

The PSNR (in dB) is defined as:

$$\begin{aligned} PSNR &= 10 \cdot \log_{10}\left(\frac{MAX_I^2}{MSE}\right) \\ &= 20 \cdot \log_{10}\left(\frac{MAX_I}{\sqrt{MSE}}\right) \\ &= 20 \cdot \log_{10}(MAX_I) - 10 \cdot \log_{10}(MSE) \end{aligned}$$

Fig. 2 PSNR & MSE

IV. RESULTS AND ANALYSIS

Following is the result after the detection is performed when an input hazy image is given.

Fig. 1 Results

V. CONCLUSIONS

In this project, we have taken foggy image and found edges on it. Haze present in the foggy image is removed by dark channel prior method. Then we have used Edge detection methods to find the edges from the image. These are simple and best methods than any other methods.

VI. ACKNOWLEDGMENT

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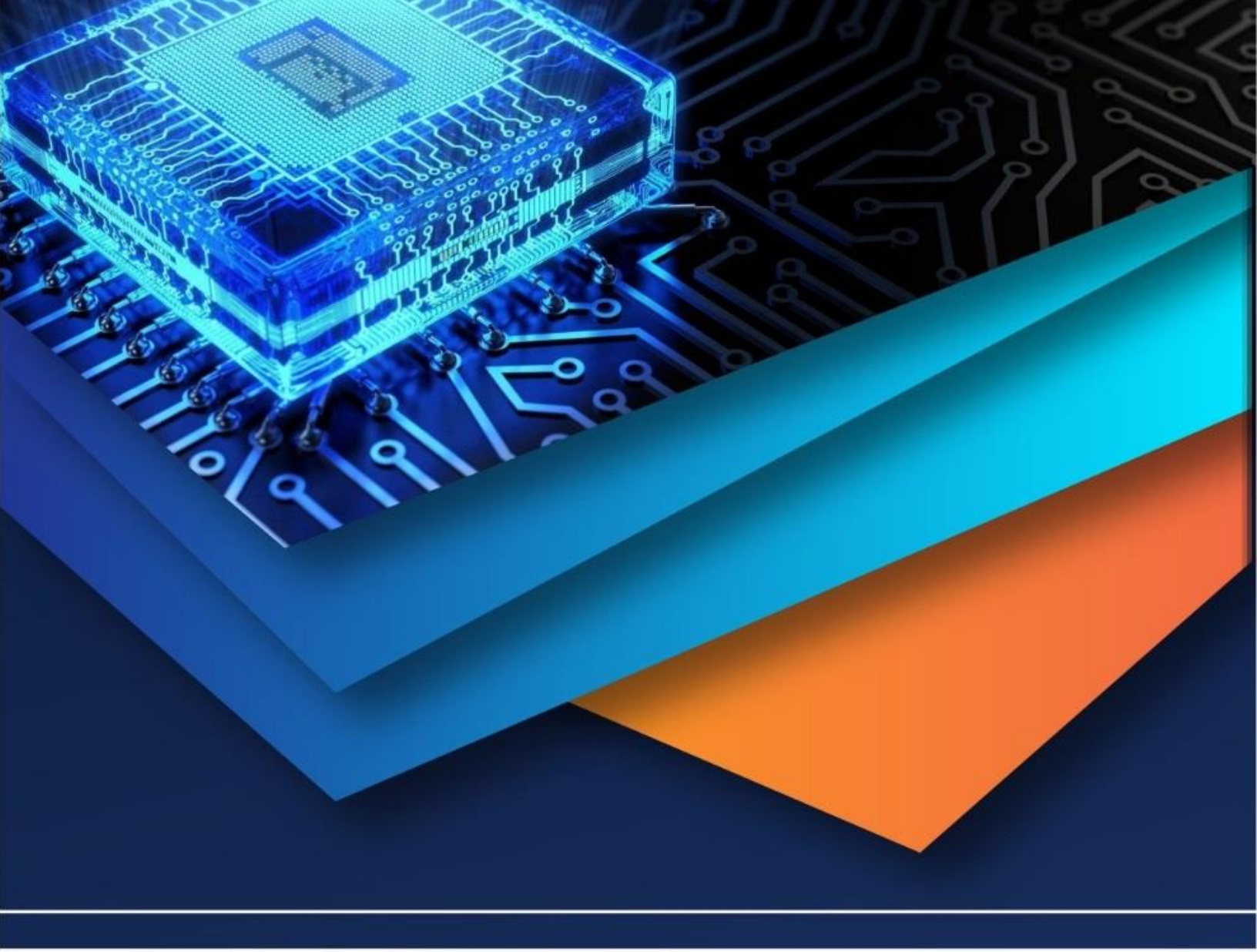

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