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A Review on Extracting DEBLUR Image Using Fuzzy Logic Approach from Impulse Noise

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Abstract: ***The image processing is very crucial field of research in which we can get the complete and detailed information about any image. One of the main issues in our research field is to get quality of an image. So we will try to propose an advanced algorithm to enhance the quality of an image by removing noise. Deblurring techniques are basically used to sharp an image using different methods & parameters so that we can abundant amount of knowledge. As we know there are various types of noises occurred in an image and like salt & pepper noise, additive white Gaussian noise, flicker noise, shot noise and many more. To compensate these noises there are various types of technique like algorithm, filtering concept, fuzzy logic approach and much more. Every technique is suitable for a particular noise and we cannot apply randomly to remove a particular noise. In last few years there is lot of development and attentions in area of blur detection techniques. The Blur detection techniques are very helpful in real life application and are used in image segmentation, image restoration and image enhancement. Blur detection techniques are used to remove the blur from a blurred region of an image which is due to defocus of a camera or motion of an object.***

Keywords—Deblur, Salt & pepper, Fuzzy, Gaussian Noise, Impulse, Membership Function.

I. INTRODUCTION

We know that during image acquisition process, various factors will cause image blurring. The most common sources of image blur are motion, defocus and aspects inherent to the camera such as sensor resolution and pixel size. The blur in image affects identification and extraction of the useful information in the images. Therefore the restoration of degraded images is important to expand uses of the images. The image deblurring can be divided into two types: non-blind and blind [1]. A blurred image can be considered as a convolution of sharp image and PSF i.e. point spread function or blur kernel. The degradation, from which the image is to be restored, can be modelled as given by equation (1).

$$g = H * f + n \quad (1)$$

Fuzzy techniques in image processing are a promising research field. Among the different topics, this project will focus on the construction and application of fuzzy filters for image processing. It is well known that fuzzy filters have a more robust performance than classical filters. For example, most classical filters that remove noise simultaneously blur the edges, while fuzzy filters have the ability to combine edge-preservation and smoothing. Compared to other non-linear techniques, fuzzy filters are able to represent knowledge in a comprehensible way [2-4]. Fuzzy techniques have already been applied in several domains of image processing and have numerous practical applications such as in industrial and medical image processing. In this project, we will focus on fuzzy techniques for image filtering.

Fig.1. Blurred and Deblurred Image

II. LITERATURE SURVEY

As we know there are various type of noises occurred in an images and there are so many technique to compensate these noise. With pace of time many researcher contribute to deblur image with filters and many more approaches and algorithm. Latest trends going on fuzzy logic because it is more robust approach as compared to other technique

Face Recognition with set theoretic method: Here in the set theoretic approach both blur and illumination problem are taken into account. Instead of taking blind deconvolution as such here we can see that that the different characteristics of blur are included. Also the image is taken as a convex set. Using the Direct Recognition of blurred faces algorithm we can remove the blurring of the images. In the algorithm a sharp image gallery is blurred with a blur kernel applying different conditions [7-8]. Then the distances between the blurred images are compared with the artificially blurred image and that having minimum distance is taken as the corresponding image. Followed by that the illumination challenges are taken into account. Here the illumination coefficient for image when considered at different planes are considered and is incorporated in the algorithm. Now together with the removal of blur illumination problems are also removes. It is easy to implement, not complex and returns much better result than the other previous approaches. Also here L1 norm distance is taken for making the algorithm robust to pixel misalignments [9].

Fig.2. Face Recognition with set theoretic

Deblurring with Linear Ternary Pattern: Linearly binary patterns can be called as an extension of LBP features and also invariant to small misalignments of pixels. This method mainly has 3 divisions. Firstly to eliminate the effects of illumination problem a pre-evaluating chain is presented without eliminating the essential features required for face recognition. Then the local ternary pattern is selected and it is less sensitive to blur effects. Here we can see that the local distance transform based on similarity is better than the local histogramming. When this method is compare with other approaches Multiscale Retinex (MSR [10]), Logarithmic Total Variation (LTV [8]) this method proves much better. So far this method has not been used along with subspace analysis. It can be incorporated to improve this method's performance.

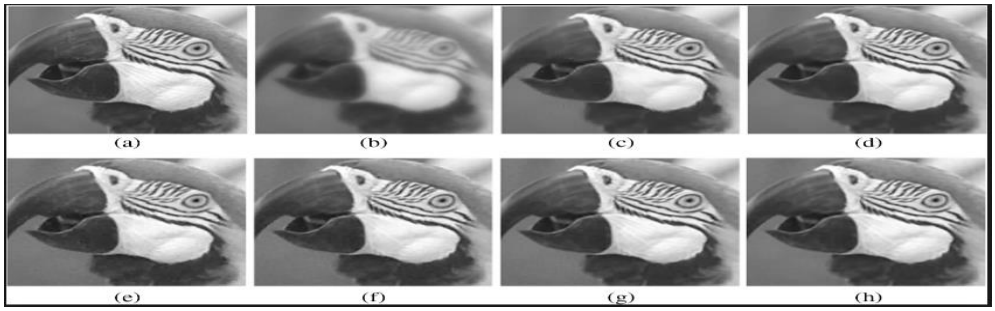

Fig.3 Deblurring with Linear Ternary Pattern

Deblurring with noisy image pairs:In this approach the image is deblurred with the help of noisy image. As a first step both the images the blurred and noisy image are used to find an accurate blur kernel. It is often very difficult to get blur kernel from one image. Following that a residual deconvolution is done and this will reduce artifacts that appear as spurious signals which are common in image deconvolution [12]. As the third and final step the remaining artifacts which are present in the non-sharp images are suppressed by gain controlled deconvolution process. The main advantage of this approach is that it takes both the blurred and noisy image and as a result produces high quality reconstructed image. With these two images an iterative algorithm has been formulated which will estimate a good initial kernel and reduce deconvolution artifacts. There is no special hardware is required. There are also disadvantages with this approach like there is a spatial point spread function that is invariant.

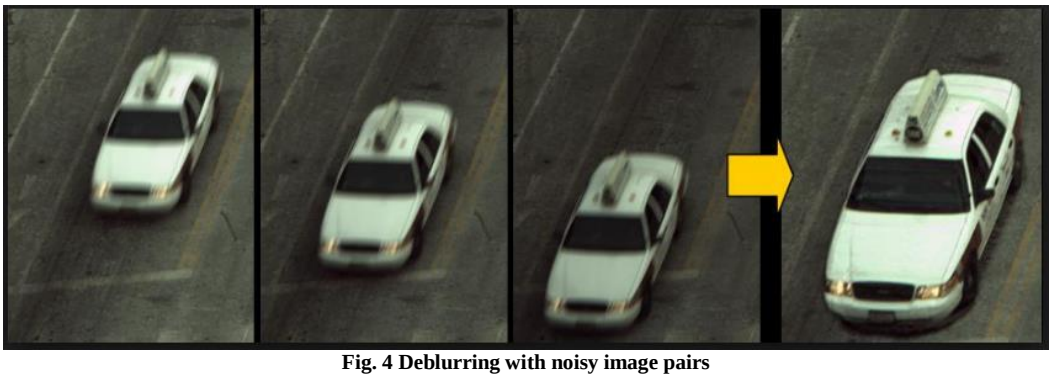

Fig. 4 Deblurring with noisy image pairs

Edge Sharpness Analysis method: Edge sharpness analysis is an important technique for blur detection. When the image is clear then the edges that it contains are step edges and when the image becomes blurred then the step edges become ramp edges. A measure of the sharpness or blurriness of edges in an image can be useful for a number of applications in image processing, such as checking the focus of a camera lens, identify shadow of an image having edges less sharp then object edges. This method doesn't require the information about the light source or the parameters like shapes and positions of the object [14]. To find the blur kernel from a blurred image through the parameters such as quantile-quantile plot, probability plot and probability plot correlation coefficient plots. To find the shape parameters that produce the maximum probability plot correlation coefficient (PPCC) define the best functional form for blur kernel. Edge profile method can be combined with the more corrected blur function (PSF) or blind de-convolution method. This method works on various future researches. For example to produce a correct and adaptable blur function through other blur function and combinations of functions.

(a)

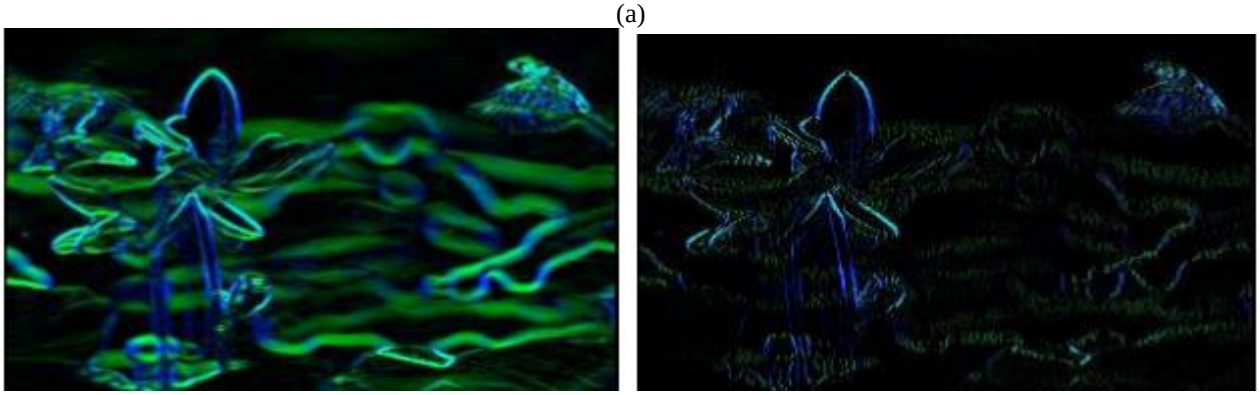

Fig. 5: An example of blur measurement using Edge sharpness analysis (a)Input Image (b)edge magnitude image; Blue- Vertical edge, Green Horizontal edge (c) Sharp edge Image.

III. METHODOLOGY

Different types of blur frequently contaminate images. Motion blur is one such blur, which may affect images at the time of image taken by camera. Motion blur is frequently used to show a sense of speed. You can artificially achieve this effect in a usual scene using cameras with a slow shutter speed. Photos taken with a camera do not represent a single moment of time. Two type of image are there gray scale image and color image. Edge detection forms the crux of the project and helps in extracting the features of the captured image of the maze. Also, the speed

of processing a black & white image is less compared to a colour image. Core objective is to acquire image and processing the images. This involves noise removal and enhancing the image for further feature extraction.

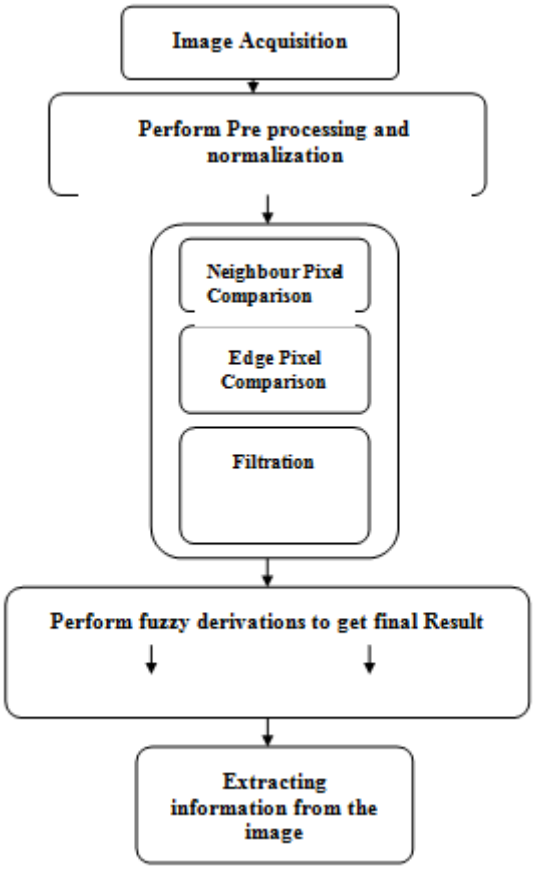

Fig. 6 Fuzzy Approach Flow Chart

Fuzzy Filters: Noise reduction is an important area for image processing. Besides classical filters, there are lots of fuzzy filters in the literature. Images can be corrupted with impulse noise, Gaussian noise or both. Depending on the type of noise, filters can be used. The fuzzy filters are categorized into two subclasses

Fuzzy-classical filters: Fuzzy Classical filters are filters that use fuzzy logic and these are the modification of the classical filters. Some of the fuzzy- classical filters are

Fuzzy median filter: Fuzzy median filter is well known for removing impulse noise. It is the fuzzy rank ordering of samples and is simply a replacement of conventional median filter with fuzzy counterparts. (ii) Fuzzy impulse noise detection and reduction method- this filter by Selhulte detects the impulse noise and any other noise in the image. It contains the noise— detection step and filtering step to preserve the edges. Fuzzy detection step uses fuzzy gradient values in eight directions with a 3 x 3 window, which indicates the degree of central pixel as an impulse noise pixel. A fuzzy set is constructed based on the gradient.

Fuzzy filters: These are filters that are totally dependent on fuzzy logic and they do not have any connection with classical filters. A few fuzzy filters ale discussed below.
Gaussian noise reduction filter (GOA) - This filter is specially designed to remove Gaussian noise. Averaging is done for a pixel using other neighbourhood pixels and simultaneously taking care of the other image structures such as edges. To achieve this, two features are required. First, in order to distinguish between the variations die to noise and the image structures, the filter uses gradient for all the eight directions. Second, the membership functions are adapted accordingly to the noise level to perform fuzzy smoothing. The filter is applied iteratively.

Histogram adaptive filter (HAF) - This type of filter removes high impulsive noise, preserving edge information. In HAF, each input pixel is considered a fuzzy variable and a square window of size 3X3 is sided over the entire image and the filter output is associated with each centre pixel in a window. Three fuzzy sets for dark, Medium, and bright are created and the membership functions for these fuzzy sets are calculated. Then fuzzy inference rules based on the Takagi-Sugeno approach with a slight difference is used in a final output decision process.

IV. SOFTWARE USED AND SIMULATION RESULT

Software: MATLAB Version R2015a: It is powerful software that provides an environment for numerical computation as well as graphical display of outputs. In Matlab the data input is in the ASCII format as well as binary format. It is high-performance language for technical computing integrates computation, visualization, and programming in a simple way where problems and solutions are expressed in familiar mathematical notation.

- Acquisition, Data Exploration, Analysing &Visualization
- Engineering complex drawing and scientific graphics
- Analysing of algorithmic designing
- Mathematical and Computational functions
- Modelling and simulating problems prototyping
- GUI (graphical user interface) building environment.

Using MATLAB, you can solve technical computing problems very easily and time saving as compared to traditional programming languages, such as C, C++, and FORTRAN.
The name MATLAB stands for matrix laboratory.

MATLAB Features

- MATLAB is a high-level language used for numerical computation, visualization, and application development
- It create very friendly environment for iterative exploration, design, and problem solving
- Mathematical functions for solving ordinary differential equations, Fourier analysis, linear algebra, statistics, filtering, optimization, numerical integration
- Development tools for enhancing code quality and maximizing performance
- Tools for building applications with custom graphical interfaces (GUI)
- Functions for integrating MATLAB based algorithms with external applications and we can able to generate code in hex file, c, embedded etc.

CONCLUSION

We study various research paper and finally we came to the conclusion that there are so many blur effects occurred in an image due to various reasons from acquisition of an image to transmit viva different channel and also in receiving noise occurred and our target is to deblur the images so that we can get crucial information whatever it consist. Blur Detection is a technique to remove the blur from a blurred region of an image which is due to defocus of a camera or motion of an object. After studying deeply various paper we find various method for blur detection such as blind image de-convolution, Low DOF, Edge sharpness analysis, Low directional high frequency energy. In Blind Image de-convolution we don't, require the prior knowledge of PSF and noise parameters which are the main advantage of this technique over other techniques. In Edge sharpness method we detect the blur in an image through the intensity of an image profile. This method is has low computational cost but not effective on complex images over other methods. All these methods of blur detection are used for various applications such as: Video Object Extraction, Image Indexing and Enhancement. Fuzzy image processing is the collection of all approaches that understand, represent and process the images, their segments and features as fuzzy sets. The representation and processing depend on the selected fuzzy technique and on the problem to be solved. Fuzzy logic is conceptually easy to understand. It is flexible. With any given system, it is easy to layer on more functionality without starting again from scratch. Fuzzy logic is tolerant of imprecise data. It can model nonlinear functions of arbitrary complexity.

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