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Image De-Blurring and De-Noising using Weiner Filter and Anisotropic Diffusion for Natural Images

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Abstract: The proposed method basically represents how to de-blur and de-noise images using a wiener filter and Anisotropic Diffusion Filter. Basically wiener filter is used to produce an estimate of a desired image or target a random process by linear time-invariant filtering of an observed noisy process, assuming known stationary signal and noise spectra, and additive noise. The Wiener filter minimizes the mean square error between the estimated random process and the desired process to reduce the speckle/Gaussian noise from the medical images based on components separation and wavelet shrinkage model with non-local means for preserving the image quality without any information loss. The Anisotropic Diffusion Filter is to convert the blurred images to normal image, while preserving meaningful detail such as blurred images.
Keywords: de-blur, de-noise images, stationary signal, and estimated random process.

I. INTRODUCTION

Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is the fast growing technologies today, with its applications in various aspects of a business. This area develops the core research area within engineering and computer science disciplines too. An image is a two-dimensional picture, which has a similar appearance to some subject usually a physical object or a person. Image is a two-dimensional, such as a photograph, screen display, and as well as a three-dimensional, such as a statue. In this wider sense, images can also be rendered manually, such as by drawing, painting, carving, rendered automatically by printing or computer graphics technology, or developed by a combination of methods, especially in a pseudo-photograph. An image is a rectangular grid of pixels. It has a definite height and a definite width counted in pixels. Each pixel is square and has a fixed size on a given display. However different computer monitors may use different sized pixels. The pixels that constitute an image are ordered as a grid (columns and rows); each pixel consists of numbers representing magnitudes of brightness and color. Each pixel has a color. The color is a 32-bit integer. The first eight bits determine the redness of the pixel, the next eight bits the greenness, the next eight bits the blueness, and the remaining eight bits the transparency of the pixel.

II. FUNDAMENTAL STEPS IN DIGITAL IMAGE PROCESSING

Digital image processing, the manipulation of images by computer, is relatively recent development in terms of man's ancient fascination with visual stimuli. In its short history, it has been applied to practically every type of images with varying degree of success.

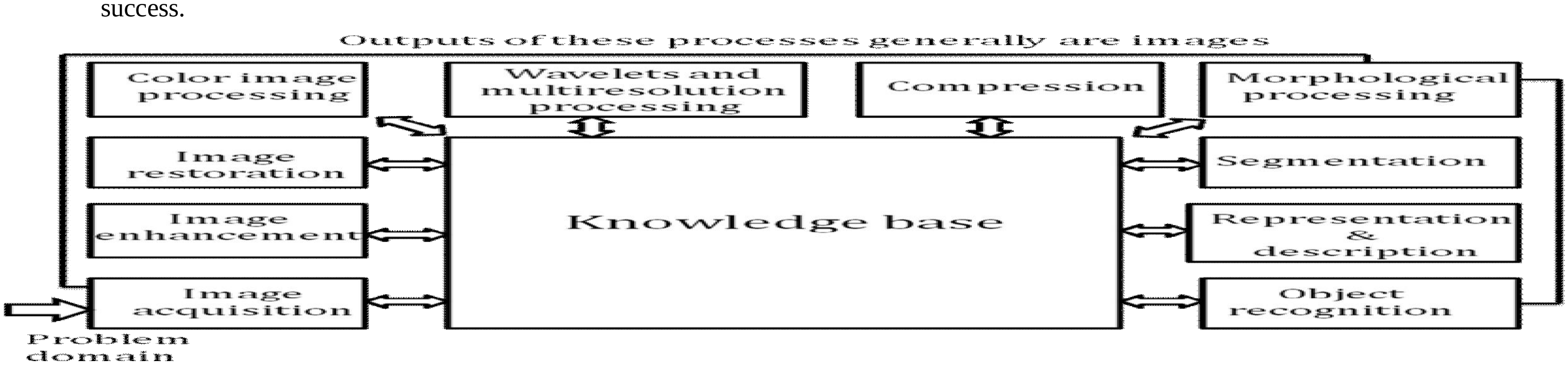

Fig 1 : Digital image processing

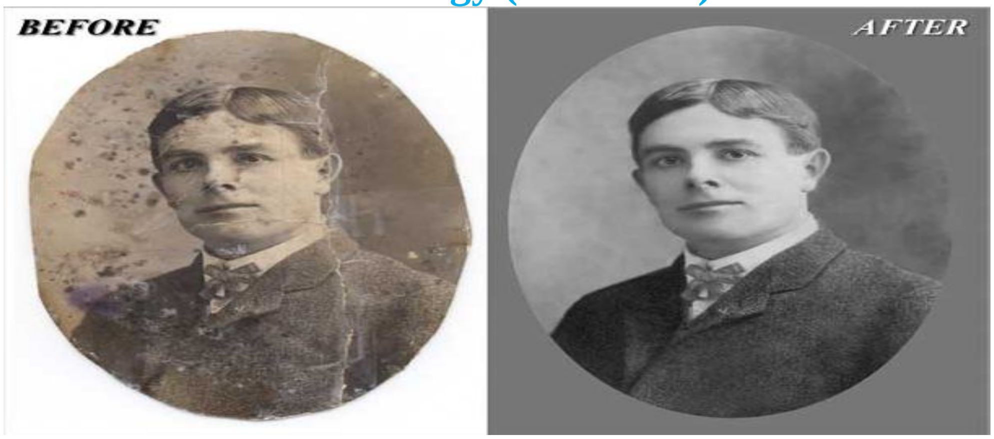

Fig 2 : Input image database

A. Color Image Processing

The use of color in image processing is motivated by two principal factors. First, color is a powerful descriptor that often simplifies object identification and extraction from a scene. Second, humans can discern thousands of color shades and intensities, compared to about only two dozen shades of gray. This second factor is particularly important in manual image analysis.

B. Segmentation

Segmentation procedures partition an image into its constituent parts or objects. The process of autonomous segmentation is one of the most difficult tasks in digital image processing. A rugged segmentation procedure brings the process a long way toward successful solution of imaging problems that require objects to be identified individually.

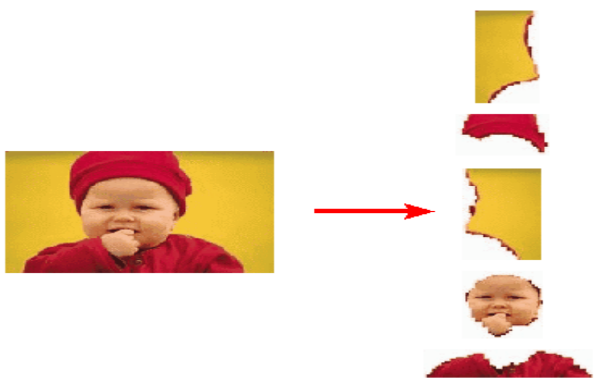

Fig 3 : Image segmentation

C. Image File Sizes

Image file size is expressed as the number of bytes that increases with the number of pixels composing an image, and the color depth of the pixels. The greater the number of rows and columns, the greater the image resolution, and the larger the file. Also, each pixel of an image increases in size when its color depth increases, an 8-bit pixel (1 byte) stores 256 colors, a 24-bit pixel (3 bytes) stores 16 million colors, the latter known as true color.

III. OBJECTIVE

The main objective of this project aims at filtering images contaminated by Gaussian additive noise and produce images without any blur. To have a better signal to noise ratio and to preserve the image edges and textures. This method would suppress the noise effectively from the natural image. The Weiner Filter mostly focuses on removing the blur in the input image given. The Anisotropic diffusion removes the noise in the image without affecting the edges and textures of the natural image. This provides us a very good signal to noise ratio compared to the existing systems.

However, the enormous amount of retinal data obtained nowadays mostly stored locally; and the valuable embedded clinical knowledge is not efficiently exploited. In this paper we present an online depository, ORIGA-light, which aims to share clinical ground truth retinal images with the public; provide open access for researchers to benchmark their computer-aided segmentation algorithms. An in-house image segmentation and grading tool is developed to facilitate the construction of ORIGA-light.

IV. LITERATURE SURVEY

In this paper, we propose a new image quality assessment (IQA) scheme, with emphasis on gradient similarity. Gradients convey important visual information and are crucial to scene understanding. Using such information, structural and contrast changes can be effectively captured. Therefore, we use the gradient similarity to measure the change in contrast and structure in images. The proposed scheme considers both luminance and contrast-structural changes to effectively assess image quality.

Furthermore, the proposed scheme is designed to follow the masking effect and visibility threshold more closely, i.e., the case when both masked and masking signals are small is more effectively tackled by the proposed scheme. Finally, the effects of the changes in luminance and contrast-structure are integrated via an adaptive method to obtain the overall image quality score. Extensive experiments conducted with six publicly available subject-rated databases (comprising of diverse images and distortion types) have confirmed the effectiveness, robustness, and efficiency of the proposed scheme in comparison with the relevant state-of-the-art schemes.

In this paper, we propose an empirical identification method of the Gaussian blur parameter for image de-blurring. The parameter estimate is chosen from a collection of candidate parameters. The blurred image is restored by these candidate parameters under the assumption that the candidate is equal to the true value. The estimate is selected to be at the maximum point of the differential coefficients of restored image Laplacian L1 norm curve. Experimental results are presented to demonstrate the performance of the proposed method.

V. EXISTING SYSTEM

In the existing system they uses Block-Matching, Discrete Cosine Transform for Image de-noising in spatial domain. The filtering scheme proposed in this paper is based on filtering via image sparse representation. The proposed similarity-matching-3D-DCT-Noise-Suppression. Filter is designed to suppress additive noise in gray scale images while preserving image features such as edges, chromaticity characteristics, textures and fine details.

A. Block Matching

First step in an algorithm involves the Block-matching procedure to find blocks that exhibit high similarity in a noisy image. Block Matching Algorithm is a way of locating matching macro blocks in a sequence of digital video frames for the purpose of motion estimation. The displacement in block location from the current frame to the location in the reference frame is the motion vector. Block matching techniques can be divided into three main components as block determination, search method, and matching criteria.

B. Discrete Cosine Transform

The Discrete Cosine Transform (DCT) attempts to de-correlate the image data. It helps to separate the image into parts of differing importance. DCT is similar to Discrete Fourier Transform (DFT). Blur detection scheme for discrete cosine transform (DCT) uses a recent clarification to desire and to manipulate the accessible discrete cosine transform data in MPEG or JPEG compressed video or pictures. Although containing a lowest computational load, the technique calculated from MPEG or JPEG images and commonly depends upon the histograms of non-zero occurrences. This method is relevant for all type of pictures such as I-frames, P- frames and B- frames, for MPEG compressed video. In this operation the main aim of blur detection is to given the percentage the quality of global image in the form of blur: 0 % percentage contains that the frame is fully blurred and 100 % percentage contains that no blur formed in an image.

C. Edge detection

This additional step in procedure is referred to edge detection, identifying and locating sharp discontinuities in an image. The discontinuities are abrupt changes in the pixel intensity, which characterize boundaries of objects in a scene. The edge detection is calculated with Sobel Operator.

VI. PROPOSED SYSTEM

The proposed method represents how to de-blur and de-noise images using a wiener filter and Anisotropic Diffusion Filter. The Wiener filter minimizes the mean square error between the estimated random process and the desired process. It also reduces Gaussian noise from the images based on components separation and wavelet shrinkage model for preserving the image quality without any information loss.

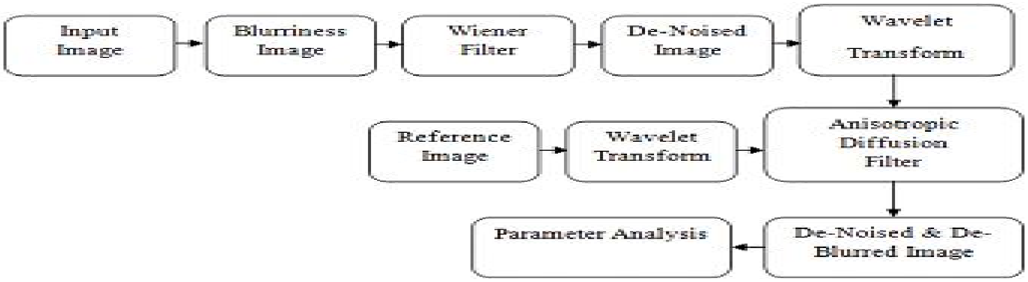

Fig 4: Proposed block diagram

In blurring, we simple blur an image. An image looks sharper or more detailed if we are able to perceive all the objects and their shapes correctly in it. An image with a face, looks clear when we are able to identify eyes, ears, nose, lips, forehead etc. very clear. This shape of an object is due to its edges. So in blurring, simply reduce the edge content and makes the transition from one color to the other very smoothly.

VII. SOFTWARE DESCRIPTION

MATLAB is a high-performance language for technical computing. It combines computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation.

A. Typical Uses Include

1) Math and computation
2) Algorithm development
3) Modelling, simulation, and prototypin
4) Data analysis, exploration, and visualization
5) Scientific and engineering graphic
6) Application development, including graphical user interface building

MATLAB is an interactive system whose basic data element is an array that does not require dimensioning. This allows you to solve many technical computing problems, especially those with matrix and vector formulations, in a fraction of the time it would take to write a program in a scalar non-interactive language such as C or FORTRAN.

MATLAB features a family of application-specific solutions called toolboxes. Very important to most users of MATLAB, toolboxes allow you to learn and apply specialized technology. Toolboxes are comprehensive collections of MATLAB functions (M-files) that extend the MATLAB environment to solve particular classes of problems. Areas in which toolboxes are available include signal processing, control systems, neural networks, fuzzy logic, simulation, and many others.

VIII. RESULTS AND DISCUSSIONS

Fig 5: Input image

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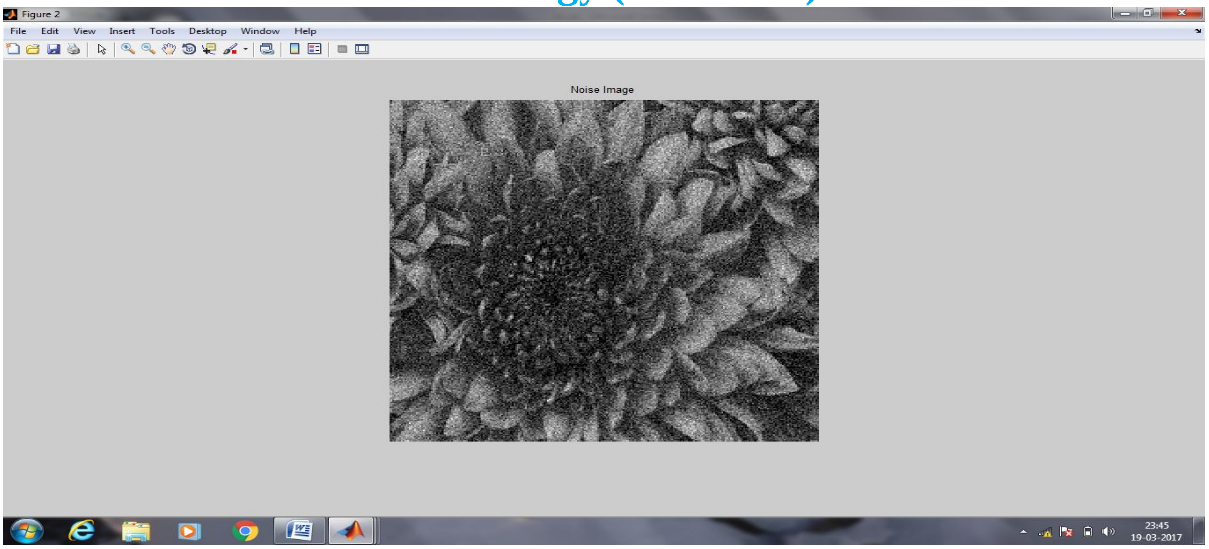

Fig 6: Noise image

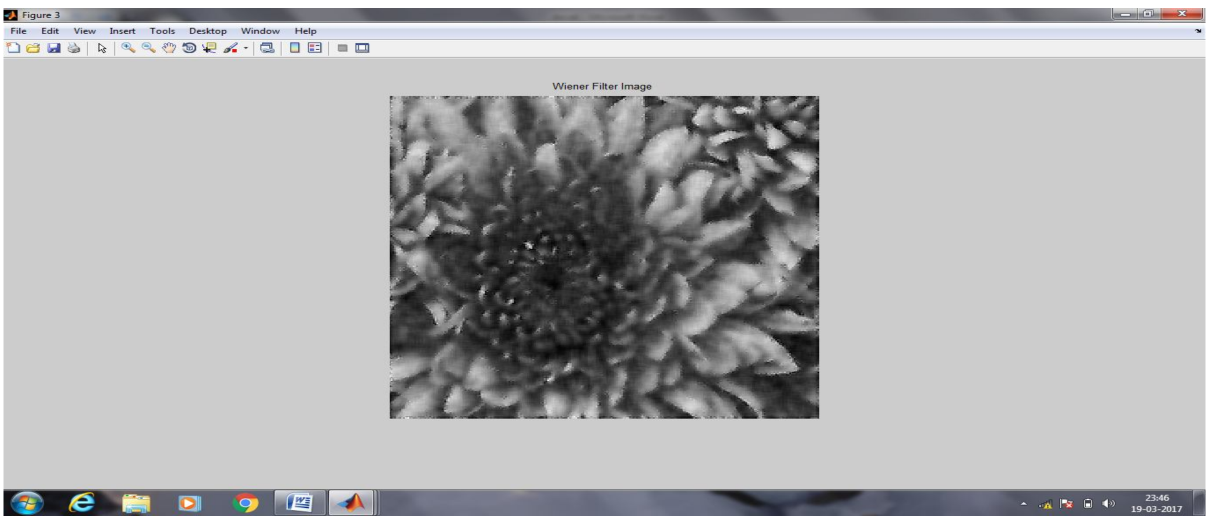

Fig 7: Wiener filter image

IX. CONCLUSION

Hence the given input image is successfully de-blurred and de-noised using Wiener Filter and Anisotropic Diffusion Filter and a realistic image is obtained. The noise after pre-processing is removed by Wiener Filter. Finally the parameters of the resultant image are analyzed and ensured with appropriate quality.

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