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Cervical Implementation of Image Restoration Schema Using Digital Image Processing Techniques

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Abstract-Image Restoration in Image processing domain provides a systematic way of implementation towards real-time data with different level of implications. Our conventional setup initially focuses with images with theirs noises. This paper perform a detailed study of image restoration towards variant noises in the field of image processing which can be carried out with request to optimal output strategies. We will implement our iterated image restoration techniques with real time implementation of Tamilnadu –India Road map of Tirunelveli, Kanyakumari districts in roadmap board Domains. We will also perform algorithmic procedural strategies for the successful implementation of our proposed research technique in several sampling domains with a maximum level of improvements. In near future we will implement the Optimal Image Restoration techniques for the de noising structure of image domain.

I. Introduction

In imaging science, **image processing** is any form of signal processing for which the input is an image, such as a photograph or video frame; the output of image processing may be either an image or a set of characteristics or parameters related to the image [1]. Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it [2].

Image processing usually refers to digital image processing, but optical and analog image processing also are possible [3] This article is about general techniques that apply to all of them. The *acquisition* of images (producing the input image in the first place) is referred to as imaging [4].

Closely related to image processing are computer graphics and computer vision. In computer graphics, images are manually *made* from physical models of objects, environments, and lighting, instead of being acquired (via imaging devices such as cameras) from *natural* scenes, as in most animated movies. Computer vision, on the other hand, is often considered *high-level* image processing out of which a machine/computer/software intends to decipher the physical contents of an image or a sequence of images (e.g., videos or 3D full-body magnetic resonance scans)[5].

In modern sciences and technologies, images also gain much broader scopes due to the ever growing importance of scientific visualization (of often large-scale complex scientific/experimental data) [6]. Examples include micro array data in genetic research, or real-time multi-asset portfolio trading in finance.

Image restoration is the operation of taking a corrupted/noisy image and estimating the clean original image. Corruption may come in many forms such as motion blur, noise, and camera misfocus. Image restoration is different from image enhancement in that the latter is designed to emphasize features of the image that make the image more pleasing to the observer [7], but not necessarily to produce realistic data from a scientific point of view. Image enhancement techniques (like contrast stretching or de-blurring by a nearest neighbor procedure) provided by "Imaging packages" use no a priori model of the process that created the image [8].

Figure 1:Sample Image restorations

In digital editing, photographs are usually taken with a digital camera and input directly into a computer. Transparencies, negatives or printed photographs may also be digitized using a scanner, or images may be obtained from stock photography databases. With the advent of computers, graphics tablets, and digital cameras, the term *image editing* encompasses everything that can be done to a photo, whether in a darkroom or on a computer [9]. Photo manipulation is often much more explicit than subtle alterations to color balance or contrast and may involve overlaying a head onto a different body or changing a sign's text, for examples. Image editing software can be used to apply effects and warp an image until the desired result is achieved [10].

II. Proposed Methodology-The Imaging model

The image degradation process can be modeled by the following equation:

$$\mathbf{g=H^{\cdot}f+w} \qquad (1)$$

where, **H** represents a convolution matrix that models the blurring that many imaging systems introduce. For example, camera defocus, motion blur, imperfections of the lenses all can be modeled by **H.** The vectors **g**, **f**, and **w** represent the observed, the original and the noise images. More specifically, **w** is a random vector that models the random errors in the observed data. These errors can be due to the electronics used (thermal and shot noise) the recording medium (film grain) or the imaging process (photon noise).

Problems

Obtaining **f** from Eq. (1) is not a straight forward task since in most cases of interest the matrix **H** is*ill-posed.* Mathematically this means that certain eigenvalues of this matrix are close to zero, which makes the inversion process very unstable. For practical purposes this implies that the inverse or the pseudo-inverse solutions

$$f_1=H^{-1}g \text{ and } f_2=(H^TH)^{-1}H^Tg \quad (2)$$

amplify the noise and provide useless results. This fact is demonstrated in what follows.

Solution

Regularization is one way to avoid the problems due to the ill-posed nature of **H**. According to regularization instead of minimizing $\| g - Hf \|^2$ in order to find **f** one minimizes:

$$\| g - Hf \|^2 + \lambda\|Qf\|^2 \quad (3)$$

the additional term $\|Qf\|^2$ is called regularization term and can be viewed as capturing the properties of the desired solution. In other words, the first term in Eq. (3) stirs the solution **f** to be “close” to the observed data **g** while the second term enforces “prior knowledge” to the solution. The prior knowledge that is used is that the image is locally smooth. In most cases **Q** represents the convolution with a high-pass filter. Thus the term $\|Qf\|^2$ can be viewed as the high-pass energy of the restored image. The parameter λ is called *regularization parameter* and controls the closeness to the data vs. the prior knowledge of the solution. Finding **f** based on Eq. (3) gives

$$f_3=(H^TH+\lambda Q^TQ)^{-1}H^Tg. \quad (4)$$

Finding the proper value for the parameter λ is an important problem. In the demo that follows one can choose different values of λ and observe the effect to the restored image. A large value of λresults in a smoother image and is necessary if the noise variance is high or **H** is highly ill-conditioned. On the other hand a large λ blurs out the image details. So one has to decide between smoothness and detail in the solution.

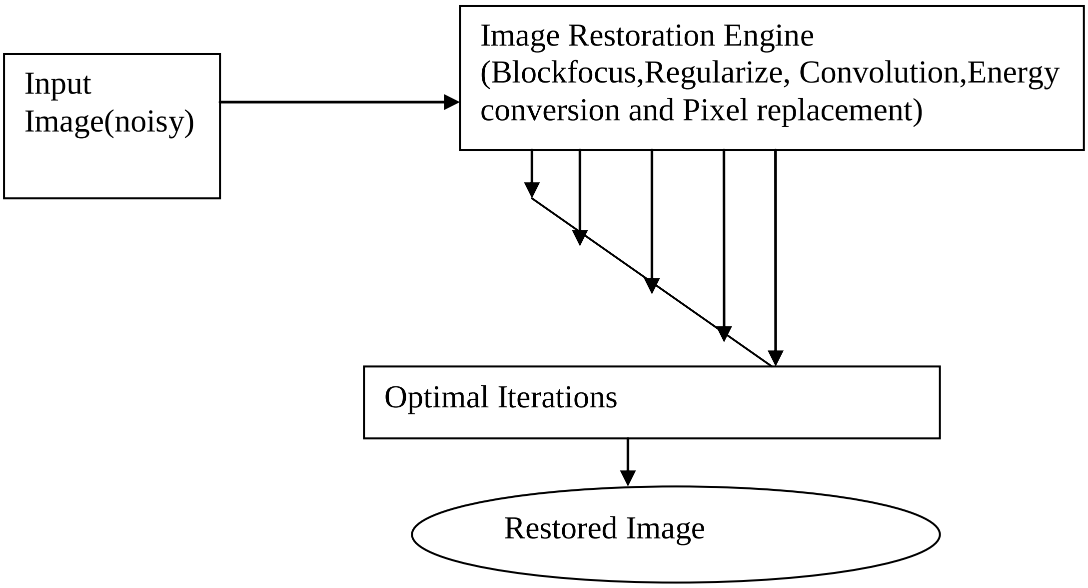

Figure 2: Proposed Image restoration Procedure

III.IMPLEMENTATION

Now implementing the proposed denoising technique the input image can be restored as follows,

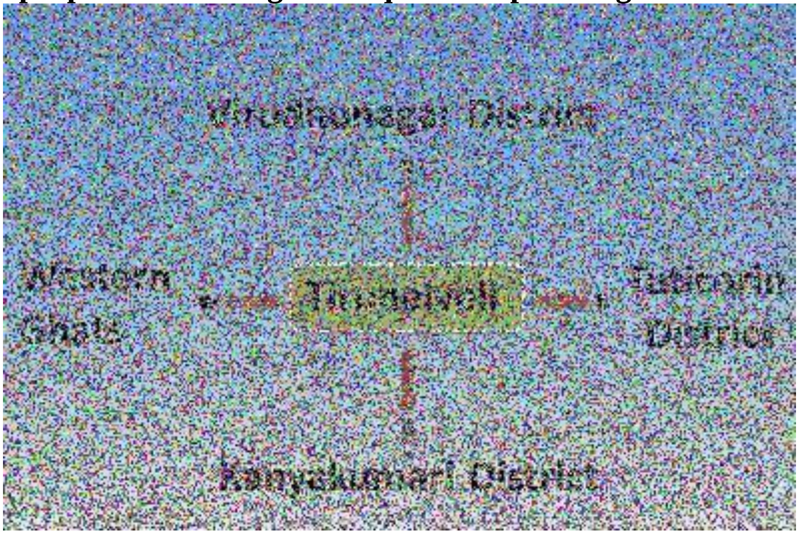

Figure:-3 Input Image

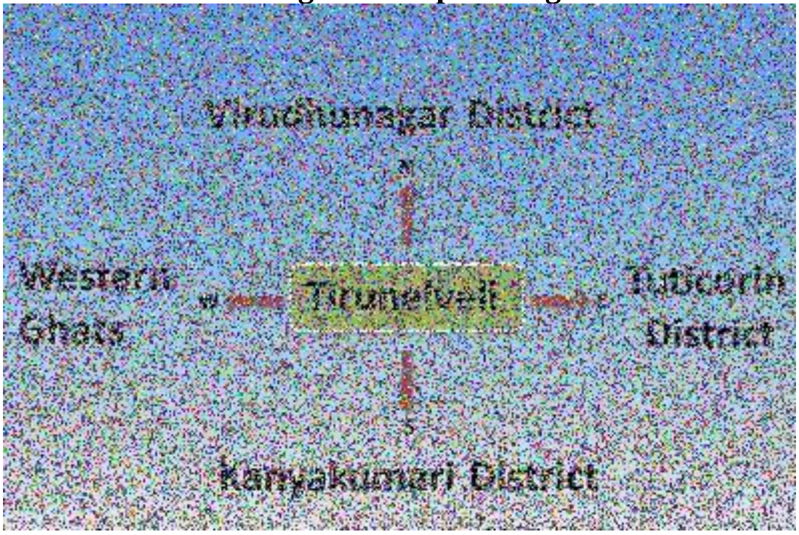

Figure:-4 Iteration-1 Image Restoration Technique

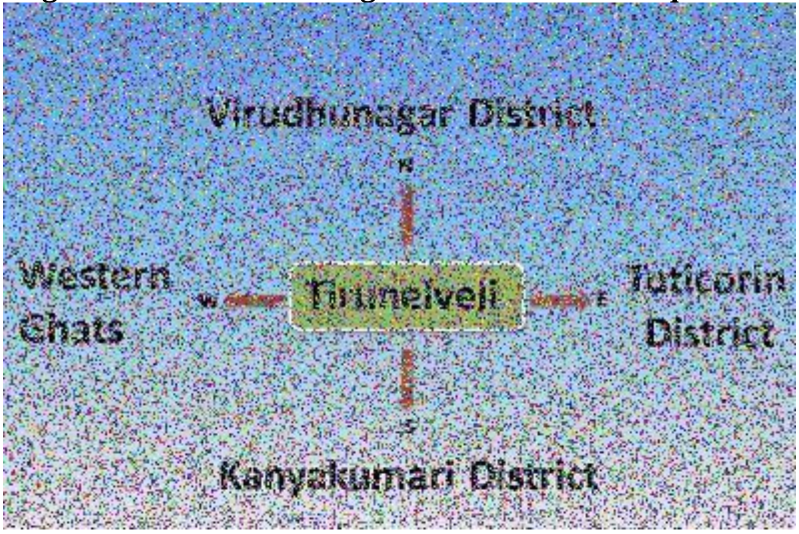

Figure:-5 Iteration-2 Image Restoration Technique

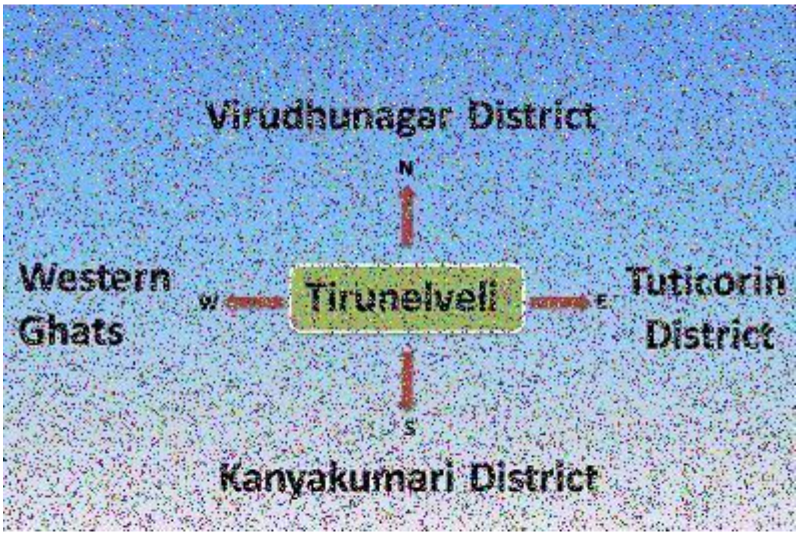

Figure:-6 Iteration-3 Image Restoration Technique

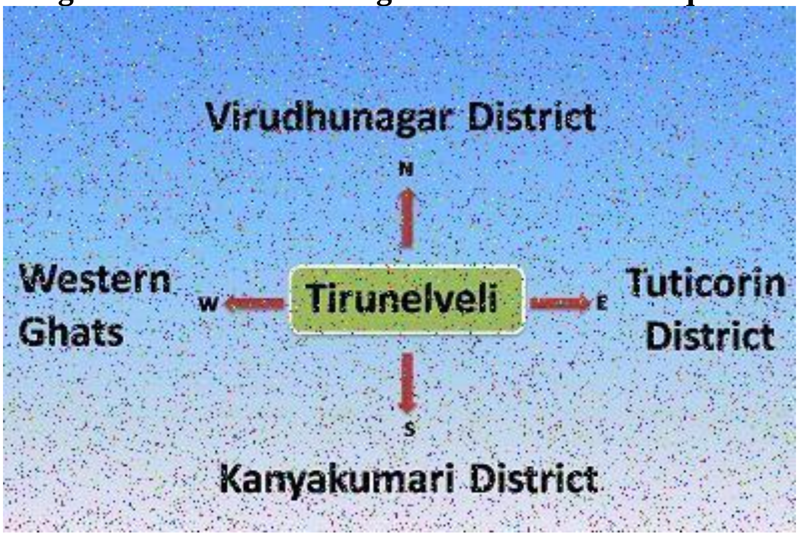

Figure:-7 Iteration-4 Image Restoration Technique

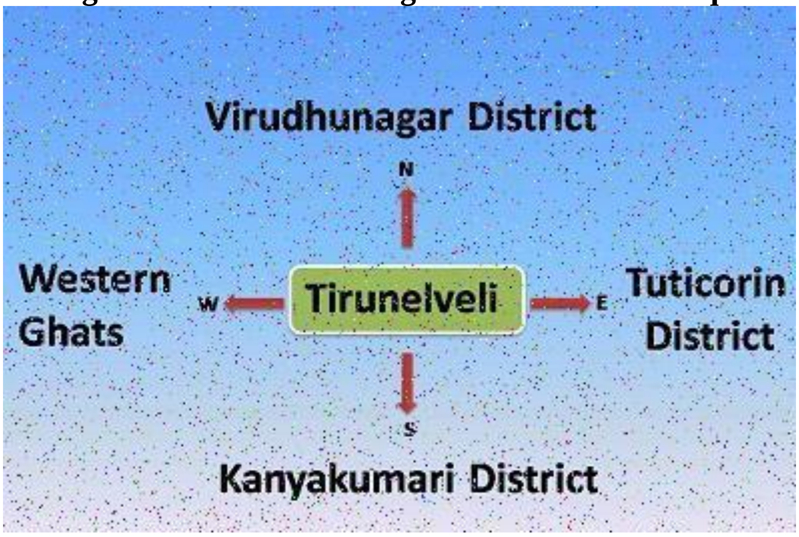

Figure:-8 Iteration-5 Image Restoration Technique

The image restoration progress can be observable in the following table indicators from the proposed image restoration process.

Table-1:Image Restoration Value-Tool indicators

Sl.No	Iteration	Noise level	Image restoration value
1	Level-0	81%	19%
2	Level-1	73%	27%

3	**Level-2**	**61%**	**39%**
4	**Level-3**	**47%**	**53%**
5	**Level-4**	**23%**	**77%**
6	**Level-5**	**12%**	**88%**

IV.RESULTS AND DISCUSSIONS

The following graph pinpoints the development of image restoration process through several iterations.

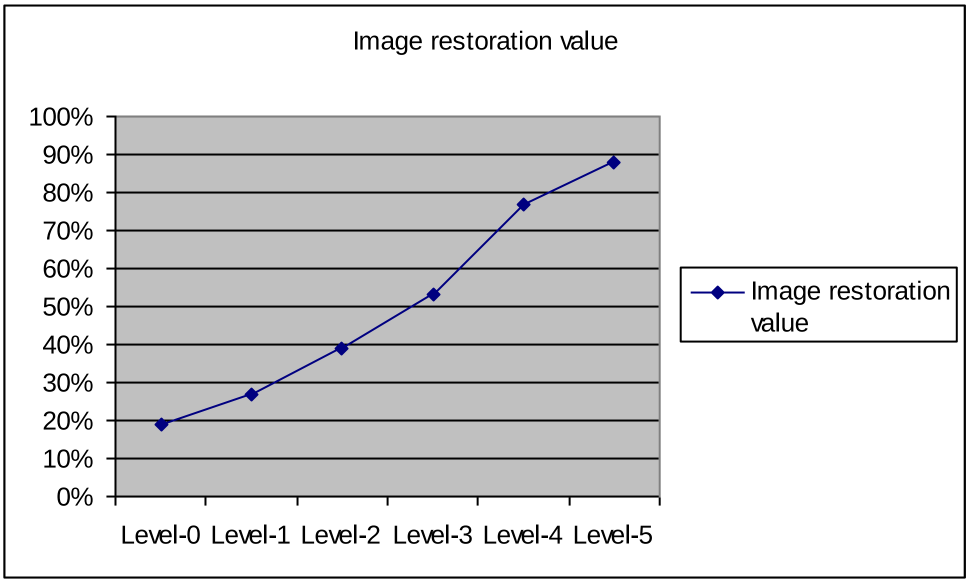

Figure 9:Image Restoration gain process improvements

The first thing we have to do is pick a λ, where λ must satisfy the following

$$|1 - \lambda B(\omega_1, \omega_2)| < 1$$

and thus will be a positive integer in the range of 0 to 1. The bigger λ is, the faster $\hat{f}_k$ and $\hat{f}_{k+1}$ will converge. However, picking too large a λ may also make $\hat{f}_k$and $\hat{f}_{k+1}$ diverge instead of converge. Imagine that we're walking along a path and the end of the path is a cliff. λ is the size of of the steps we take. We want to go to the edge of the path as fast as possible without falling off. Taking large steps will ensure that we will get there fast but we'd probably first. Taking small will ensure that we get there without falling off but it could take an infinite amount of time. So the compromise would be to take big steps at the start and decrease our step size as we get close to our destination.

The following is the noiseless image after 150 iterations. λ starts off at 0.1 and decreases by 10% every 25 iterations.

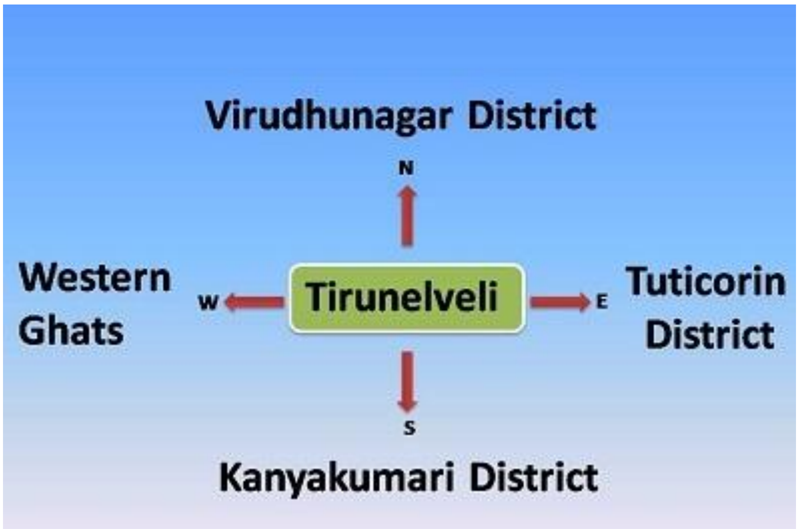

Figure-10;Optimal output Image

V.CONCLUSION

Image restoration is a highly technical process to implement in an efficient way. The image collection and the iteration allocation is a scientific methodology to implement. Our proposed methodology make it as an easy process by the further focusing of images into sub blocks.

For a given image size, we are limited in the number of blocks we can break our image into. For multiple degraded images, we may be limited by how many image snapshots we can obtain. So we are limited in both cases by how many iterations we can average over, and this profoundly affects our estimations. This is one of the main drawbacks that we found in homomorphic techniques.

In near future this research will focus on an optimal algorithmic identification of Image restoration process.

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