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Noise Dismissal from Images Using Nonlinear Algorithms

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ABSTRACT

Impulse noise reduction or removal is a very active research area of image processing. This paper presented a constrained optimization type of numerical algorithm for removing noise from images. The complete variation of the digital image is reduced subject to constraints involving the measurements of the noise. The parameters are imposed using Lagrange multipliers. The solution is secured using the gradient-projection method. This method uses a time dependent partial differential equation on a manifold determined by the boundary conditions. At time of zero the solution converges to a steady state condition results the de-noised image. It is very difficult to get image with normal methods this is over come by the numerical algorithm as it is simple and relatively fast. The results appear to be state-of-the-art for very noisy images. The method is asymptomatic, gives sharp edges in the image. The technique elucidate as a first step of moving each level set of the image normal to itself with velocity equal to the curvature of the level set divided by the magnitude of the direction of the image, and a second step which projects the image back onto the curtailment set.
Keywords: Image processing, Lagrange multipliers, numerical algorithm

I. INTRODUCTION

If you have a digital camera, whether you have a latest top of the line DSLR or a easy point and capture, you will at some point obtain images with little dots all over the picture. These small dots might not be most noticeable when you focus at the image on the back of the camera, but when you zoom in and view the image at 100% on your computer, they all of a sudden become quite visible. This noise can be reduced using the selective Gaussian blur filter. It works on time marching procedure and Level Set Methods are numerical techniques which can track the evolution of interfaces.

These interfaces can expand sharp corners, break apart, and merge together.
The techniques have a huge range of applications, including problems in fluid mechanics, combustion, and manufacturing of computer chips, computer animation, image processing, structure of snowflakes, and the shape of soap bubbles, Such schemes usually go unstable and raises up as the curvature builds around a joint, since small errors in the position produce large errors in the determination of the curvature. These techniques, based on high-order upwind formulations, are particularly attractive, since they are highly stable, accurate, and preserve un- modulated.

A nonlinear hybrid filter for removing fixed impulse noise (salt & pepper) noise from color images has been proposed in this study. Technique is based on mathematical morphology and trimmed standard median filter It removes the fixed impulse noise (salt & pepper) very well without distorting the image features, color components and edges. It does not introduce blurring and moving effects even in high noise densities (up to 90%). Noise introduces random variations into image that fluctuate the original values to some different values. Causes which may introduce noise to images include flaws in data transmission, imperfect optics, sensor malfunctioning, processing techniques and electronic interference.

This work evaluates several standard and state-of-the-art noise reduction techniques using both in silico and physical phantoms, and ex vivo rat coronary data for their ability to improve vascular network analysis. We compared five noise reduction approaches, including vendor-supplied (Gaussian smoothing), conventional (median filter) and advanced (i.e. wavelet filter with soft thresholding, block-matching collaborative filtering (BM3D), and isotropic and anisotropic total variation de-noising) techniques. The latter two methods were chosen for their reported ability to preserve fine details, a prerequisite for a successful microvascular extraction. The full evaluation pipeline included the reconstruction from projection images, de-noising, vascular segmentation and graph model extraction to be performed on all simulated and real image data sets. SNR, CNR and 3D NPS were quantified from denoised images, and where the ground truth was known, Sørensen–Dice coefficients, Jaccard index metrics were calculated as measures of segmentation error. A new method is proposed that can achieve a better performance in comparison with the traditional method. Median filter is used in some part of spectrum of noisy images to reduce the noise. At the second part of this paper, to demonstrate the robustness of the proposed method, it is implemented for some noisy images that have moire' pattern.

Experiments on noisy images with different characteristics show that the proposed method increases the PSNR values compared with previous methods [5]. Recently, a μCT technique to reduce this blurring effect was proposed by placing the specimen (a rat liver) very close to the detector array. It is well known that PVEs depend on several factors: type of scanner (spatial resolution, x-ray source focal spot and detector), the size of the specimen, the range of the attenuation coefficients, motion, and other temporal effects. In our study, by applying post-reconstruction techniques like the wavelet regularization, BM3D and ITV are known to preserve fine details, the blurring effect associated with PVE and with the reconstruction algorithm should be decreased.

II. REASONS FOR NOISE

A.CAMERA SENSORS: Image noise emerges from either the camera sensor or the sensitivity of the camera sensor, or sometimes both. a sensor that collects light particles via very tiny buckets called "photo sites", which later become pixels in the final digital image. For example, if your digital camera is equipped with a 10 megapixel sensor, it means that there are 10 million photo sites present on the camera sensor. The size of the photo sites plays a vital role on the collection of noise that is current in the image. Generally, the smaller the photo site, the noisier the image obtained. This is where the size of the sensor comes into play. If you took a DSLR and a point and shoot camera and both have 10 megapixel sensors, the DSLR would yield a huge cleaner image with a much less noise when compared to the point and shoot image. This is because DSLR's have much larger sensors (full frame sensors can be 15+ times bigger in size than sensors in point and shoot cameras) and therefore can accommodate larger photo sites compared to point and shoot. If you use a phone camera, you might see plenty of noise in images even during bright sunny days, which happens because too many pixels are crammed into a tiny sensor. Consequently, smaller sensors with a large number of pixels generally produce noisier images.

B.SENSITIVITY OF SENSORS: The second source of camera noise is the sensitivity level of the camera sensor, known as ISO in photography. ISO is simply a camera setting that will brighten or darken a photo. Photos will grow progressively brighter as ISO increase number. Basically, as camera ISO increases, the amount of noise automatically increases. For example, increasing ISO from 100 to 200 doubles the sensor sensitivity and could be result in more noise.

III. TECHNIQUES FOR IMAGE NOISE REDUCTION

A. An isotropic diffusion

In image processing and computer vision, anisotropic diffusion, also called Perona–Malik diffusion, is a technique aiming at reducing image noise without removing significant parts of the image content, typically edges, lines or other details that are important for the interpretation of the image

B. Average with limited data validity

In image analysis, the average with limited data validity is an image filter for feature-preserving noise removal, consisting in a smoothing filter that only involves pixels satisfying some validity criterion

C. Bilateral filter

A bilateral filter is a non-linear, edge-preserving, and noise-reducing smoothing filter for images. It replaces the intensity of each pixel with a weighted average of intensity values from nearby pixels

D. Dark frame subtraction

In digital photography, dark-frame subtraction is a way to minimize image noise for photographs shot with long exposure times, at high ISO sensor sensitivity or at high temperatures. It takes advantage of the fact that a component of image noise, known as fixed-pattern noise, is the same from shot to shot

E. Gaussian Blur

In image processing, a Gaussian blur (also known as Gaussian smoothing) is the result of blurring an image by a Gaussian function. It is a widely used effect in graphics software, typically to reduce image noise and reduce detail. The visual effect of this blurring technique is a smooth blur resembling that of viewing the image through a translucent screen, distinctly different from the bokeh effect produced by an out-of-focus lens or the shadow of an object under usual illumination.

F. Local pixel grouping

In image Noise reduction, **local pixel grouping** is the algorithm to remove noise from images using principal component analysis (PCA)

G. Non local means

Non-local means is an algorithm in image processing for image denoising. Unlike "local mean" filters, which take the mean value of a group of pixels surrounding a target pixel to smooth the image, non-local means filtering takes a mean of all pixels in the image, weighted by how similar these pixels are to the target pixel.

IV. NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS BASED DENOISING ALGORITHMS.

Let the observed intensity function u0(x, y) denote the pixel values of a noisy image for x, y˜ O. Let u(x, y) denote the desired clean image, so Uo(X, Y) = u(x, y) + n(x, y), when n is the additive noise. Two dimensional continuous framework their constrained minimization problem is minimize $\int_{\Omega} (u_{xx} + u_{yy})^2$

Subject to constraints involving the mean $\int_{\Omega} u = \int_{\Omega} u_0$ and standard deviation $\int_{\Omega} (u - u_0)^2 = \sigma^2$

The resulting linear system is now easy to solve using modern numerical linear algebra.

Gaussian random variable Z

$$p.d.f. \quad f_Z(z) = \frac{1}{\sqrt{2\pi}} \cdot e^{-0.5z^2}$$

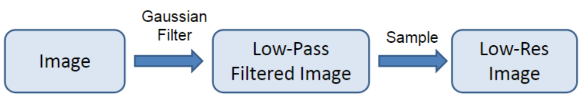
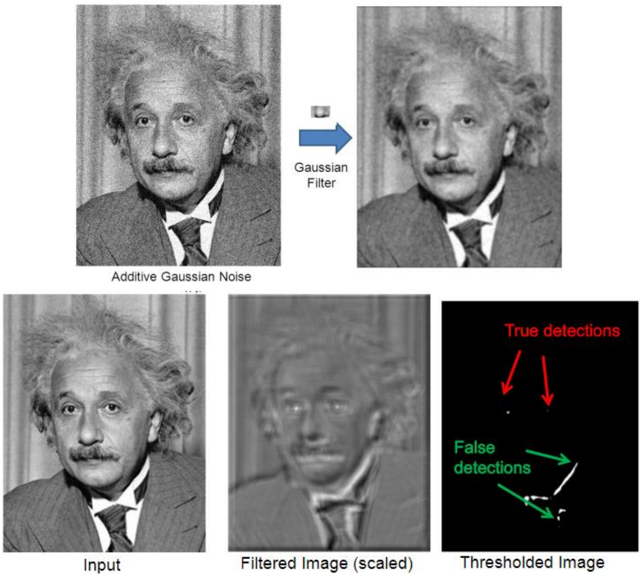
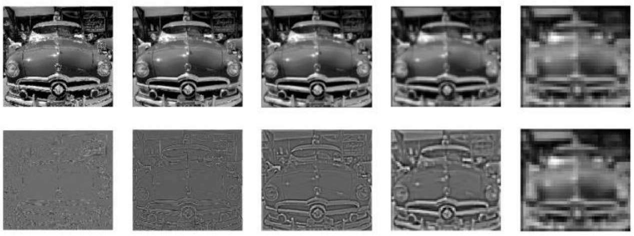


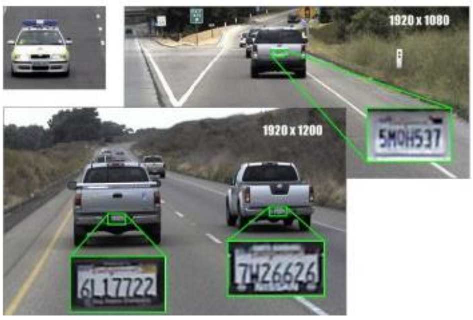
Figure 1. Schematic diagram of steps in Gauss filter

For finding the nose in image shown in below figure has been matched using non linear algorithm. Image has been filtered with nose patch.



A constrained optimization method of numerical algorithm for deleting noise from pictures is presented. The complete variation of the picture is reduced subject to constraints involving the statistics of the noise. The constraints are imposed using Lan range multipliers. The solution is get using the gradient-projection method. This amounts to solving a time dependent partial differential equation on a manifold determined by the constraints





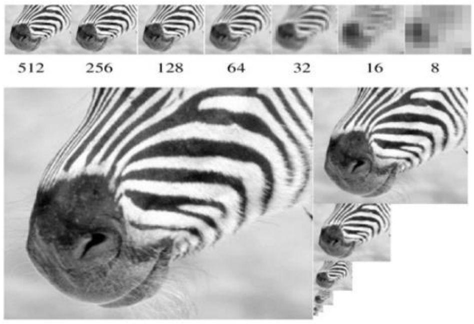


Figure 2. Template matching Gauss pyramid

The Gaussian pyramid is calculated as follows. The source image is involved with a Gaussian kernel. As defined above the resulting image is a low pass filtered version of the original image. The cut-off frequency can be controlled using the parameter σ. The Laplacian is then computed as the difference between the source image and the low pass filtered image. This process is continued flow to obtain a group of band-pass filtered pictures (since each is the difference between two levels of the Gaussian pyramid).the variation of Gaussian and Laplacian is that the Laplacian pyramid is a set of band pass filters.

A low pass pyramid is construct by smoothing the picture with an appropriate smoothing filter and then subsampling the smoothed picture, usually by a factor of 2 along each coordinate angles. The resulting image is then subjected to the same format, and the cycle is repeated huge times. Each cycle of this operation results in a less image with increased smoothing, but with decreased spatial sampling density (that is, decreased image resolution). If illustrated graphically, the entire multi-scale representation will look like a pyramid, with the original image on the bottom and each cycle's resulting smaller image stacked one atop the other

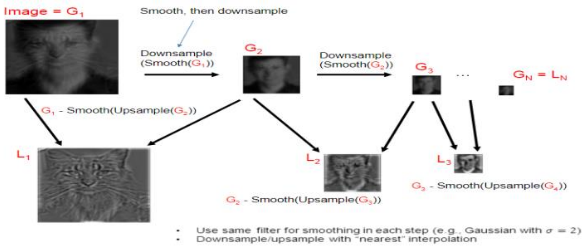
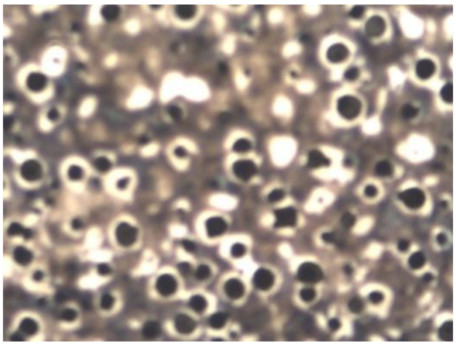


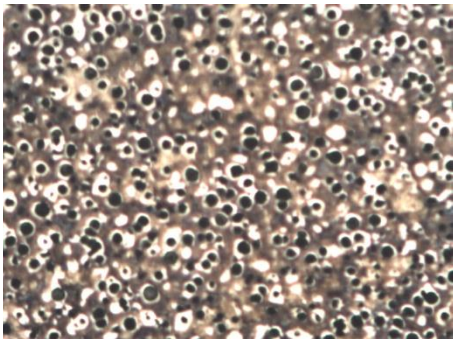
Figure 3. The major use of this pyramids is compressive

V. RESULT ANALYSIS

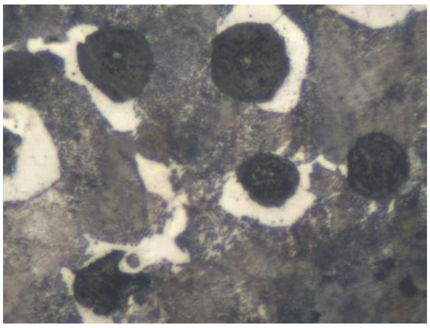
The analysis is performed for cast-iron plate in metallurgy laboratory using 50X, 100X, 200X, 1000X. Magnificent lenses. The images are shown in figure below figure 4.



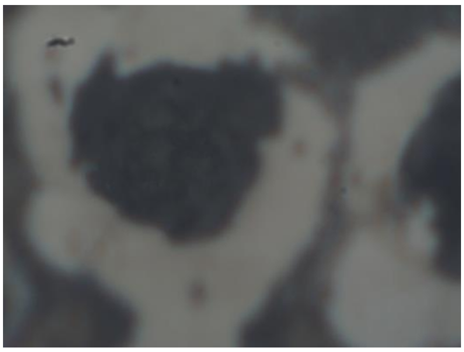
50X



200X



500X



1000X

From the test run of two-dimensional de-NOISING algorithm it is clear that Gaussian non liner image filter has merits over of itself. Images displayed on integer value 0 to 250. The processing takes place on a function whose values generally lie arbitrarily far outside the original range. The scale of the Gaussian controls the pixels of the resultant image and thus the size of the structures that can be measured.

VI. REFERENCES

[1]. IsmaIrum MuhammadSharif MudassarRaza SajjadMohsin, "A Nonlinear Hybrid Filter for Salt & Pepper Noise Removal from Color Images ," Journal of International Business Studies, Journal of Applied Research and Technology Volume 13, Issue 1, February 2015,

[2]. K.N. Plataniotis, A.N. Venetsanopoulos, Color image processing and applications, Springer (2000)

[3]. R. Kulkarni, Novel Restoration Techniques for Images Corrupted with High Density Impulsive Noise, National , nstitute of Technology, Rourkela, INDIA (2012)

[4]. Valentina Davidoiu1 , Lucas Hadjilucas1 , Irvin Teh2 , Nicolas P Smith1,3 , Jürgen E Schneider2,4 and Jack Lee1, Evaluation of noise removal algorithms for imaging and reconstruction of vascular networks using micro-CT, Biomed. Phys. Eng. Express 2 (2016) 045015 doi:10.1088/2057-1976/2/4/045015

[5]. Seyede Mahya Hazavei, A New Method for Removing the Moire' Pattern from Images Kline T and Ritman E 2012 Studying Microcirculation with Micro-CT (Wiley-VCH Verlag) pp 313-47 XXIII (4), pp. 605-635, 1992. (journal style)

[6]. R. Caves, Multinational Enterprise and Economic Analysis, Cambridge University Press, Cambridge, 1982. (book style)

[7]. R. Caves, Multinational Enterprise and Economic Analysis, Cambridge University Press, Cambridge, 1982. (book style)

[8]. M. Clerc, "The Swarm and the Queen: Towards a Deterministic and Adaptive Particle Swarm Optimization," In Proceedings of the IEEE Congress on Evolutionary Computation (CEC), pp. 1951-1957, 1999. (conference style)

[9]. H.H. Crokell, "Specialization and International Competitiveness," in Managing the Multinational Subsidiary, H. Etemad and L. S, Sulude (eds.), Croom-Helm, London, 1986. (book chapter style)

[10]. K. Deb, S. Agrawal, A. Pratab, T. Meyarivan, "A Fast Elitist Non-dominated Sorting Genetic Algorithms for Multiobjective Optimization: NSGA II," KanGAL report 200001, Indian Institute of Technology, Kanpur, India, 2000. (technical report style)

[11]. J. Geralds, "Sega Ends Production of Dreamcast," vnunet.com, para. 2, Jan. 31, 2001. Online]. Available: http://nl1.vnunet.com/news/1116995. Accessed: Sept. 12, 2004]. (General Internet site)