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Digital image processing Image Enhancement in Spatial Filtering

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Abstract:- **Computational techniques involving contrast enhancement and noise filtering on two-dimensional image arrays are developed based on their local mean and variance. These algorithms are nonrecursive and do not require the use of any kind of transform. They share the same characteristics in that each pixel is processed independently. Consequently, this approach has an obvious advantage when used in real-time digital image processing applications and where a parallel processor can be used. Spatial filtering refreshing can be done Sharpening filters using by 1st derivative filters and 2nd derivative filters Followed by the Combining filtering to achieve the enhanced quality images for old age images, palm leaf also beautifying and extract actual content in that very easily also possible in this method.**

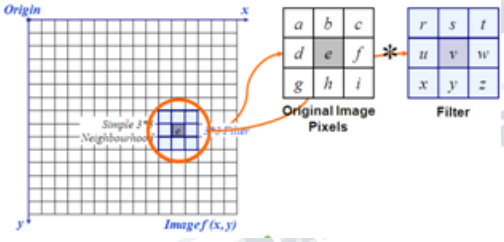
***Keywords*—(Two dimentional array, filtering, spatial, refresher,sharpaning, sobal, Laplacian, colored image)**

I. INTRODUCTION

Algorithm for Image Enhancement in Spatial Filtering

Step 1: Spatial Filtering Refresher

For every pixel in the original image to generate the smoothed image by the below Equ-1



$$e_{processed} = v*e + r*a + s*b + t*c + u*d + w*f + x*g + y*h + z*i \qquad Equ\text{-}1$$

Step 2: Sharpening spatial filters seek to highlight fine detail.

The purpose is remove blurring from images and highlight edges Sharpening filters are based on spatial differentiation. Differentiation measures the rate of change of a function. it is have two derivatives

Step 2.1 : 1st Derivative derivative of a function is as follows

$$\frac{\partial f}{\partial x} = f(x+1) - f(x) \qquad Equ\text{-}2$$

It's just the difference between subsequent values and measures the rate of change of the function

Step 2.2: The 2nd derivative of a function is as follows:

$$\frac{\partial^2 f}{\partial^2 x} = f(x+1) + f(x-1) - 2f(x) \qquad Equ\text{-}3$$

Simply takes into account the values both before and after the current value. The result of a Laplacian filtering is not an enhanced image. We have to do more work in order to get our final image.

Step 3: Laplacian filtering using of 2nd derivative of a function

The Laplacian is defined as follows:

$$\nabla^2 f = \frac{\partial^2 f}{\partial^2 x} + \frac{\partial^2 f}{\partial^2 y}$$

Equ-4 where the partial 1st order derivative in the *x* direction is defined as follows:

$$\frac{\partial^2 f}{\partial^2 x} = f(x+1, y) + f(x-1, y) - 2f(x, y)$$

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Equ-5 and in the *y* direction as follows:

$$\frac{\partial^2 f}{\partial^2 y} = f(x, y+1) + f(x, y-1) - 2f(x, y)$$ Equ-6

So,Equ-5 & Equ-6 the Laplacian can be given as follows:

$$\nabla^2 f = [f(x+1, y) + f(x-1, y) + f(x, y+1) + f(x, y-1)] - 4f(x, y)$$

Equ-7

Table 1

0	1	0
1	-4	1
0	1	0

We can easily build a filter based on this Subtract the Laplacian result from the original image to generate our final sharpened enhanced image

$$g(x, y) = f(x, y) - \nabla^2 f$$

Equ-8 The entire enhancement can be Equ-7 & Equ-8 combined into a single filtering operation

$$= f(x, y) - [f(x+1, y) + f(x-1, y) + f(x, y+1) + f(x, y-1) - 4f(x, y)]$$

Equ-9

$$= 5f(x, y) - f(x+1, y) - f(x-1, y) - f(x, y+1) - f(x, y-1)$$ Equ-10

The result of a Laplacian filtering is not an enhanced image.We have to do more work in order to get our final image

Step 4: Sobel filters are typically used for edge detection from above laplacian equation from deriving sobel equation

There is some debate as to how best to calculate these gradients but we will use:

$$\nabla f \approx |(z_7 + 2z_8 + z_9) - (z_1 + 2z_2 + z_3)| + |(z_3 + 2z_6 + z_9) - (z_1 + 2z_4 + z_7)|$$

Equ-11

which is based on these coordinates

Table 2

z_1	z_2	z_3
z_4	z_5	z_6
z_7	z_8	z_9

Based on the previous equations Equ-5 & Equ-6 we can derive

Table 3

-1	-2	-1
0	0	0
1	2	1

Table 4

-1	0	1
-2	0	2
-1	0	1

The Sobel Operators to filter an image it is filtered using both operators the results of which are added together Combining Spatial Enhancement Methods sample after Spatial Filtering by Figure 1 & Figure 2

Figure 1

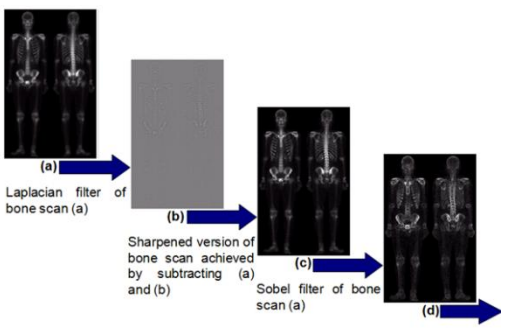

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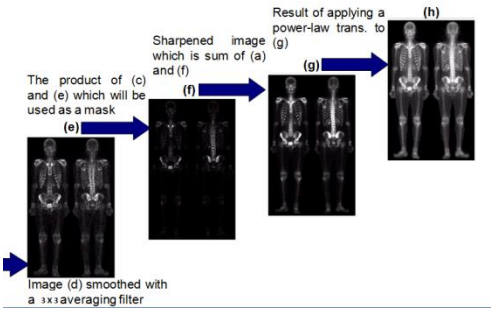
Figure 2



II. FUTURE SCOPE

The algorithms can be extended in such a way that the way of reducing the noise from an image without losing the actual and important information. A thorough research can be done in choosing a different images suitable for denoising a Particular image.Some image processing applications require an accurate determination of object boundary. In future research, the present algorithms can be extended with the help of morphological operations to extract the boundary of the medical objects which in turn useful in image topology.

III. CONCLUSION

In this paper, MRI & old-age spatial image de-noising filters have been developed. These filters work to remove abnormal pixels (noise) from an image by using some calculations that depend on the pixel distance and inverting the distance between pixels. The extracted results obviously illustrate the efficiency of the proposed filters and give better image quality compared to the mean filter, which is used widely in image enhancement of the cardinality of 5 (5 x 5 kernel). Itis possible to improve these filters further by adding more criteria, such as threshold, or by expanding the filter kernel cardinality. This is left for future work.

In this paper, we have investigated a hot research topic—clear screen content IQA and image. Because of a great amount of computer-created graphical content that usually consists of texts and graphics. We have developed a new algorithm technique proposed metric is simple and has low time complexity. Interpretation of palm images, MRI images and age-old images is difficult due to inherent noise and in homogeneity. filtering is considered as vitally important step in image analysis . Several methods are employed for image is remove blurring , Sharpening image and edge detection etc.

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