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REVIEW ARTICLE

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Survey Paper on Vector valued image processing using parallel level sets.

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ABSTRACT

The use of digital image processing techniques has many advantages in terms of enhancing the quality of a picture. Most of the image processing tools use the CMYK model but the RGB color model yields a better output. There is a strong inter-channel correlation in vector valued images which is yet to be explored. Based on the angle between the spatial gradients of their channels, we put forward a new perception of treating vector-valued images. We can attain our desired objective, minimizing the cost functional which reprimands large angles. Placing forward the idea and the corresponding cost functional we discuss their Gâteaux derivatives that lead to a diffusion-like gradient descent scheme. Denoising and demosacking help in exemplifying the properties of cost functional. For low level noised images demosacking will provide superior results.

Keywords-Parallel level sets, vector-valued images, variational methods, non-linear diffusion, denoising, demosaicking.

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INTRODUCTION

Consider the images that are clicked on a bright sunny day, the images are unblemished and the details are sharp and uncluttered. But consider the images which are clicked on a dull day, in low light or during night; the images contain noise and are a lot grainy. The camera sensors adjust automatically to a high ISO and slow shutter speed which results in yielding noise and clamor. Cameras in general have a greater apperture opening which results in sharp focus at a particular point of the picture and it's adjacent level as a result of which the sharpness of the rest of the picture is compromised. Due to these factors a lot of valuable information is sometimes lost which is inevitable. Thus to prevent the loss of such vital and significant information, this platform will provide an interface to deal with the delinquents stated above.

Most of the image processing applications at a single point in space provide more than one piece of information. The RGB color model at any point encodes the amount of red green and blue color. Most of available image processing tools are designated for scalar valued images if applied independently channel by channel on vector valued images it fails to exploit the information expressed the correlation between channels. Color total variation is a noticeable example of using information amid channels. The color total variation is based on a Eigen values of the structure tensor, thus it penalizes image variation at every point by taking information into account from its neighborhood. The results illustrate the efficiency of the proposed approach as well as the amended performance. The so called Nambu functional is produced by using the concept of Polyakov action. In order to get parallel level sets, the gradients are associated. Image enhancing techniques like denoising and demosaicking use the enhanced common structures.

II. RELATED WORK

The formerly published papers include denoising, demosaicking**.**

Most image processing tools are designed for scalar-valued images or when applied to vector- valued images they process these independently channel by channel, the information accessible is not expressed in the correlation between channels.

One prominent example of using information between channels is color total variation. This extension of the scalar-valued version leads to a non-linear diffusion scheme where the diffusivity depends on all channels. This approach is extended, where several variational methods in image processing of vector-valued images are combined using the concept of Polyakov action which yields the so called Nambu functional

2.1 Demosaicking

It is an algorithm used in digital image processing to reconstruct a full color image from the incomplete color samples. It is called as CFA (Color Filter Array) interpolation or color reconstruction. The most commonly used CFA is the Bayer Filter which consists of square grids of photosensors.

2.2 Denoising

The basic notion in image denoising is noise reduction through image blurring. This blurring can be done locally. For eg, in Gaussian smoothing model or by calculus of variations. Images taken conventionally pick up noise from a number of sources. This noise can be removed fully or partially through denoising.

2.3 Segmentation

The division of an image into meaningful structures, image segmentation, is often an essential step in image analysis, object representation, visualization, and many other image processing tasks Algorithms. A great variety of segmentation methods has been proposed in the past decades, and some categorization is necessary to present the methods properly here. A disjunctive categorization does not seem to be possible though, because even two very different segmentation approaches may share properties that defy singular categorization1. The categorization presented in this chapter is therefore rather a categorization regarding the emphasis of an approach than a strict division.

The following categories are used:

- **Threshold based segmentation.** Histogram threshold and slicing techniques are used to segment the image. They may be applied directly to an image, but can also be combined with pre- and post-processing techniques.
- **Edge based segmentation.** With this technique, detected edges in an image are assumed to represent object boundaries, and used to identify these objects.
- **Region based segmentation.** Where an edge based technique may attempt to find the object boundaries and then locate the object itself by filling them in, a region based technique takes the opposite approach, by (e.g.) starting in the middle of an object and then “growing” outward until it meets the object boundaries.

• **Clustering techniques.** Although clustering is sometimes used as a synonym for (agglomerative) segmentation techniques, we use it here to denote techniques that are primarily used in exploratory data analysis of high-dimensional measurement patterns. In this context, clustering methods attempt to group together patterns that are similar in some sense. This goal is very similar to what we are attempting to do when we segment an image, and indeed some clustering techniques can readily be applied for image segmentation.
• **Matching.** When we know what an object we wish to identify in an image (approximately) looks like, we can use this knowledge to locate the object in an image. This approach to segmentation is called matching.

2.4 Algorithms

2.4.1 Segmentation Algorithms

K-means clustering algorithm Chan Vese image segmentation CVK algorithm. For undamaged, unlurred, synthetic images, all three algorithms (K-means, CV and CVK) work well. For natural images or noisy images, the K-means algorithm cannot be used to completely segment the images although it can still be useful to create an initial guess for other algorithms. CV and CVK are designed to handle these images as well.

2.4.2 CVK ALGORITHM

Full domain
Narrow band
Multi resolution

In the narrow band method, time is saved because calculations are only performed on a small domain. On the other hand, extra administration is needed to calculate and store the location of the narrow band. In the current implementation, the narrow band does not result in speedup but some speed down, whereas previous versions of the narrow band did result in speedup. This is not a flaw in the current implementation of the narrow band method. In previous implementation of the full domain method, the level set methods had to be reinitialized after every iteration. This could be eliminated in the current implementation of the full domain method, but not in the implementation of the narrow band method.

III. PROBLEM DEFINITION AND SCOPE

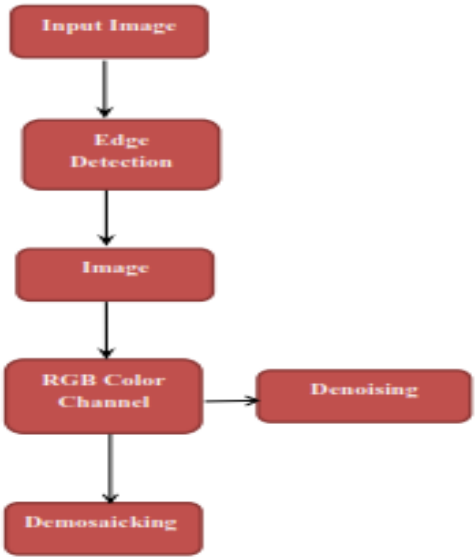
A. Problem Statement

Enhancing images on a masked zone using denoising and demosaicking.

B. Scope

Previously CMYK color model was being used for enhancing images but the results were not paramount and were not convincing enough. Thus the RGB color model came into use because it improves the image quality. RGB color model has a wide range of colors other than CMYK which produces colors that are more vivid and vibrant. The colors produced by CMYK are mostly beyond the range of RGB and are typically dull and dark. In medical field, for a similar spatial point, different scanners measure different properties. An example of it is the Computed Tomography (CT) scanner which measures the absorption of X-rays.

IV. BLOCK DIAGRAM



V. GOALS AND OBJECTIVES

In our project we are allowing the clients or users those who are registered and have a login id and password to access the software. An image is to be used as an input that is to be boosted and after the desired functionalities are implemented on the input, the result can be saved.

5.1 Features

1) File List: It will display list of files on computer.
3) Open and view files: It will open the selected file for viewing purpose.
4) Functions: Denoising and demosaicking for image augmentation.
5) Save files: It will save the file by the users on the system.
6) Close application: The application should be closed after use.

VI. ADVANTAGES OF SYSTEM

Most of the platforms formerly developed had CMYK color model; due to which the color range was minimized. On the contrary, the RGB color model has a broader color range which also provides a greater profundity of colors and also an enhanced PPI.

1) Availability: The platform can be easily availed in a system
2) Cost effective: There is no extra hardware required in developing the software which reduces the cost.
3) Efficiency: It requires lesser efforts, amount and time
4) Reliability: It has the ability to function specifically for reducing noise and blurriness and detecting the edges.

VII. CONCLUSION

We propose a framework based on RGB color model which can be used for image enhancement of vector- valued images which overcomes the flaws of the CMYK color model. The inter-channel correlation is exploited which is inherent in many vector-valued images such as RGB images. The examples presented in this paper indicate that exploiting this correlation leads to better, sharper reconstructions with fewer artifacts. The results show that RGB model is a promising tool for vector-valued image processing tasks. While showing the usage for denoising and demosaicking it is easily extendible to other applications where more complicated operators are involved. This includes for instance simultaneous reconstruction of multi-modal medical imaging

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