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Texture Segmation Based Filters for Water Images

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Abstract— Image segmentation is a mechanism used to divide an image into various segments. It will make image flat and easy to evaluate. Segmentation process also helps to find region of interest in a particular image. The main goal is to make image simpler and meaningful. Image Segmentation is an main pixel based measurement of image processing which often has a large impact on quantitative image study result. The texture is the main attribute in many image analysis or computer vision applications. The procedures developed for texture segmentation can be subdivided into four categories: structural approach, statistical approach, model based approach and filter based approach. Different definitions of texture are described, but more importance is given to filter based methods, such as Median Filter, Gaussian Smoothing and Mean Filter. These filters are used in Water images. The main objective of this analysis is to study different filtering methods for texture segmentation of water images.

Keywords— Image Processing, Segmentation, Median Filter, Gaussian Smoothing, Mean Filter

I. INTRODUCTION

Image segmentation which are still being used by the researcher are Edge Detection, Threshold, Histogram, Region based methods, and Watershed Transformation. Images are divided into two type on the basis of their color, i.e. gray scale and color images. Hence image segmentation for color images is totally different from gray scale images ie content based image retrieval. One of the main goal of image processing is to retrieve required information from the given image in a way that it will not effects the other features of that image. Noising/improvement of an image is the most important step required to fulfill this requirement. Image Segmentation is one of the main step of image processing in which any image is being subdivided into multiple segments. Every one segment will represent some kind of information to user in the form of color, intensity, or texture. It is important to isolate the boundaries of any image in the form of its segments. This process of segmentation will assign a single value to each pixel of an image in order to make it easy to differentiate between different regions of any image. This isolation between different segments of image is done on the basis of three properties of image, i.e., color, intensity, and texture of that image.

Texture can be identified as a measure of the variation in the intensity of a surface, quantifying properties such as smoothness, coarseness and regularity. It is widely used as a region descriptor in image analysis and digital vision. Textures characterized by the distribution of gray levels in the adjacent pixels. Resolution at which image is extracted determines how texture is perceived. An effective and efficient texture segmentation method is very useful in applications like analysis of aerial images, biomedical images and seismic images as well as automation of industrial applications, surface inspection. Texture is concerned with quality described as the repetition of the local spatial patterns. Many textural dimensions or parameters are commonly proposed, namely, coarseness, contrast, roughness, density, directionality, frequency, regularity, orientation, uniformity and so on.

II. LITERATURE REVIEW

V. Bhosle [1] in the paper "Texture Segmentation: Different Methods" discussed that Image Segmentation is an important pixel base measurement of image processing, which often has a large impact on quantitative image analysis results. The texture is most important attribute in many image analysis or computer vision applications. The procedures developed for texture problem can be subdivided into four categories: structural approach, statistical approach, model based approach and filter based approach. Different definition of texture is described but more import is given to filter based methods. Fourier transform, Gabor, Thresholding, Histogram and wavelet transforms. These filters are used to VisTex images and Brodatz Textures Database. The main objective of this paper is to study different methods for texture segmentation.

D. Wang [2] in the paper "Factorization-Based Texture Segmentation" introduced a factorization-based approach that efficiently segments textured images. They used local spectral histograms as features, and construct an M × N feature matrix using M-dimensional feature vectors in an N-pixel image. Based on the observation that each feature can be approximated by a linear combination of several

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representative features, they factor the feature matrix into two matrices-one consisting of the representative features and the other containing the weights of representative features at each pixel used for linear combination. The factorization method is based on singular value decomposition and nonnegative matrix factorization. The method uses local spectral histograms to discriminate region appearances in a computationally efficient way and at the same time accurately localizes region boundaries. The experiments conducted on public segmentation data sets show the promise of this simple yet powerful approach

HaindlMikes [3]in the paper “Unsupervised Texture Segmentation” discussed three efficient and robust methods for unsupervised texture segmentation with unknown number of classes based on the underlying Markovian and GM texture models and their modifications for medical mammographics and remote sensing applications, respectively. Although these algorithm use the random field type models they are fast because they use efficient recursive or pseudo-likelihood parameter estimation of the underlying texture model and they are much faster than the usual Markov unsupervised segmentation.

NawalHouhou, Jean-Philippe Thiran and Xavier Bresson[4] in the paper “Fast Texture Segmentation Based on Semi-Local Region Descriptor and Active Contour” presented an efficient approach for unsupervised segmentation of natural and textural images based on the extraction of image features and a fast active contour segmentation model. We address the problem of textures where neither the gray-level information nor the boundary information is adequate for object extraction. This is often the case of natural images composed of both homogeneous and textured regions. Because these images cannot be in general directly processed by the gray-level information, they propose a new texture descriptor which intrinsically defines the geometry of textures using semi-local image information and tools from differential geometry.

Kyong I. Chang, Kevin W. Bowyer and MunishSivagurunath [5] in the paper “Evaluation of Texture Segmentation Algorithms” presented a method of evaluating unsupervised texture segmentation algorithms. The control scheme of texture segmentation has been conceptualized as two modular processes: (l) feature computation and (2) segmentation of homogeneous regions based on the feature values. Three feature extraction methods are considered: gray level co-occurrence matrax, Laws’ texture energy and Gabor multi-channel filtering. Three segmentation algorithms are considered: fuzzy c-means clustering, square-error clustering and split-and-merge.

Taramati S Taji and Deipali V Gore[6] in the paper “Overview of Texture Image Segmentation Techniques” discussed that texture is pervasive in natural images and is a powerful cue for a variety of image analysis and computer vision applications like image segmentation, shape recovery from texture, and image retrieval. Texture analysis has wide range of applications like medical diagnosis, content-based-image retrieval, satellite imaging and many others. Since texture is not a local phenomenon, one must take into account a neighbourhood of each pixel in order to classify that pixel exactly. The problem of segmenting an image based on texture basis is referred to as texture segmentation problem. Textures may be regular or randomly structured and various structural, statistical, and spectral approaches have been proposed towards segmenting them.

Ani1 K. Jain and FarshidFarrokhnia [7] in the paper “Unsupervised Texture Segmentation Using Gabor Filters” presented a texture segmentation algorithm inspired by the multi-channel filtering theory for visual information processing in the early stages of human visual system. The channels are characterized by a bank of Gabor filters that nearly uniformly covers the spatial-frequency domain. An unsupervised square-emr clustering algorithm is then used to integrate the feature images and produce segmentation. A simple procedure to incorporate spatial adjacency information in the clustering process is also proposed. They report experiments on images with natural textures as well as artificial textures with identical 2nd- and 3rd-order statistics.

III. EXPERIMENTAL RESULT

There are various tools which are used to carry research work for executing the desiredtask. MATLAB R2015 is a tool is usedforthis research work. MATLAB is powerful softwarein which different environments are available through which research work can be carried out in effective.

Mean filtering

Mean filtering is a uncomplicated, inherent and easy to carry through a practice of smoothing images, i.e. minimizing the amount of intensity variation between nearby pixels. This filter generally used to decrease noise in images.Median filtering is a nonlinear method used to abolish noise fromimages. It is prescribed as very strapping method at removing noise while preservingedges.It is particularly rich in productive at removing ‘salt and pepper’ type noise.The median filter works by moving through the image pixel by pixel, replacing each value with the median value of adjacent pixels.The idea of mean filtering is simply to restore each pixel value in an image with the mean (`average') value of its adjacent pixels, including of itself. This filtering has the effect of eliminating pixel values, which are aberrant of their surroundings. Mean filtering is usually thought of as anintricacy filter.

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Fig 3(a) Water image mean filtering

Fig 3(b) Water image mean filtering

Fig 3(c) Water image mean filtering

Fig 3(d)Water image mean filtering

Fig 3(e)Water image mean filtering

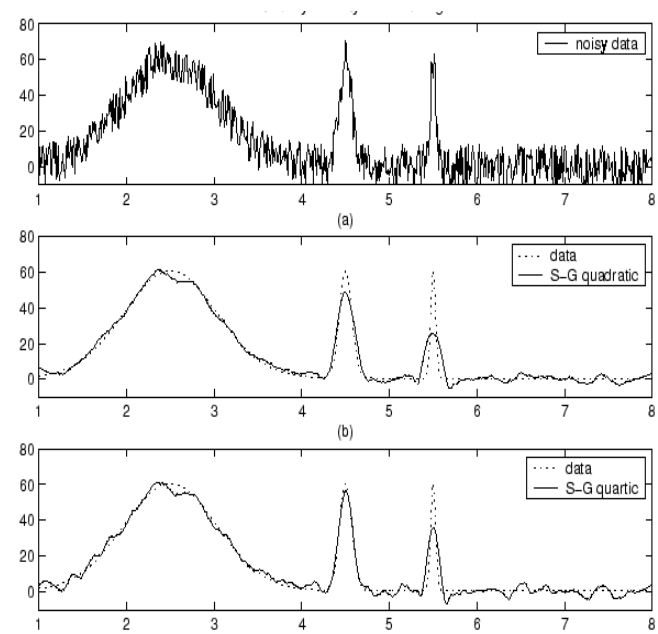
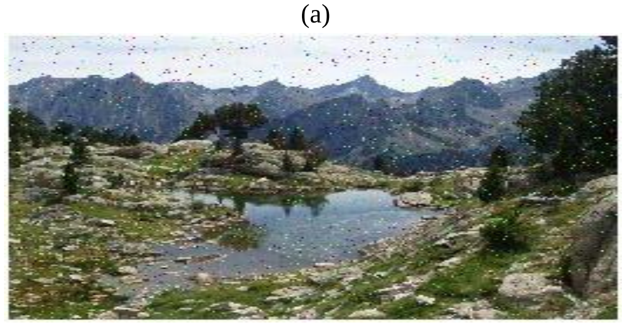


Fig 3(f)Graph mean filtering Median Filter

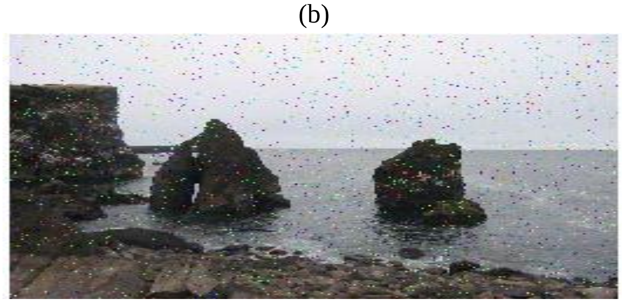
The median filter is a nonlinear digital filtering algorithm often used to remove noise from an image or signal. Such noise reduction is a typical pre-processing step to improve the consequences of later processing. The major scheme of the median filter is to run through the signal entry by entry replacing each entry with the median of neighboring entry. The pattern of neighbors are called the "window", which slide entry by entry, over the entire signal. For 1D signal, the most obvious window is just the first few preceding and following entry, whereas for 2D signals such as image, more complex window patterns are possible.

Median Filter Using Matlab

(a)



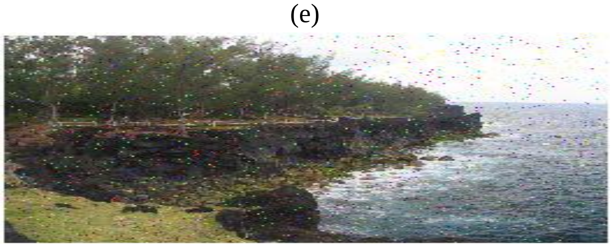
(b)



(c)

(d)

(e)



IV. GAUSSIAN SMOOTHING

An image processing a Gaussian blur (also known as Gaussian smoothing) is the result of blurring an image by a Gaussian function (named after mathematician and scientist Carl Friedrich Gauss). It is a extensively 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 view the image through a transparent screen, particularly different from the bokeh effect produced an out-of-focus lens or the shadow of an object under usual enlightenment.

Gaussian Kernel 9x9 size with Standard Deviation =1.76

Fig 4 (a) Water image

Fig 4 (b) Water image

Fig 4 (c) Water image

Fig 4 (d) Water image

Fig 4 (e) Water image

Table 1: Water Image Mat lab

Real-time image	Mean Filtering	Median Filtering	Gaussian Smoothing
Water Type Image1	2.1276	**0.0627**	1.4464
Water Type Image2	2.9472	**0.0632**	1.4634
Water Type Image3	2.1302	**0.0688**	1.4549

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Water Type Image4	2.1626	**0.0457**	2.1587
Water Type Image5	2.1595	**0.0.657**	2.6252

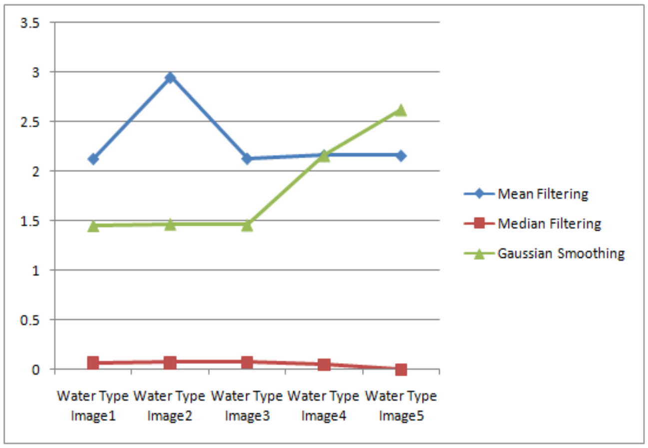

Figure: 4.1. Comparative study on Mean, MedianGaussian Using Mat lab Values

V. CONCLUSION

Texture segmentation has come anelongated way from manual segmentation to reasonable automated segmentation. Using just a few simple grouping cues, one can now produce rather splendid segmentation on a large set of Textures. In several case from texture, meaningful object have been identified based on variation of color depth far away a threshold value. In some cases boundary between two regions are measured by comparing intensity differences across the boundary and intensity differences between adjacent pixels within each region. The works done so far will not be able to get meaningful texture segmentation in all case, mainly when the threshold values change immoderately within the same object or the object is a combination of various different parts with different features and colors. Several image filtering techniques can be efficiently implemented with a minimum number of operations per pixel. This analysis have done the comparison between different image filtering algorithms, So we conclude that median filtering approach is the best approach that can be easily implemented with the help of the image histograms. The median filter is prominently better than another algorithms at removing noise because it preserves edges for a given, fixed window size.

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