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Texture Filter based Medical Images Segmentation for Cancer Disease

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Abstract— Medical Image processing is one of the most challenging topics in research field. In medical field, CT (Computed Tomography) scan imaging and MRI (magnetic resonance imaging) are the most important for image based visual diagnostics, but applying segmentation to these images is very tedious and requires an adjusting approach. The main objective of medical image segmentation is to extract and characterize anatomical structures with respect to some input features or expert knowledge. In this paper we have formulated a simple, general, fast, and user-friendly approach to the problem of medical image segmentation based on texture filter. In this method, the experimental results show that the segmentation results are visually satisfactory of medical image texture segmentation.

Keywords— Medical image processing, image texture, image segmentation, texture analysis**,** medical imaging, , Medical image Analysis ,texture filter.

1. INTRODUCTION

Medical imaging application plays an indispensable role by automating or facilitating the delineation of anatomical structures. Medical image segmentation is a challenging task due to the various characteristics of the images, which leads to the complexity of segmentation. [1]. In computer vision, Image segmentation is known as a process of partitioning an image into several segments also known as super pixels. The important goal of image segmentation is to simplify or change the representation of an image into form that is more meaningful and is easy for analysis [2]. Segmentation is an important process in the analysis of MR (Medical Resonance) Images for medical diagnosis. It divides the MR image into different types of classes and groups the homogeneous pixels into clusters. This is used in medical diagnosis in many ways, detecting brain tumor, tissue analysis, bone fractures and similar problems [3]. Segmentation of medical images involves three main image-related problems. The image may contain noise that can alter the intensity of a pixel such that its classification becomes uncertain. Also, the images can exhibit intensity nonuniformity where the intensity level of a tissue class varies gradually over the extent of the image. Third, the images have finite pixel size are subject to partial volume averaging where individual pixel volumes contain a mixture of tissue classes so that the intensity of a pixel in the image may not be consistent with any single tissue class[4].An image texture can be defined as the local spatial variations in pixel intensities and orientation. In order to recognize objects and scenes in computer vision, it is essential to be able to partition an image into meaningful regions with respect to texture characteristics. Texture segmentation has a wide range of applications like content based image retrieval, medical diagnosis, analysis of satellite or aerial images, surface defect detection and terrain classification for mobile robot navigation[5]. This paper produce texture segmentation method for medical images. The organization of the rest of this paper is as follows. Section 2 highlights the related works. Section 3 introduces image texture analysis . Section 4 describes the proposed method. Section 5 present the experimental results and section 6 concludes the paper.

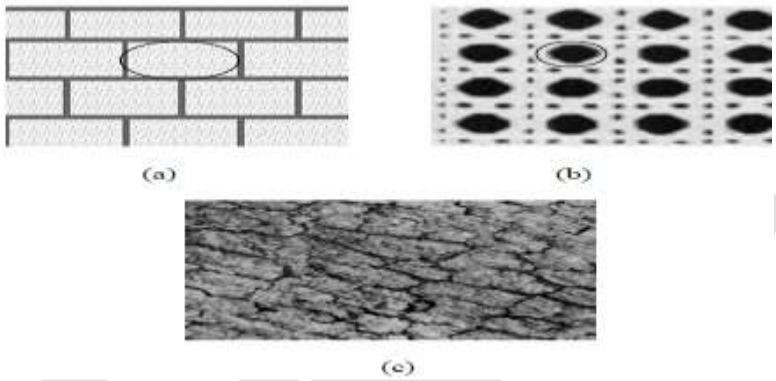
2. RELATED WORKS

Medical image segmentation is a challenging task due to the various characteristics of the images, which leads to the complexity of segmentation **Eldman and Maria** [6] introduced an automatic method of medical image segmentation used in the study of the Central Nervous System (CNS) by multilevel thresholding based on histogram difference. **V. Grau*, A. U. J. Mewes** [7] Presented a method to combine the watershed transform and atlas registration, through the use of markers. This new algorithm applied to two challenging

applications: knee cartilage and gray matter/white matter segmentation in MR images. Numerical validation of the results is provided, demonstrating the strength of the algorithm for medical image segmentation. **Ch.Hima Bindu,QISCET, Ongole** [8] Employed an optimized Otsu method based on improved thresholding algorithm for medical image segmentation ,the experimental results show that the new optimized method dramatically reduces the operating time and increases the separability factor in medical image segmentation while ensures the final image segmentation quality. **Seongjai Kim and Hyeona Lim** [9] proposed the background subtraction (MBS) in order to minimize difficulties arising in the application of segmentation methods to medical imagery. **Ebrahim and Dehmeshki**[10]developed a method that requires the definition of a speed function that controls curve evolution. The image intensity gradient and the curvature are utilized together to determine the speed and direction of the propagation. Although level set methods are highly effective in segmenting image, but. they are sometimes unable to exactly detect objects in images with low-contrast boundaries. In this method hybrid speed functions are used for an implicit active contour (level set) method which is capable of segmenting images with low-contrast boundaries.

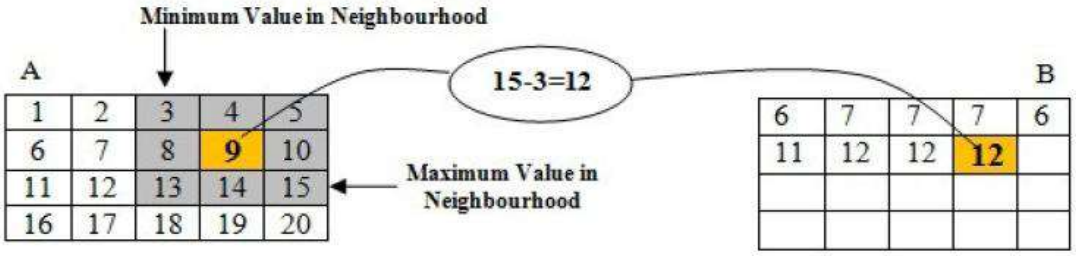
3. IMAGE TEXTURE ANALYSIS

The regular repetition of an element or pattern on a surface it is called as texture. It is used to identify different textured and non-textured regions in an image, to classify/segment different texture regions in an image, to extract boundaries between major texture regions ,figure(1) illustrate three examples of image texture[11]:



Figure(1): Different examples of image texture

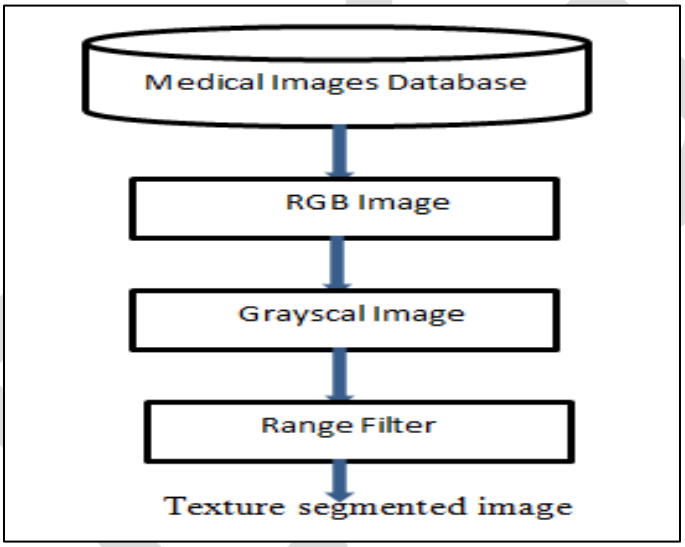
Texture is a difficult concept to represent, the identification of specific textures in an image is achieved primarily by modeling texture as a two-dimensional gray level variation. The relative brightness of pairs of pixels is computed such that degree of contrast, regularity, coarseness and directionality[11]. Texture analysis refers to the characterization of regions in an image by their texture content. Texture analysis attempts to quantify intuitive qualities described by terms such as rough, silky, or bumpy in the context of an image. In this case, the roughness or bumpiness refers to variations in the brightness values or gray levels[12]. Texture analysis of an image gives distributed arrangements of the intensity of the pixel in an image[13].An image texture can be defined as the local spatial variations in pixel intensities and orientation. In order to recognize objects and scenes in computer vision, it is essential to be able to partition an image into meaningful regions with respect to texture characteristics[14].Texture analysis is used in a variety of applications, including remote sensing, automated inspection, and medical image processing. Texture analysis can be used to find the texture boundaries, called texture segmentation[12]. All texture functions operate in a similar way. They define a neighborhood around the pixel of interest calculate the statistic for that neighborhood and then use the computed statistic value as the value of the pixel of interest in the output image. The example that shown in Figure(2) illustrates how the range filtering function operates on a simple matrix. In this example, the value of element B (2, 4) is calculated from A (2, 4). Range filtering function use m by n pixels, in this example 3 × 3, neighborhood around the pixels[12].



Figure(2): Range filtering function

4. PROPOSED METHOD

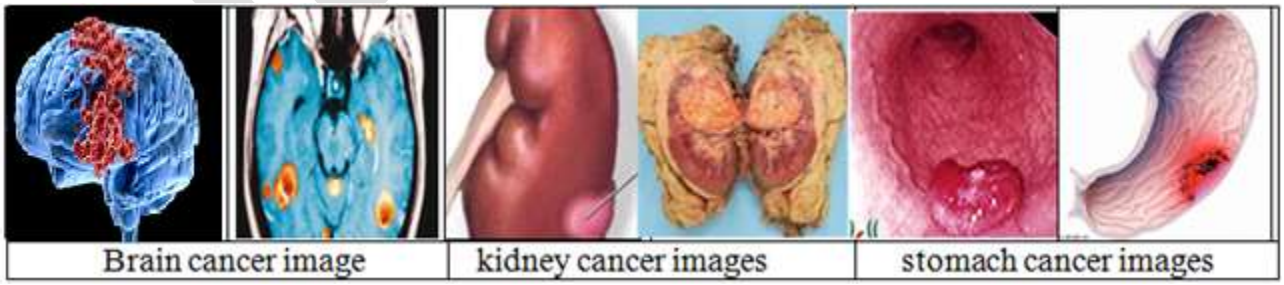
In this paper the texture segmentation for medical image based on applying a range filter is proposed. At first the color image is read from a database that contain a collection of medical images, then these images are converted to grayscale image, later the range filter is applied in order to extract the texture content of medical image. The texture segmentation process diagram is illustrated in figure(3) as shown below:



Figure(3): Block diagram for texture image segmentation

4.1 IMAGE DATABASE

The starting point of this work was the creation of a database with six medical images modalities having different sizes that is collect from the web. The database consist of three groups : brain cancer , kidney cancer and stomach cancer images. Figure (4) show the database images.



Figure(4): Different medical images

4.2 RGB IMAGE CONVERSION

The colored medical image is converted to gray scale image by converts RGB values to grayscale values by forming a weighted sum of the R, G, and B components using equation(1):

$$y = 0.2989 * R + 0.5870 * G + 0.1140 * B \quad \text{.....(1)}$$

4.3 RANGE FILTERING

Filtering is perhaps the most fundamental operation of image processing. The term filtering can be defined as the value of the filtered image at a given location. It is a function of the values of the input image in a small neighborhood of the same location. Filter operators can be used to sharpen or blur images, to selectively suppress image noise, to detect and enhance edges, or to alter the contrast of the image. The filters use the local statistical variations in an image to reveal the edges and its histogram [15].

5. EXPERIMENTAL RESULTS

The proposed algorithm is applied on the medical images of cancer disease, at first the color image is reading from the database then it converted to grayscale as shown in figure(5):

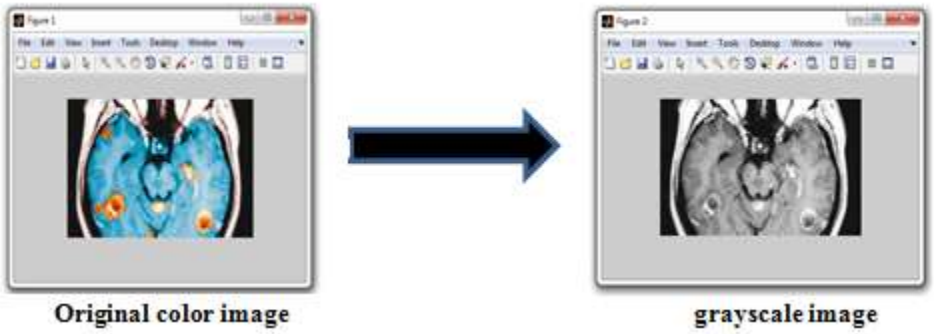


Figure (5): Colored Image conversion.

Then the range filter is applied on grayscale image to obtain the texture segmented medical image as show in figure (6):

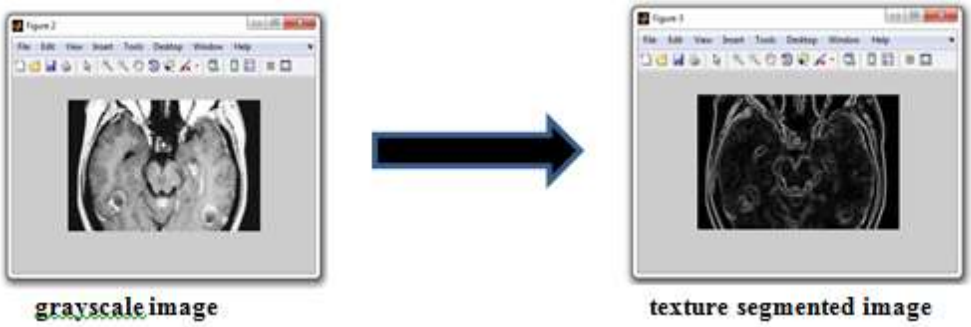
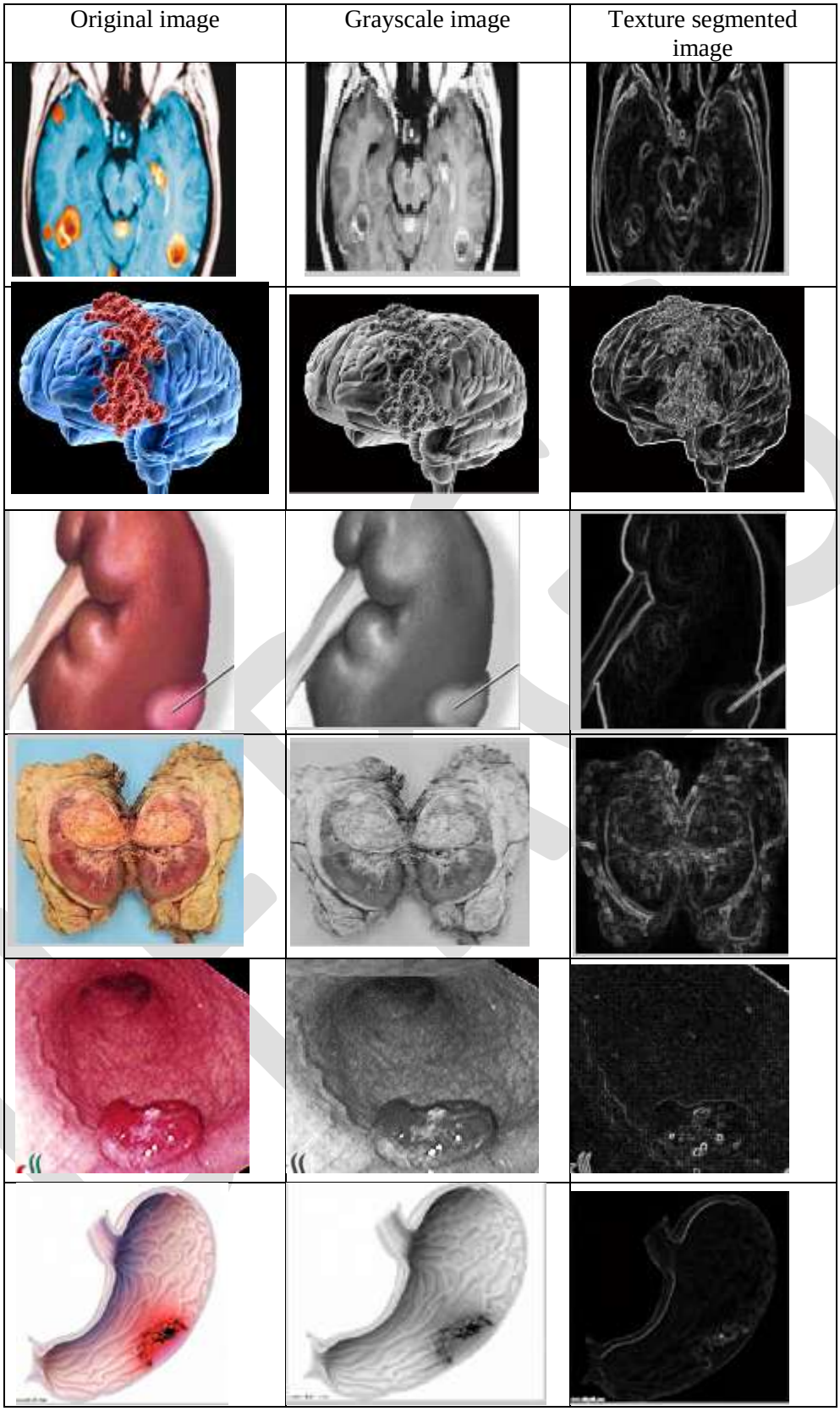


Figure (6): Texture segmented medical image

The same steps applied for the rest image given the result as shown in figure (7):



Figure(7): Results of texture segmented for medical images

6. CONCLUSION

In this paper we have considered the method of texture filter for an effective segmentation of medical images. The method uses the range filter to achieve robust and accurate segmentation results which are visually satisfactory. The whole process is autonomous and requires no supervision, which is one of the advantages of the proposed method. The method guarantees best segmentation of textures in poor-quality images also. The resulting figure show the efficiency, simplicity and robustness of medical image texture segmentation.

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