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A SEGMENTATION APPROACH OF THE ULTRA SOUND IMAGE TO DETECT RENAL CALCULI

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Abstract-This paper proposes to develop the image segmentation method by appraising the various image analysis techniques. The effective method had been examined and degree of justification was carried out in various clinical concerns. Currently, we scrutinize a classification of methodology in terms of previous data. New ideas had been obtained from additional papers and demonstrated about clinical efficiency or potential specific to the ultrasound segmentation of the renal calculi.
Keywords – Ultrasound image, Kidney stone, Regional grow, Renal calculi

1. INTRODUCTION

Ultrasound image segmentation is powerfully assertive by the quality of information and continuous development of computer technology, digital systems, portability and modern medical imaging technology has been utilized widely in clinical applications. It involves X-ray imaging techniques, Computerized Tomography (CT), Magnetic Resonance Imaging (MRI), Ultrasonic Imaging (US), Infrared Thermal Imaging (Thermal Imaging), Endoscope imaging (Endoscope),micrograph imaging (Micrograph), Positron Emission Tomography (PET), Digital Subtraction Angiography (DSA) and so on. An improved image segmentation method based on region growing algorithm was surveyed. Initially, growth rule is determined by the result of automatic scan. Based on the growth rule, a seed point is chosen in the region of kidney[1-3]. Segmentation results are optimized using image morphology. The basic operations of image morphology are opening and closing of images by Region Growing Algorithm.

The rest of the paper is organized as follows. Proposed embedding and extraction algorithms are explained in section 2. Experimental results are presented in section 3. Concluding remarks are given in section 4.

2. PROPOSED ALGORITHM

A.Region Growing algorithm –

The region based segmentation is partitioning of an image into similar/homogenous areas of connected pixels through the application of homogeneity/similarity criteria among candidate sets of pixels. Each of the pixels in a region is similar with respect to some characteristics or computed property such as colour, intensity and/or texture. Failure to adjust the homogeneity/similarity criteria accordingly will produce undesirable results. The following are some of them:

1. The segmented region might be smaller or larger than the actual.
2. Over or under-segmentation of the image (arising of pseudo objects or missing objects)

Region growing is a simple region-based image segmentation method. It is also classified as a pixel-based image segmentation method since it involves the selection of initial seed points. This approach to segmentation examines neighbouring pixels of initial "seed points" and determines whether the pixel neighbours should be added to the region. The process is iterated on, in the same manner as general data clustering algorithms. The fundamental drawback of histogram-based region detection is that histograms provide no spatial information (only the distribution of gray levels).

Region-growing approaches exploit the important fact that pixels which are close together have similar gray values. Region growing approaches is the opposite of the split and merge approach. An initial set of small areas are iteratively merged according to similarity constraints.

1. Start by choosing an arbitrary seed pixel and compare it with neighbouring pixels.
2. Region is grown from the seed pixel by adding in neighbouring pixels that are similar, increasing the size of the region.
3. When the growth of one region stops we simply choose another seed pixel
4. Which does not yet belong to any region and start again.
5. This whole process is continued until all pixels belong to some region.

Region growing methods often give very good segmentations that correspond well to the observed edges. There are a few main points that are important to consider when trying segmenting an image. The regions must span the entire image because

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each point has to belong to one region or another. To get regions at all, we must define some property that will be true for each region that you define.

To ensure that the regions are well defined and that they are indeed regions themselves and not several regions together or just a fraction of a single region, that property cannot be true for any combination of two or more regions. If these criteria are met, then the image is truly segmented into regions. This paper discusses two different region determination techniques: one that focuses on edge detection as its main determination characteristic and another that uses region growing to locate separate areas of the image. The region growing techniques took on a variety of aspects the block diagram below illustrates the potential sequences of processes that can lead to segmentation using region growing.

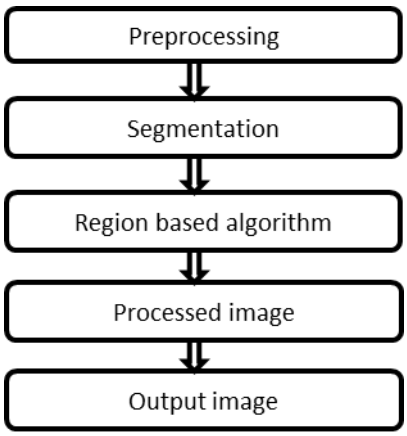

Figure1. Processing Block Diagram

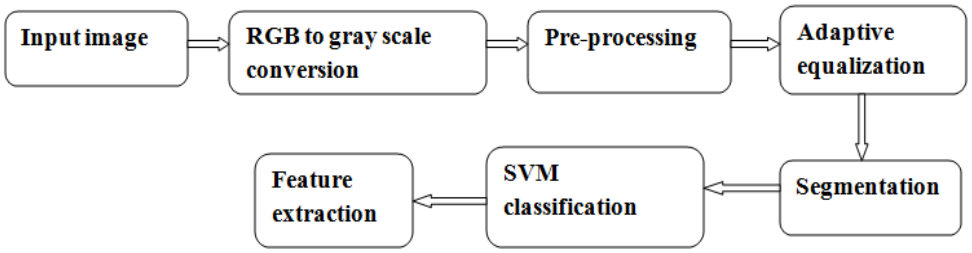

Figure2. Proposed Block Diagram

B. K-Means algorithm –

The described techniques approach permits us to automatically accomplish a statistical analysis of various parameters from alive cells in kidney. The average gray level intensity inside the kidney region is determined. K means Algorithm will overcome the problems with 3D models due to moving parts. GFR measurement is done by using voxel deformation which is important parameter in diagnosis. Finally, the diagnosis of renal diseases is expected by using the standard sets of rules are still to be defined. K-means algorithm proposes to cluster the object by grouping them with their nearest mean value. This algorithm splits unspecified data into fixed number of clusters. The center point in the cluster is called as centroid.

3. EXPERIMENT AND RESULT

OUTPUT:

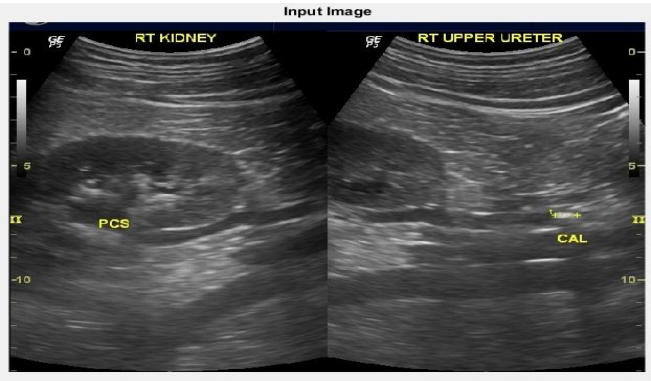

Fig 4.4.1: Input Scan Image Of Kidney

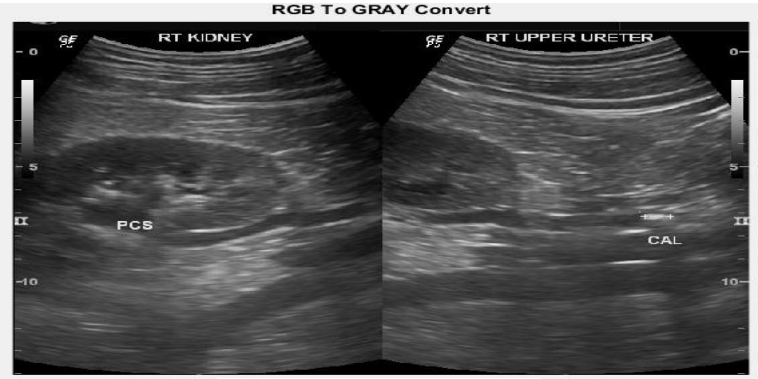

Fig 4.4.2: Rgb To Gray Image

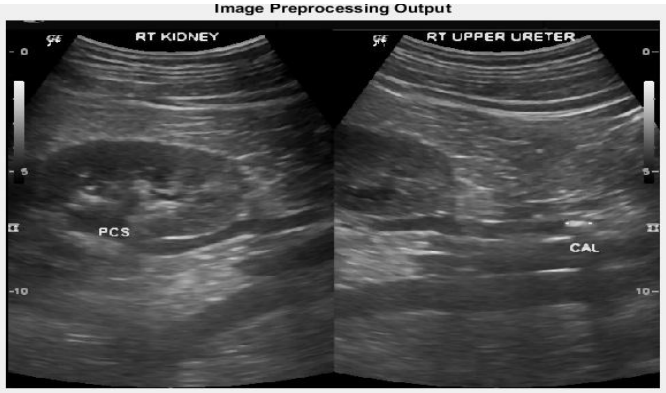

Fig 4.4.3: Preprocessed image using median filter

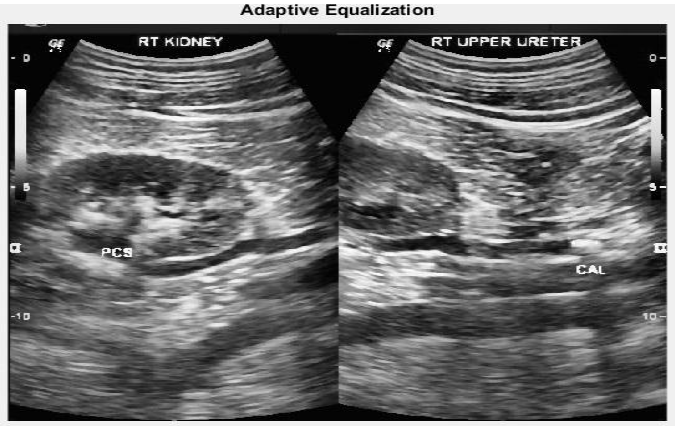

Fig 4.4.4: Adaptive equalization

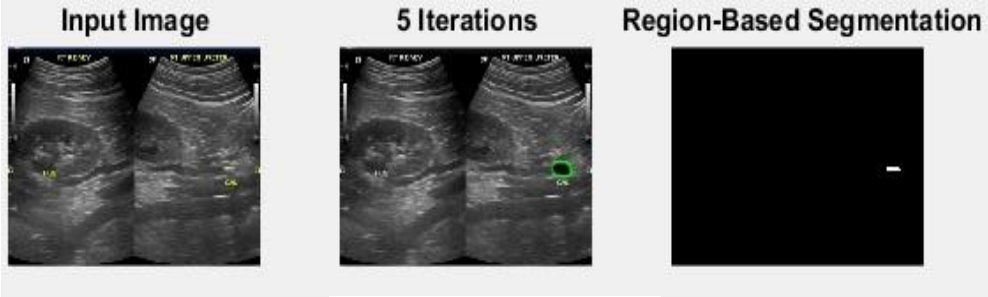

Fig 4.4.5: Segmentation output

Contrast: 4.2897e+03
Correlation: -0.0029
Energy: 5.6152e-05
Homogeneity: 0.0481
Feature Extraction Value are: 4.289657e+03
Feature Extraction Value are: -2.880201e-03
Feature Extraction Value are: 4.805833e-02
Feature Extraction Value are: 5.615242e-05
conMat = 6 10
7 7
The Peak-SNR value is 14.7225
The SNR value is 3.2217
Dimension = 11.07 cm

Figure 4. (A) Original Image (B) DDNT Watermark Image (C) Watermarked Image (D) Recovered Watermark Image

Table -1 Experiment Result

Kidney Images	Mn	Dn	Vn	En	Ep
US image	15.3	6.6	2.3	20.1	18.4
Kidney stone	24.1	10.4	4.1	32.3	25.6
Early Detection	21.5	8.3	3.2	20.2	23.2
Early Calculi	22.1	6.1	2.3	20.1	18.4
Medium calculi	25.3	8.5	4.1	20.1	18.4
Early Calculi	27.1	11.3	7.3	20.1	18.4
Proposed Renal calculi	23.2	8.5	6.5	22.1	17.2

Table 1 The comparison of output values among ultra sound image, MRI image and CT scan image. The parameters are Mean pixel rate(Mn), Dispersion pixel rate(Dn),Variance Pixel Rate(Vn), Energy Joules(En),Entropy rate(Ep) of the image.

4.CONCLUSION

The segmentation to detect renal calculi has been proposed. We use region growing method for segmenting the affected part from the renal image. Region growing which is a best region-based image segmentation method, the results are reported to show the effectiveness of the proposed algorithms on producing accurate result by using some images. It is also classified as a pixel-based image segmentation method since it involves the selection of initial seed points. It exploits the important fact that pixels which are close together have similar gray scale values. The segmentation algorithm has been implemented in MATLAB software. MATLAB software integrates computation, visualization and programming in a user friendly environment where problems and solutions are expressed in familiar mathematical notation. It serves as a complete environment for high-level programming, as well as interactive data analysis. Thus using MATLAB the segmented output has been shown in the result. The obtained result segments the calculi part accurately from the scan images which are given as input and provides the segmented calculi is a separate image.

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