A Literature Review on Analysis of MRI Images of Rheumatoid Arthritis through Morphological Image Processing Techniques

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Abstract— The **main aim is Image Enhancement of Bio-Medical MRI Images Using Morphology technique.**
There are basically four operations in Morphology technique: Dilation, Erosion, Opening an Image and closing an Image. Basically I am going to use Dilation and erosion operations of the Morphology Technique for Image Enhancement.
Previously I used Histogram Technique for enhancing image clarity; I collected Various MRI images of a normal child and a Rheumatoid Arthritis patient, including reading and writing images, performing histogram equalization on an image, and getting information about an image

Keywords— **Rheumatoid Arthritis (RA), Morphological Image processing, erosion, dilation**.

1. INTRODUCTION

Rheumatoid Arthritis (RA) is a disease, which is inflammatory in nature that mainly affects the joints of the body, basically fingers, hands, knees. Till today there is no proven cure for the disease, hence close monitoring of the disease is important in the medical treatment of the disease. There are various methods available for the treatment of disease, among which Joint damage assessment in hand radiographs is the most frequently used method [1].
Signs and Symptoms of Rheumatoid Arthritis (RA): Since Rheumatoid Arthritis mainly occurs in the joints of the body, so it includes the problems involving the other organs of the body [2].

2. LITERATURE SURVEY

In my previous work I took a noisy image and its variants such as sobel, Roberts and prewitt and used Laplcian filter to remove those noises. I took knee bone image of a healthy child and used MAT-LAB to crop and showed enlarged view of image. I took Rheumatoid Arthritis patient bone image and using ROI processing in MAT-LAB highlighted the affected part of the patient which would be a fruitful techchnique for doctors.
Many Researchers have presented their ideas on Image Analysis and Image. Major listings of some of them are as follows:

i. In this the study works as Rheumatoid arthritis (RA) which is an inflammatory joint disease.
Longitudinal imaging is an effective tool for clinical studies and patient management, which is based on visual inspection or interactive analysis. There are two different methods for quantifying changes in a bone, first one is segmentation and second one is thresholding algorithm [1].

ii. The major findings of this paper are that, in this researcher examined 18 normal subjects and 13 patients were diagnosed, who are having Rheumatoid Arthritis (RA), and their thermal images of hands, wrist and palms and knees were collected. For each subject, values were calculated from the temperature measurements: Mode/Max, Median/Max, Min/Max, Variance, Max-Min, (Mode-Mean) 2, and Mean/Min [2].

iii. This paper is part of a thesis that investigates the possibilities of automating the assessment of joint damage in hand radiographs. Basically the goal is to design an algorithm called robust segmentation algorithm for the hand skeleton, which is basically based on active appearance models (AAM) [3] [4],

its results are useful the future for radiographic assessment of rheumatoid arthritis [5].

iv. In this the study works as the physician sand, who presented a tool for accessing various services performance. Since the strength of data mining and Artificial Neural network is not only limited to business, fraud detection and telecommunications, it is also applicable to medical field, especially in the prediction of breast cancer in patients [6].

v. There are three evaluation methods used to measure observer performance based on the compressed images, among which the ROC methodology is most commonly used. There are some types of images which are basically digitized chest images such CT, MRI and Ultrasound images. So, as a result we come to know that image compression in digital radiology should have been optimized based, which is based on the types of images being generated, interpreted, stored, and transmitted [7].

vi. Image Compression basically is a technique in which unnecessary noise/data is reduced and generally referred as Digital Compression. Basically there are two types of image compression techniques: "Lossless" or reversible compression Lossy" or irreversible compression [8].In Lossless Compression technique there is no loss of data and information image data while Lossy Compression basically involves techniques: image transformation, quantification, and encoding [9].

3. CASE STUDIES

3.1 Morphological Operations

Morphology is a technique of image processing which is based on the shapes. In this input image pixel of its neighbours is compared with the output image [9].

3.1.1 Dilation and Erosion

Dilation and Erosion basically are the two fundamental morphological operations. While Dilation adds pixels to the boundaries of objects in an image, erosion removes pixels on object boundaries. [9].

3.2 Processing Pixels at Image Borders

3.2.1 Rules for Padding

Operation	Rule
Dilation	Pixels beyond the image border are assigned the minimum value afforded by the data type. For binary images, these pixels are assumed to be set to 0. For grayscale images, the minimum value for uint8
	images is 0.
Erosion	Pixels beyond the image border are assigned the maximum value afforded by the data type. For binary images, these pixels are assumed to be set to 1. For grayscale images, the maximum value for uint8 images is 255.

Table 1: Rules for Padding Images [9]

3.3 Structuring Elements

Basically Structuring elements consist of a matrix of 0's and 1's.Pixel of the structuring element, which are called the origin, basically identifies the pixel of interest [10].

3.4 Dilating an Image

To dilate an image, basically imdilate function is used. The imdilate function, accepts two primary arguments: The input image to be processed and a structuring element object [10].

3.5 Eroding an Image

To erode an image, basically imerode function is used. The imerode function, accepts two primary arguments: The input image to be processed (gray scale, binary, or packed binary image) and a structuring element [10] [11].

4. RESEARCH QUESTIONS

RQ1: Image Enhancement using Morphological Operations: Dilation and Erosion.
RQ2: Conclusion for Enhanced Images.

5. CONCLUSIONS AND FUTURE SCOPE

I conclude that quality of image will be better with greater details which are beneficial for doctors for diagnosis purpose. Basically a radiographic Image processing based methodology is presented to accurately and reliably diagnosis of the presence of disease Rheumatoid arthritis. The results presented here are preliminary and focused only the reproducibility aspects of the technique. This technique is being applied towards monitoring early stage rheumatoid arthritis patients in an ongoing clinical trial. Results obtained from the clinical trial data should provide a better understanding. The presented project provides thought of better understanding towards the disease in comparative way.
In future I will be using Morphology, which is a technique of image processing based on shapes. The value of each pixel in the output image is based on a comparison of the corresponding pixel in the input image with its neighbours. By choosing the size and shape of the neighbourhood, you can

construct a morphological operation that is sensitive to specific shapes in the input image.

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