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Microscopic Feature Extraction Method

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ABSTRACT

In this paper a new method of microscopic feature extraction on image processing has been proposed. The proposed technique is effective in extracting desired microscopic features from an image. In this technique dynamic threshold technique is applied on the image in order to remove the background, then vector median filter is applied to remove the noisy pixels for achieving clear image, and finally by digital morphological algorithm to find the desired location in an image is obtained.

Keywords - **Microscopic, Features, Image, Pixels, Grey Level**

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I. INTRODUCTION

Nowadays, Digital Image Processing is becoming the revolutionary field of computer science from which the medical science is gaining a lot of benefits. It is helpful in many areas of medical science such as fracture detection in X-Rays, Tumor detection in brain, CT Scans etc. The paper is about finding the tiny holes often found in human bones which can be detected by analyzing microscopically. This topic is selected after studying the information about stress fracture which sometimes create micro cracks in bones often observed in athletes, soldiers etc. These micro cracks are sometimes very small in size and form very small holes. It is very difficult for a human eye to detect them in X-Rays. In this paper microscopic feature extraction [12][13][14] technique to detect the minute holes in bones [1] is described in order to find out the clear view of desired area of image.

(a) (b)

Fig 1. Stress Fracture in Human Bone (a) Original (b) X-Ray Image [15]

II. GREY-LEVEL TECHNIQUES FOR IMAGE SEGMENTATION

The segmentation of an image by converting it to gray scale is an important aspect of image processing. Threshold value of an image contains the most necessary information of an image which can be the number of objects in the image, shape and type of the object etc. [2] Grayscale many times makes image processing operations simple by reducing the picture to some easy to calculate pixel values. Gray scale values can help find the desired area in the image with color values of some specific threshold. For this there can be different ways which are described in [3] and [4] etc.

III. EXISTING WORK

In CFEM [6], the image needs to be captured from the high resolution camera. This means that the high quality image can take more time to be processed. In this technique the image is divided into different cells which can be of different shapes [6]. To classify the cells, CFEM first selects cells' outer pixels which can help to make the cell classes. After outlining the cell, the inner side pixels are then selected to collect the useful information. CFEM sometimes ignores some target inside pixels during processing; as a result of which useful information is difficult to attain [6].

Similarly, the work related to the feature extraction can be found in research papers by Bergevin et al. [7], L. Cinque et al. [5], Q. Wang et al. [8], Jun Li et al. [9], Zhongbo Zhang et al. [10]

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IV. PROPOSED TECHNIQUE

In proposed technique minute features in the image can be extracted in an efficient manner. The first step is to remove the background by applying thresholding method [1], as a result of which the image is converted into gray-level image, composed of black and white pixels. Then a parameter θ called the threshold is selected and applied to the image a[x, y] as

```
if a[x, y]>= θ
   a[x, y]= object=1
else
    a[x, y] = θ
    background=0
```

where a is the image to be processed and x, y are the pixel values of x-coordinate and y-coordinate.
Then, the average gray scale value is used to threshold the image with black background.

In vector median filter pixels are compared with one selected pixel and distance will be calculated. In this way pixel with distance less than the other pixels will be considered as noise pixel and that pixel is being discarded from the image. This process will continue until all noise pixels are removed.
After getting clear image of the object, the next step is to find out the desired location of the defected or infected area. This will be done by applying mathematical morphological algorithm, in this technique image will be converted into matrix form and the area, perimeter and convexity coefficient of the image will be calculated. Area is defined as the number of pixels included in the object.

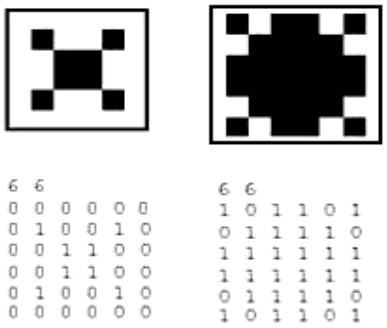

Fig 2. Pixel selection using morphological algorithm

In the proposed technique a number of algorithms are used and applied in order to make image as clear as possible so that microscopic features can be extracted efficiently. The whole process can be summarized by the Block diagram given below

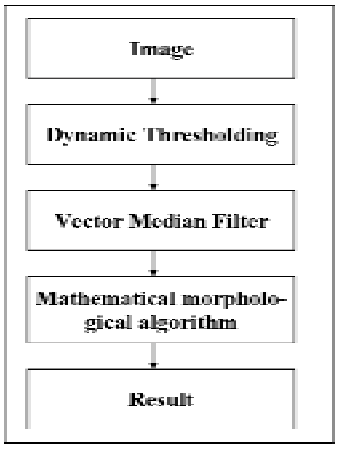

Fig 3. Block diagram

Suppose if we want to find out microscopic holes (it's a kind of disease occur in bones) from the image, then according to proposed technique first step is to take image which is to be processed and convert it into gray scale image and find out the threshold value by using formula described above or by drawing histogram as described in proposed technique, in order to specify object and background, as shown in figure.

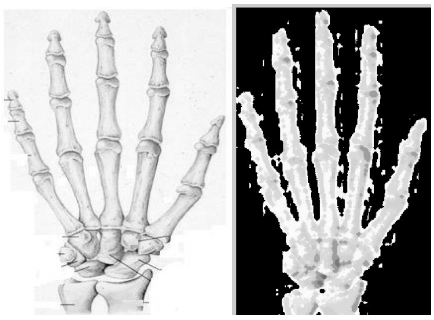

Fig 4. (a) Gray scale image (left), (b) Threshold image (Right)

When background and objects are being specified, the next step is to specify the desired object or location that is needed for detection. This is possible finding the gradient of an image. For this the Sobel [11] Operator is used i.e.

```
objs = edge(I, 'sobel', (graythresh(I) * .1))
```

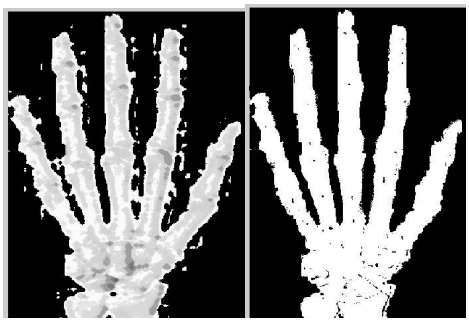

Fig 5. (a) Desired object with noise pixels (left). Clear image (Right)

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The image above in fig.6 (a) (left) shows that noise pixels are also included in it, so in order to clear this image, a vector median filer is used. In this way un-ambiguity in image of object will be removed as shown in figure 6(b).

Now the final step is to find out the desired location in the object like hole or crack. For this purpose, mathematical morphological algorithm is applied. In this algorithm, metrics of 10 x 20 pixels will be made as shown below.

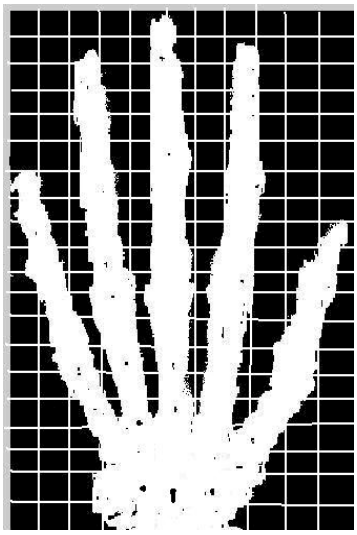

Fig 6. Image in metrics form

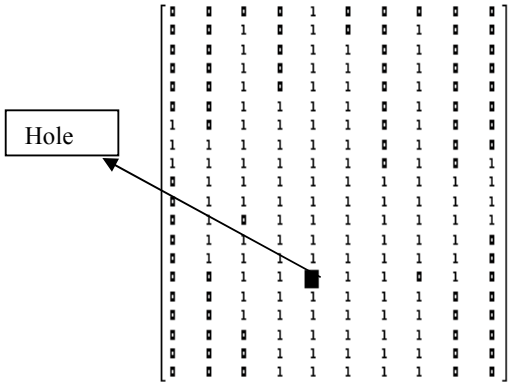

Fig 7. 10x20 metrics of image

In matrix, the red colored 00 indicate that hole is present in this location. When it will reconvert into image this specified hole will be highlighted and one could easily detect it. This proposed technique is helpful in different fields like medical for detection of infected areas for example infected cells in human body. Besides, it can be used in the manufacturing of different products.

RESULT:

The results after implementation of this proposed technique shows that microscopic feature can be identified clearly and accurately as shown below.

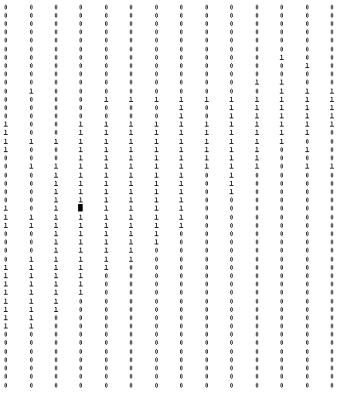

Fig 8. Matrix generated as a result of morphology

V. CONCLUSION

The technique proposed in this paper has significant advantages over the other existing techniques, because number of algorithms and methods are used to overcome the problem of image quality, and can be extracted in an efficient manner. This can be applicable in different areas of life, for example, in medical it is helpful for identification of infected parts like cracks and holes in bones and tainted cell in the body. Other than this it is also useful in the construction of sophisticated products like medical instruments, glass products etc. For further improvement some kind of techniques could be developed in order to make it more accurate and efficient.

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