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Blood Cells Segmentation by Using Thresholding Techniques

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***Abstract*- In this paper, we present a segmentation method by thresholding for automated leukemia detection. This paper deals with the segmentation and threshold of blood cells for the purpose of detecting leukemia (abnormal blood cells). After the image acquisition and the preprocessing step, we proceeded to the application of the segmentation implemented in ImageJ. In order to show the interest of the proposed approach, we present the different cancerous regions identified with their characteristics for biomedical diagnostic aid. The proposed system is tested on image dataset and 96,63 % accuracy is achieved. The proposed system is successfully implemented in ImageJ, with the obtained experimental results are very encouraging.**

Keywords : segmentation; thresholding; leukemia; abnormal blood cells.

I. INTRODUCTION

One of the fundamental processes in the chain of image processing is the segmentation. The segmentation is a difficult problem because we do not know a priori the type of textures present in the image to be analyzed, how many different textures are present and with which the region associate what texture or color. In fact, it is not necessary to know what exactly the existing textures are and what are the relevant colors ?

Automatic white blood cell segmentation which plays an important role in automatic blood cell morphology analysis remains a challenging issue because of the morphological diversity of WBCs and the complex background of blood microscopic images. In this paper, our focus is the leukemia detection using segmentation method by thresholding.

This study showed us all the problems that can be encountered in the field of medical imaging. And this especially when dealing with textured images as our research based on whole blood cells downloads [1]. This work allowed us to reflect on thresholding segmentation algorithms.

Segmentation is the process by which we determine the most important regions of an image. Here again, this process is extremely difficult to implement on highly textured images [2] for example microscopic WBC.

Some work on microscopic WBC image segmentation is available in the literature [3-5]. Treshold-based methods include Otsu's method [6].

Our paper is structured as follows. In section 1 we have described problematic of our work. In section 2 we discuss details the main steps of the proposed approach and in section 3 give experimental results and discussion. Finally, section 4 contains reference.

II. PROBLEMATIC

A point of view the Medical blood cancer or leukemia with its different types remains a problem among hematologists for the detection of abnormal cells in the first stage of the patient. And a point of view technical, since, efforts of research Enormous have been carried out to develop new algorithms for clustering for the analysis by cluster.

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III. METHODOLOGY

A. *Medical context*

The type of microscopic medical images using on your work is the blood cells, which represents pathology [7]. Cancer of the blood, also known as leukemia, results from an excessive production of abnormal white blood cells [8]. They then fight infections more effectively and can interfere with the production of platelets and red blood cells, where the risks of anemia and bleeding disorders. There are many different types of leukemia. They are first classified by type of stem cell blood from which they develop.

B. *Proposed system*

Our proposed system in this paper (Fig.1), contains two essential steps are, pretreatment of microscopic medical images after segmentation to identify abnormal blood cells based on the relevant element color.

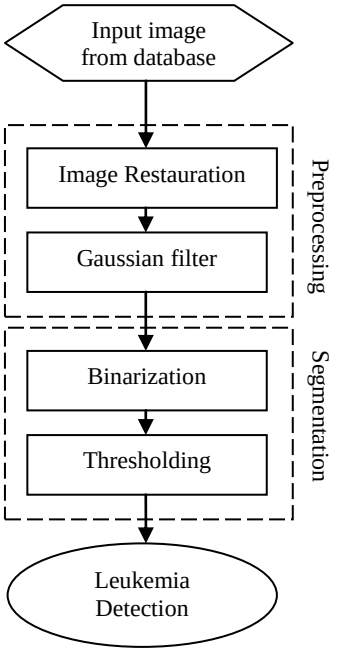

Fig. 1. Block diagram of the proposed algorithm

1) *Database*

The proposed method was tested on 122 images taken from [9], a public and free, specifically designed for the evaluation and comparison of algorithms for segmentation and image classification. The images of the dataset have all been captured with an optical laboratory microscope coupled with camera with dimension 720*540.

The purpose of this step is to make all images to treat to a same size 256*256 for what is easy to manipulate by our method of segmentation.

2) *Filtering*

In order to improve the visual effects of the image test filtering is necessary, which mainly includes the eliminate the noise and improve the quality of the image.

3) *Testing procedure*

The threshold segmentation was implemented using (ImageJ) and tested the segment techniques on the image illustrated in the Fig 2.

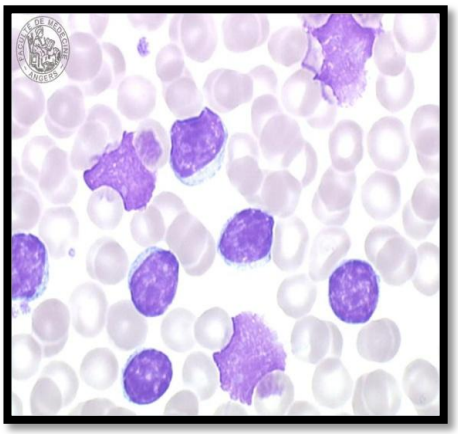

Fig. 2. Medical microscopic image (Blood Cell)

C. *Segmentation by Thresholding technique*

This Threshold technique is one of the important techniques in image segmentation [10]. This technique can be expressed as:

$$T=T[x, y, p(x, y), f(x, y)] \quad (1)$$

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Where: T is the threshold value. x, y are the coordinates of the threshold value point. P (x, y) f(x, y) are points the gray level image pixels. Threshold image $g(x, y)$ can be define :

$$g(x,y) = \begin{cases} 1 & if\ f(x,y) > T \\ 0 & if\ f(x,y) \leq T \end{cases} \qquad (2)$$

IV. RESULTS AND DISCUSSION

In this section we present the results of images segmentation that we have obtained. We have implemented the programs using ImageJ. The experimental results presented in this section show the efficiency of the thresholding segmentation method for the purpose [10]. environment and tested on a common PC Pentium (R) Dual-Core CPU Processor 2.20 GHz with 4 GB RAM.

A. Preprocessing

In this step, we apply a Gaussian filter to reduce noise and improve image quality. (Fig.3)

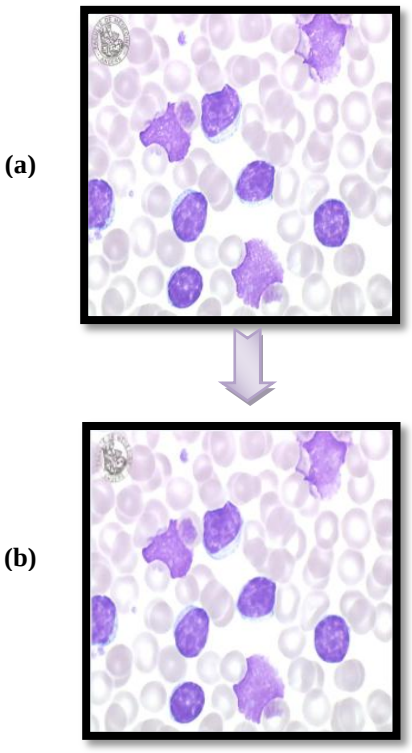

Fig. 3. Preprocessing: (a) Resizing initial image, (b) Image filter

B. Binarization

Fig.4 shows the binarization that will enable to produce an image binarized matrix that is to say that a matrix containing values to 0 or 255 if we think on the whole [0..255], or 0 1 or when working across [0..1].

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Fig. 4. Binary image

C. *Segmentation by thresholding*

Thresholding [12], as we have said, can produce an image in two classes. The object is represented by the color blue and the bottom of the green. The algorithm that results is very simple, just assign to all pixel having a gray level greater than the threshold value the green (bottom). If they are given the blue (leukemia) [13].

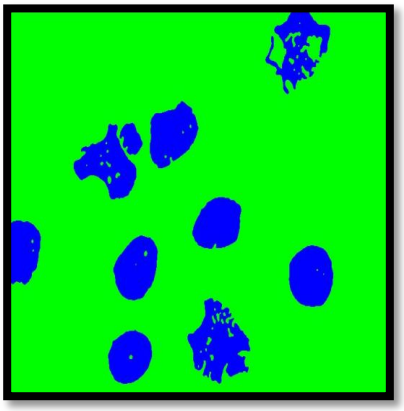

Fig. 5. Segmentation by thresholding

The histogram of our segmented image is shown in the following Fig. 6:

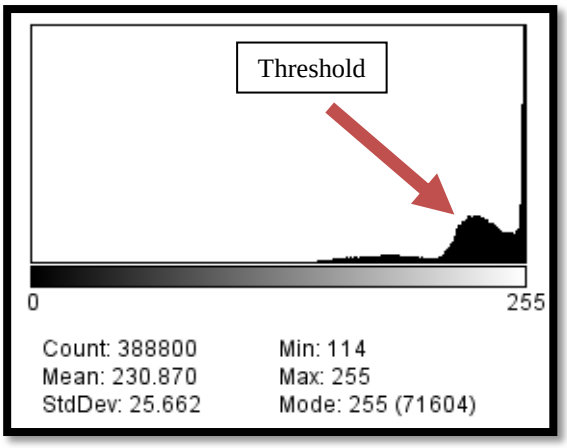

Fig. 6. Thresholding histogram

This histogram allows us to visualize the threshold of our segmentation, we tested on several image with this value of threshold = 205.

V. CONCLUSION

In this paper, we have proposed a method to extract the cancerous regions of blood cells (leukemia). We have performed kinds of preprocessing the image restoration and Median filter before applying thresholding approach to Segment the image. This method is reasonably faster than manual approach and it helps in cancerous regions detection. Testing with blood cells datasets provided from the hematology service of the CHU Hospital. Finally, we will try to apply this approach on FPGA to test the algorithm in real time. This will make the object of our future work.

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