Counting Of WBC Using Digital Microscopic Camera in Image Processing

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Abstract - The differential counting of white blood cell provides invaluable information to pathologist for diagnosis and treatment of many diseases manually counting of white blood cell is a tiresome, time-consuming and susceptible to error procedure due to the tedious nature of this process, an automatic system is preferable in this automatic process, segmentation and classification of white blood cell are the most important stages. The objective of the present study is to develop an automatic tool to identify and classify the white blood cells namely, lymphocytes, monocytes and neutrophil in digital microscopic images. We have proposed color based segmentation method and the geometric features extracted for each segment are used to identify and classify the different types of white blood cells. The experimental results are compared with the manual results obtained by the pathologist and demonstrate the efficacy of the proposed method. This paper approaches methods to segment the blood cells from microscopic thin blood images. This data is the premise to perform higher level tasks for example, automatic differential blood counting.

Keywords - Digital Image Processing, White blood cells, segmentation, image analysis, leukocytes, lymphocyte, monocyte, neutrophil, color segmentation.

I. INTRODUCTION

White blood cells (WBC) or leukocytes play a significant role in the diagnosis of different diseases, and therefore, extracting information about that is valuable for hematologists. In the past, digital image processing techniques have helped to analyze the cells that lead to more accurate, standard, and remote disease diagnosis systems. However, there are a few complications in extracting the data from WBC due to wide variation of cells in shape, size, edge, and position. Moreover, since illumination is imbalanced, the image contrast between Cell boundaries and the background varies depending on the condition during the capturing process. This study is focusing on WBC segmentation using L2 microscopic images.

The goal is to segment the WBC nucleuses and cytoplasm using a framework that has been developed using digital image processing. The use of image processing techniques have developed rapidly in the last few years, to the point where hematologists can use blood images to automatically process blood slides for the rst screening in detecting diseases. These techniques can help to second cell counts in human blood automatically.

There are three types of cells in normal human blood: red cells, or white cells and blood platelets. Generally, red cells are simple and similar. While white cells contain nucleus and cytoplasm and there are different types of them. White cells are categorized into five groups: neutrophil, eosinophil, basophil, monocyte and lymphocyte. The texture, colour, size and morphology of nucleus and cytoplasm make differences among these groups. In our paper we are considering only the nucleus. In blood smear, number of red cells is many more than white cells. For example, an image may contain up to 100 red cells and only 1 to 3 white cells. Platelets are small particles and are not clinically important. In laboratories,

Haemato logists analyzed human blood by microscope. Their main tasks in this area are: red cell count, white cell count and blood disorder detection. It is tedious task to locate, identify and count these classes of cells. Due to the importance of these processes, an automated system seems necessary and helpful. White cells are clinically more important than red cells and many of blood disorders are related to them.

II. LITERATURE SURVEY

White blood cell composition reveals important diagnostic information about the patients. Substituting automatic detection of white blood cells for manually locating identifying and counting different classes of cells is an

important topic in the domain of cancer diagnosis. A manual counting method is an alternate way to count WBCs, but with much lower throughput. The manual WBC counting method can be performed on either a blood smear sample or a haemocytometer using a standard microscope system. The specimen can either be viewed directly through the microscopes eyepiece or captured into image files. For a blood smear sample, the monolayer regions are mechanically scanned for counting the total number of WBCs. Microscopic differential white blood cell count is still performed by hematologists, being indispensable in diagnostics with malignance suspicious. While value as a reference method for blood samples containing abnormal cells remains indisputable, it is slow and subjective and its reproducibility is poor.

A) Drawbacks of traditional method:

1. It is time-consuming and laborious.
2. Counting overlapping blood cells is a major problem.
3. It is difficult to get accurate results from visual inspection.

In past decades it is observed that traditional used Manual Method And Rack Analyzers Method developed Calculating the White Blood Cell. The most economical and quick solution in this case is to provide Digital Image processing. Liao and Deng (2002)were the rst to introduce a shape analysis for WBC segmentation. After basic segmentation using simple thresholding, the contours of WBCs are identified using a shape analysis step. However, despite the simplicity and basic effectiveness, this method only applies to circular-shaped WBCs, such as lymphocytes.

Yang et al. (2005) proposed a color gradient vector on (GVF) activecontour model for WBC segmentation, where a color gradient and L2E robust estimation are incorporated into the traditional GVF snake in Luv color space to segment both nuclei and cytoplasm. While the segmentation performance is good when compared with amean-shift approach and the traditional color GVF snake, the test data is unable to distinguish weak textures, thereby limiting its ability to segment to all types of WBCs.

Jiang et al. (2006) used two feature space clustering techniques: scale-space ltering and watershed clustering, for WBC segmentation. In this scheme, nuclei are extracted using scale-space ltering from a sub-image, while watershed clustering in a 3-D HSV histogram is used to extract the cytoplasm. Finally, morphological operations are performed to obtain all the connected WBC regions. While this method is e effective for WBCs with simple cytoplasm, such as lymphocytes and monocytes, the watershed clustering is limited in the case of complex WBC categories, such as basophiles.

III. SYSTEM ARCHITECTURE

A. System Block Diagram

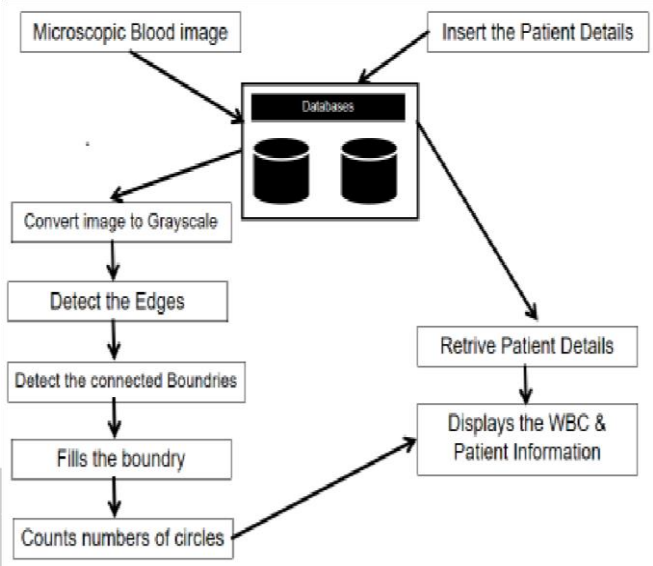

Fig. 1 System Architecture

A. Privacy/Confidential Database and System

The administrator would own a personal password for monitoring a database and system. The database includes patient name, patient address, patient blood sample image and patient blood cell count

B. GUI and Image Analysis

A clean and properly stained blood cell sample image is processed in the software. Blood cell sample image can be taken through CCD camera. For this rst we have to take sample of blood on slide is to taken and its image be captured by using CCD camera under microscope. It uses conventional algorithms to process image of blood sample which is helpful for reading pathologist workload.

C. Image Processing

Image processing tasks like Factorization, Threshold, Edge detection are done according to image and all views of image processing like contrast, convolution, sharp, Laplace, Emboss, Custom, Histogram, Lookup table, Grayscale, Render, Scaling, Image viewer are generated. Thus any patholo-gist and medical technician can see the image in different views and in clear visibility using this software and can second out the approximate count of cells and can recognize diseases from the count cells

IV. RESULT ANALYSIS

A. Main Window

Fig. 2 Main Window

This is the Home page of our project. It shows the Laboratory Name. It show the information of Login, Blood cell ,Report , Details.
In Login page, There are two section:
1.sign in
2.sign out
3.exit
Blood cell-insert the images of blood cell. Report-It show the final report of patient.
Detail-It show the patient Detail.

B. **Login Screen**

Fig. 3 Login Screen

in login screen we can enter user name and password.
It create for security purpose. It useful for user authentication.
It secure patient details.

C. WBC Counter Window

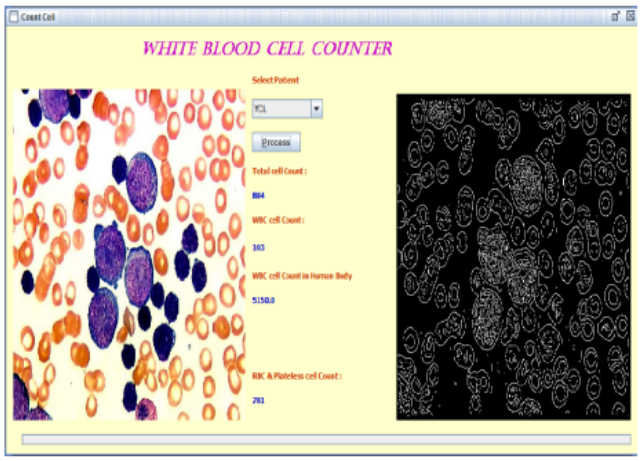

Fig. 4 WBC Counter window

There are insert blood cell images, then process of counting of total cells in body. It display results of total cell, wbc cells, rbc & cbc. There are use gray scale algo. ,Edge detection algorithm.

D. Bill Generate Window

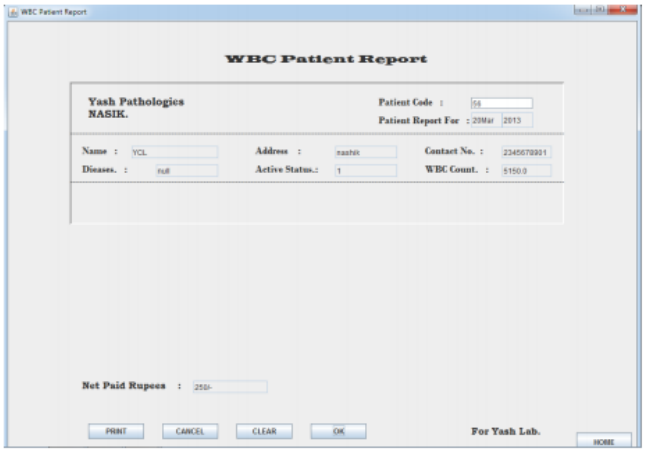

Fig. 5 Bill Generate Window

It show all patient information: like name, address etc Generate the patient bills.

V. CONCLUSION

In this paper, we have proposed an automated image segmentation and classification of electron microscope images and extracting geometric features of leukocyte cells. The experimental results are compared with the manual results obtained by pathologist. The proposed method is more reliable and computationally less expensive and yet yields comparable classification rate in the range 92% to 98% for different leukocyte cells based on feature set F1, and still better rates in the range 98% to 99% in case of feature set F4. It could be improved further by better pre-processing methods and feature sets, which will be taken up in our future work.

This method of identification and classification of leukocytes can also be extended to two other cell types, namely, eosinophil and basophil.

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