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Counting of RBCs and WBCs using Image Processing Technique

Navid Shaikh[1], Karansing Rajaput[2], Rahul Pawar[3], Dr. A. S. Vibhute[4]

[1,2,3]Dept. of ENTC Engineering, SVERI COE, Pandharpur, Maharashtra, India
[4]Head of Dept. of ENTC Engineering, SVERI COE, Pandharpur, Maharashtra, India

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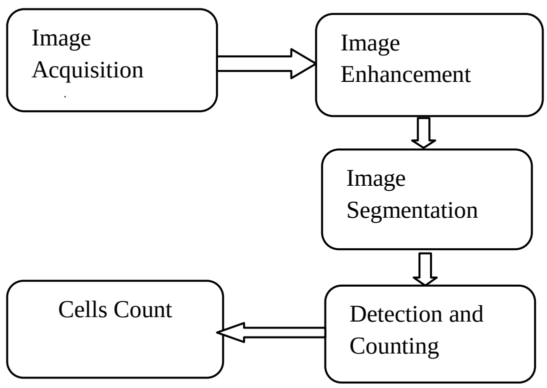
Abstract - *The human blood contains the RBCs, WBCs, Platelets and Plasma. The entire blood count defines the state of health. Blood could be a health indicator so segmentation and identification of blood cells is extremely vital. Complete Blood Count (CBC) includes count of all the cells that determines person's health. The blood cell and WBC count is extremely essential to diagnose varied diseases. Within the hospital laboratories involves manual count of blood cells victimization device known as Hemocytometer and magnifier. However this technique very monotonous, laborious, time overwhelming, and ends up in the incorrect results because of human errors. Also there square measure some pricy machines like instrument, that don't seem to be reasonable by each laboratory. The target of this paper is to provide a gift a picture process primarily based system that may mechanically notice and count the amount of RBCs and WBCs within the microscopic blood sample pictures. Image Acquisition, Pre-Processing, Image sweetening, Image Segmentation, Image Post-Processing and count algorithmic rule these square measure six steps concerned in a picture process algorithmic rule. The target of this analysis is to review the various methodologies of cells count.*

Key Words: **Complete Blood Count Image segmentation Image enhancement, Hemocytometer, microscopic blood sample pictures**

1. INTRODUCTION

The complete blood count (CBC) is the blood test used to evaluate the health of person and to detect the disorders like anemia, infection and leukemia. In medical diagnosis Complete blood count is very important. There are mainly four categories of cells: Red Blood Cells (RBCs), White Blood Cells (WBCs), Platelets and Plasma. These groups can be differentiated using texture, color, size, and morphology of nucleus and cytoplasm. Cells count is important to determine the immunity and capability of the body system. The abnormal count of cells indicates the presence of disease and person needs medical help. Current analysis is on associate degree implementation of image process primarily based machine-driven investigating of RBCs and WBCs from blood image. WBCs are also called leukocytes. These cells are an important part of immune system. These protect body by removing viruses and bacteria in a body. Medical term use to describe low count is Leucopenia. Leucopenia indicates the presence of infection. Medical term use to describe high count is Leukocytosis. Leukocytosis indicates an existence of infection, leukemia or tissue damage. RBCs are also known as erythrocytes. The function of RBC is to carry oxygen and collects carbon dioxide from lungs to the cells of body. They contain protein called hemoglobin. The presence of inner and outer layers of protein gives red color to blood. Hemoglobin does the work of carrying oxygen. An abnormal count of RBCs leads to anemia which results in mental tiredness, illness, weakness, dizziness. If it is not treated immediately it results into more serious symptoms like malnutrition and leukemia. RBC indices give information about size and shape of cells and are also useful in differentiating types of anemia.

2. Block Diagram



2.1 Image Acquisition system

Image acquisition acquires digital images of blood samples in either .jpeg or .png format. These images are in RGB color plane. These are microscopic image that are obtained from hospitals or from laboratories using digital microscopes or using a digital camera placed at the eye piece of a microscope. Images are also available on online medical library.

To examine the RBCs and WBCs stained blood pictures could also be captured with the assistance of skinny glass slides and Digital magnifier. Giesma stained thin blood film image should be taken so that platelets, RBCs and WBCs can be easily distinguished. In to differentiate RBCs from WBCs and Platelets, RBCs are less stained as compare to WBCs and

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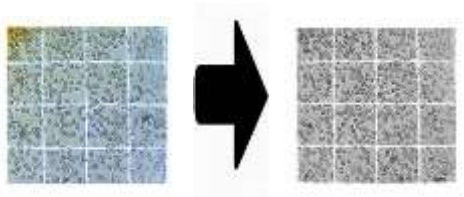
platelets leaving a bright patch with intensity value similar to background value. The images are generated by combination of an illumination source and the reflection or absorption of the energy by the elements of scene being imaged. Illumination may be originated by radar, infrared energy source, computer generated energy pattern, ultrasound energy source, X-ray energy source etc. The Image Acquisition is only Hardware Dependent method, that {during which within which} mirrored lightweight energy from the thing being imaged is born-again into electrons and cover the inner device chip which is like a 2-D array of cells is cell is called photosite and contain amount of charges which is further converted to digital form using Analog to Digital Converter. Now this digital image can be used for enhancement, restoration, segmentation and other manipulations.

2.2 Image Enhancement

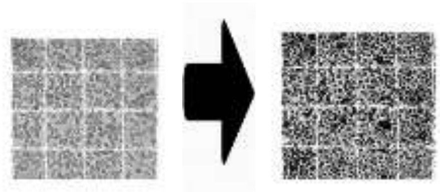
Enhancement techniques improve the quality, contrast and brightness characteristics of an image, also sharpen its details. Histogram plotting, histogram equalization, image negation, image subtraction and filtering techniques, etc. are basic Image enhancement techniques. In Hue saturation is used for enhancing an image. The histogram thresholding is used to distinguish the nucleus of the leukocyte or WBCs from the rest of the cells in the image.



To get enhanced image, pre-processing is done to get enhanced image with Contrast-Limited Adaptive Histogram Equalization. As the green color plane contains more information about the image as compare to blue and red color plane. Green color plane is extracted. To enhance the image, its contrast is adjusted by plotting its histogram. In canny edge detection and connected component labelling is used as image enhancement techniques. The goal of edge detection is to extract the important features like line, corners, curves etc. from the edge of animas. For better segmentation of the blood cells, the obtained image has to be enhanced. Green Plane Extraction: The inexperienced plane is extracted from the foreign vegetative cell image. The other planes such as red and blue are not considered because they contain less information about the image. Contrast Adjustment: To enhance the image, its contrast is adjusted by altering its histogram. The image's histogram is equalized.

2.3 Image Segmentation

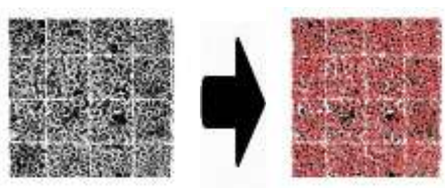
Image Segmentation stage aims to separate and notice white somatic cells (WBC) and red blood cell (RBC). The first stage of image segmentation is to notice white cell. WBC detection stage is the most important part in this study, Morphological characteristics to be searched are: WBC area - size of the area that is the number of pixels nucleus and protoplasm, Nucleus Ratio - the ratio of nucleus pixels and WBC area, and the last one is Granule Ratio is the ratio of granule pixels with pixels of nucleus. Color Filter: Color filters are used to extract WBC regions. Color main filter that will be used is purple color. The purple color is used in the 'blood smears' before usage (observing it) with a microscope. There are also two more color filters: dark blue color filter used to extract WBC nucleus and reddish purple color filter is used to extract Grayscale: After getting the WBC region, further Grayscale filters need to be used to reduce the color of digital image into 8 bits.



This method is used to convert all colors to grayscale (gray) which will provide higher accuracy for the threshold. Thresholding: Thresholding part is employed to flatten the grey image on the white cell region that's to separate between the background and therefore the object within the image. Circle Detection: Circle Detection is used to detect circles in an image using the "inner and outer circle" method. From the edges of WBC its high determined and described two circles, the inner circle and the outer circle with a diameter of specified tolerance.

2.4 Detection and Counting

The Machine Learning approach that we are going to be looking through the remainder of this system may be a doubtless promising advancement over such techniques thanks to many reasons: It requires far cheaper equipment thanks to being reliant on simple imaging. It provides results nearly instantaneously unlike the above methods. Like all Machine Learning, it promises to get better over time as we classify and count more and more blood cells and increase our dataset sizes. Moreover, given that it is software based, we can continuously update it over the air and provide consumers an experience that continually improves.



The images are hand labeled by a diagnostician associated was collected from an existing dataset. They were augmented with images we took with our own microscope and later died. As with all sensible Machine Learning, an oversized a part of our focus was really improvement and preprocessing the dataset.

2. 5 Cells count

Counting rule is applied to live range of RBCs and WBCs.

Formula for counting RBC: $N = C/A \times 10000$

Formula for counting WBC: $N = C \times 50$

Where N - RBC/WBC count in cubic millimeter.

C - Count of RBC/ WBC in an image

A - Input image area

Normal WBC count in blood 4000-11000.

Normal RBC counts in blood 4.5-5.5 million.

3. CONCLUSION

This presents a software based solution for counting the blood cells. Proposed method of cell counting is fast, cost effective and produces reasonable and accurate reliable results. We got 91% accuracy. It may be simply enforced in medical facilities anyplace with minimum investment in infrastructure

REFERENCES

[1] M C Padma Thejashwini M, "Counting of RBC's and WBC's Using Image Processing Technique," International Journal on Recent and Innovation Trends in Computing and Communication, vol. 3, no. 5, pp. 2948-2953, May 2015.

[2] Rahul Kumar Gupta, Manali Mukherjee Mausumi Maitra, "Detection and Counting of Red Blood Cells in Blood Cell Images using Hough Transform," International Journal of Computer Applications, vol. 53, no. 16, pp. 0975 – 8887), September 2012.

[3] Wiharto, and Nizomjon Polvonov Esti Suryani, "Identification and Counting White Blood Cells and," International journal of Computer Science & Network Solutions, vol. 2, no. 6, pp. 35-49, june 2014.

[4] R.C.S Morling and I.Kale S.Kareem, "A Novel Method to Count the Red Blood Cells in Thin," IEEE, pp. 1021-1024, 2011.

[5] Wan Nurshzwani Wan Zakaria, Rafidah Ngadengon and Mohd Helmy Abd Wahab Razali Tomari, "RED BLOOD CELL COUNTING ANALYSIS BY CONSIDERING AN," Asian Research Publishing Network, vol. 10, no. 3, pp. 1413-1420, FEBRUARY 2015.

[6] Jennifer C., Valiente Jr., Leonardo C., Castor, Celine Margaret T., Mendoza, Arvin Jay B., Song, Cherry Jane L., Dela Cruz, "Determination of Blood Components (WBCs,RBCs, and Platelets) Count in Microscopic Images Using Image Processing and Analysis," IEEE, pp. 293-298, may 2017.

[7] Shiroq Al-Megren and Heba Kurdi Fatimah Al-Hafiz, "Red blood cell segmentation by thresholding and Canny detector," ScienceDirect, vol. 2, no. 141, pp. 327–334, Aug. 2018l-Megren and Heba Kurdi Fatimah Al-Hafiz, "Red blood cell segmentation by thresholding and Canny detector," ScienceDirect, vol. 2, no. 141, pp. 327–334, Aug. 2018.

[8] Geonsoo Jina, Dongmin Seoa, Myung-Hyun Namb, Sungkyu Seoa, Mohendra Roya, "A simple and low-cost device performing blood cell counting based onlens-free shadow imaging technique," Sensors and Actuators B: Chemical, vol. 3 , no. 201, pp. 321-328, 14 May 2014.

[9] Dibyendu Ghoshalb Soumen Biswasa, "Blood Cell Detection using Thresholding Estimation Based," ScienceDirect, vol. 89, pp. 651-657, 2016.