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Automatic Rbc's and Wbc's Counting by Using Circular Hough Transform and K-Mean Clustering Algorithm

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Abstract - *Blood cell analysis is important for all human beings, because there are WBCs, RBCs, and Platelets in human blood, White blood cell count gives the important information about human blood and diseases related to blood that help diagnosis many of the patient's sickness. This project work presents an adaptive approach for extracting, detecting and WBC counting in microscopic blood sample images. The counting of WBC and RBC Cells are very important for the doctor to diagnose various diseases such as anemia, leukemia etc. So, the counting of blood cells plays very important role. In hospital laboratories the old conventional method used which involves manual counting of blood cells using a device called Haemocytometer. But due to this, process is extremely monotonous, time consuming, and leads to inaccurate results. Even the hardware solutions such as the Automated Haematology Counter exits, they are very expensive machines and unaffordable in each and every hospital laboratory. In order to overcome these problems, this project presents an image processing technique to counting and detecting the number of red blood & white blood cells in the blood sample image using circular Hough transform and k-means clustering technique. The use of image processing technique to helps in improving the effectiveness of the analysis in term of accuracy and time consumption.*

Key Words**: *WBC, RBC, Automated Haematology Counter, circular Hough transform,* k-means clustering technique**

1. INTRODUCTION *(Size 11 , cambria font)*

In medical analysis blood cell count plays very vital role for blood cell count. Variations in the counting of blood cells cause many diseases in the human body. For overall health diagnosis and health assessment of many human disorders complete blood count is required. Abnormal increment or decrement in cell count indicates that the person has many indispensable medical conditions. In which the Complete Blood Count (CBC) is a blood test, extensively used to check various disorders such as allergies, infections, problems with clotting, anaemia, leukaemia etc. In order to perform CBC test, firstly the blood film is imaged and then stained with a transmission light microscope. Here the analysis of the blood sample is done manually to count number of blood cells and also to identify and to judge disorders in blood samples through a microscope. But it is a very time consuming process and undesirable human error. In essence, the goal behind of this paper is to develop and to validate the required image processing steps to count blood cells on blood smear slides. Recently aims to provide the current work of mitigate problems posed by different conditions such as noisy and degraded images; detect the overlapping of cells to differentiate RBCs and WBCs which are present in a blood smear slide counting RBCs and WBCs.

1.1 Cellular elements of blood sample

1.1.a White blood cells or leukocytes

White blood cells are an important part of the body's immune system. They protect against certain type of the bacteria, viruses, cancer cells, infectious diseases. The density of the leukocytes in the blood is 5000-7000 /mm3.In 5 different types Leukocytes are categorized. They are Neutrophil, Eosinophil, Basophil, Monocyte, and Lymphocyte. This type of Low WBC counts may indicate that a person is in risk of infection. The high WBC counting might indicate an existing infection, tissue damage and leukemia.

1.1.b Red blood cells

Red blood cells, also known as Erythrocyte are the most numerous and important blood cells in the human body. Main function of RBCs is to carry oxygen to the cells in the body. They are small and minute disc shaped cells and contain a protein called hemoglobin by which it will found in red color to blood. Decrease in level of RBC's and WBC's may cause severe diseases including anemia, and leukemia.

1.1.c Platelets

A platelet is a cell fragment that circulates in all the human blood. A low platelet count can cause in human body a person to bleed without their blood clotting. A high platelet count can be increase the risk of thrombosis like (blood clots inside blood vessels), which stops blood from flowing properly.

2. Current Methods for blood cell counting

The Haemocytometer is a conventional device used to count blood cells. It consists of a very thick glass microscope slide with a rectangular indentation by creating a chamber of certain dimensions. This type of chamber is etched with a grid of perpendicular lines in this. It is possible to counting the chamber of cells in a specific volume of liquid fluid, and to calculate the concentration of cells in the fluid. To count blood cell, physician will be view haemocytometer through a recently used microscope and count blood cells using hand tally counter.

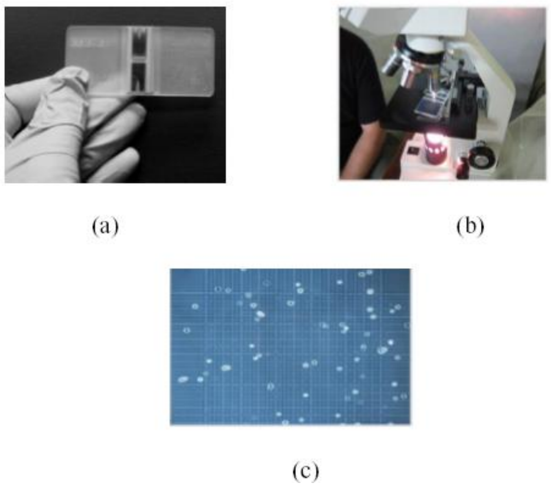


Fig. 1 (a) Haemocytometer (b) Haemocytometer in microscope (c) View of haemocytometer slide through the microscope

3. Present System in Use

At present there are many manual methods for detecting blood samples like microscope by using Haemocytometer but overlapping of blood cells is a very major problem. In today's Available equipment there is found overlapping of blood sample but by this software based method it is to be overcome easily.

- Manual counting task is time-consuming and laborious
- In blood cells the counting overlapping is a major problem
- Difficult to get consistent results from visual inspection

Work is based on counting blood cells from different blood sample images which found in it, it is important for every human being to know about their blood cells at low cost and by saving their time with accuracy.

4. Problems in the Existing System

Image processing is used to modify the Images to improve the image quality. Hence, it can be analyze in many applications such as in the result accuracy and time consuming. The major steps in the image analysis are preprocessing, image segmentation, feature extraction and counting. The most important and challenging step is image segmentation because of the feature extraction and counting depends on the correct segmentation of RBC and WBC. Besides that, the uncertainties inherent in the microscopic image to identify whether it is a foreign bodies or cell such as dust can interfere in the image analysis process.

- Manual counting task is very time-consuming and laborious
- Counting overlapping blood cells is a major problem
- Difficult to get consistent results from visual inspection

Table -1: Normal RBC and WBC in human body

Blood cell types	Male	Female
RBC	4.5-6.0 million/microliter	4.0-5.0 million/microliter
WBC	4.5-11 thousand/microliter	4.5-11 thousand/microliter

5. Methodology

Input Image

The digital microscope is interfaced to a computer and the microscopic images are obtained as digital images.

Resize Image

For better segmentation of the blood cells, the obtained image has to be enhanced.

- Green Plane Extraction: The green plane is extracted from a human imported blood cell image. The other planes such as blue and red are not considered because they contain less information about the image.

- Contrast Adjustment: To enhance the image, its available contrast is adjusted by altering its histogram. The image of histogram is equalized.

Image Segmentation

By image segmentation, it involves selecting only the region of interest in the image. Here only the blood cells are selected, because they are the important areas of interest. When circular Hough transform is to be applied, not much of the image segmentation is needed because the applied transform only looks for the circular objects in the image.

Detection of Blood Cells

The circular Hough transform is mostly applied to the contrast adjusted image. This transform searches for the blood cells in the image and then to detects them for better result. The function of “draw circle” draws circles around the detected cells. Even the overlapping circles are detected.

Counting of Blood Cells

Counting the number of cells drawn gives the total number of blood cells in the image.

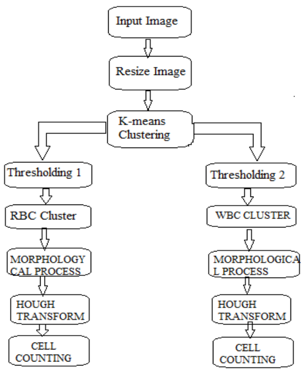
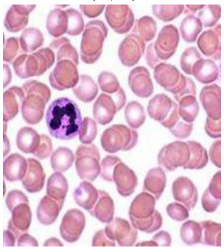
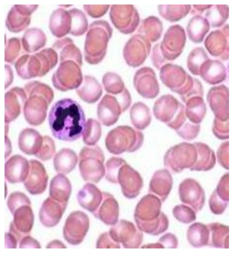


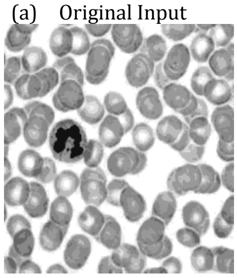
Fig 2. General Methodology



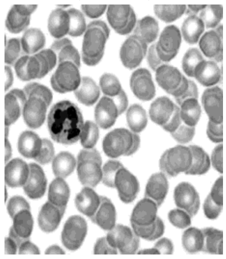
(a) Original Input



(b)Filtered Image



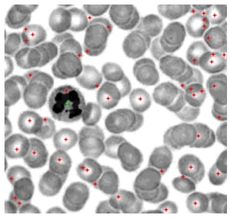
(c) Equilised green plane



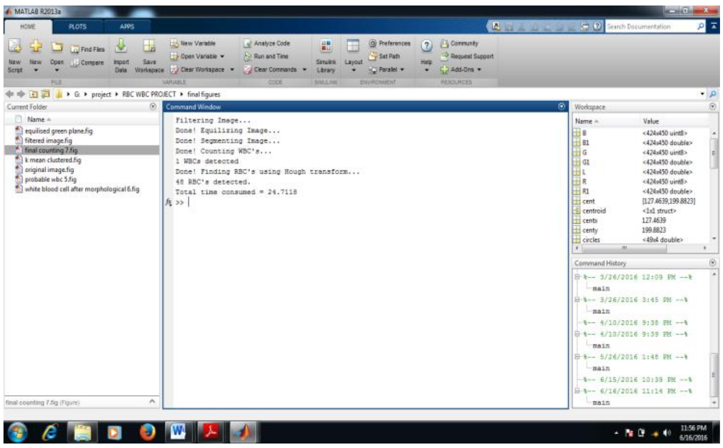
(d) K mean clustered

(e)White blood cells after Morphological operations

(f) Probable WBC



(g)Final counting



(h)MATLAB image of WBC and RBC counting

6. CONCLUSIONS

This paper presents a software based counting of the blood cells. Proposed method of cell counting is fast and accurate, cost effective and produces accurate results. It can be easily implemented anywhere with best medical facilities with minimal investment in infrastructure. This method can also recognize the overlapping cells and counts them separately. The average time required and the average accuracy of the proposed system is 24 seconds.

REFERENCES

[1] Venkatalakshmi.B, Thilagavathi.K "Automatic Red Blood Cell Counting Using Hough Transform" in Proceedings of 2013 IEEE Conference on Information and Communication Technologies (ICT 2013) in 2013.

[2] S.Kareem, R.C.S Morling and I.Kale "A Novel Method to Count the Red Blood Cells in Thin Blood Films" in 978-1-4244-9474-3/11/ IEEE in 2011

[3] Jameela Ali,Abdul Rahim Ahmad, Loay E. George, Chen Soong Der, Sherna Aziz,"Red Blood Cell Recognition using Geometrical Features" in IJCSI International Journal of Computer Science Issues, Vol. 10, Issue, 1 in January 2013.

[4] Ms. Minal D. Joshi, Prof. Atul H. Karode, Prof. S.R.Suralkar,"White Blood Cells Segmentation and Classification to Detect Acute Leukemia" in International Journal of Emerging Trends & Technology in Computer Science (IJETTCS), Volume 2,ISSN 2278-6856 in May – June 2013.