Cell Counting and Particle Analysis from Image Captured by using Microscope

Swapnali Patil[1], Mayuri Pawaskar [2], Varsha Sawant[3], Kajal Godage[4], Prof.B.A.Jadhawar[5]

B.E Student, Department of Computer Science & Engineering, DACOE, Karad[1,2,3,4]

Professor, Department of Computer Science & Engineering, DACOE, Karad[5]

Abstract: Blood cell count plays very important role in medical diagnosis. Increment or decrement in the count of blood cell causes many diseases to occur in the human body. There are different techniques of blood cell counting which involves conventional as well as automatic techniques. The conventional method of manual counting under microscope is time consuming and yields inaccurate results[5]. A solution to this problem, to provide software-based cost effective and an efficient alternative in recognizing and analyzing blood cells, This paper presents the preliminary study of automatic blood cell counting based on digital image processing. The number of blood cell count that is RBC & WBC count is then may be use to diagnose the patient as well as detection of abnormalities. For this purpose, few pre- processing and post-processing techniques have been implemented on blood cells image in order to provide a much clearer and cleaner image.

Keywords: Automatic detection, Biomedical image processing, Blood cell analysis, Segmentation.

I.INTRODUCTION

The observation of blood samples by expert operators is one of the diagnostic procedures available for the recognition of different diseases. The human visual inspection is tedious, lengthy and repetitive, and suffers from the presence of a non-standard precision: that is because it depends on the operator skills. These reasons have limited its statistical reliability. On the other side, the automated analysis by computer requires only one image and not a blood sample; for this, it turns out to be less expensive but at the same time more scrupulous in providing precise standards [1].

This project describes a preliminary study of developing a detection of blood cell count using microscopic blood sample images. Analyzing through images is very important as from images, diseases can be detected and diagnosed at earlier stage. From there, further actions like controlling, monitoring and prevention of diseases can be done.

II.NEED OF PROJECT

To detect and find a blood cell count and produce an accurate cell count report. This would be very helpful to a physician in identifying the cause of his patient's diseases. Analysis and processing of a microscopic image, in order to provide an automated procedure to support the medical activity and easily identify the intensity of diseases. Also maintain the patient detail and manage detail.

III. GOALS AND OBJECTIVES

A .Goals

-The main goal of this work is the analysis and processing of a microscopic image, in order to provide an automated procedure to support the medical activity and easily identify the intensity of diseases.

-The biggest detraction of microscopy, namely its dependence on the skill, experience and motivation of a human technician is to be removed. Used with an automated digital microscope, which would allow entire slides to be examined, it would allow the system to make diagnoses with a high degree of certainty.

B. Objective

-To provide this system is user friendly so that the pathologist can observe the blood cell sample image in different view. Also pathologist can get the result of blood cell test within seconds as tested.

-To count the number of cell automatically and provide the accurate number of cells.

IV.RELATED WORK

The conventional method of manual counting under microscope is time consuming and yields inaccurate results. Manual method for counting WBC and RBC.

A. White Blood Cell

Calculation of the WBC count is achieved by following the formula below using these factors:

i.   The number of WBCs counted in the big squares
ii.   The dilution of the cell solution
iii.   The number of counted big squares iv. The volume above a big square
iv.   The volume above a big square

WBC"s/μl=

$$\frac{\text{Number of counting WBC's * dilution}}{\text{Number of counted square * volume above one small square}}$$

B. Red Blood Cell

The calculation is achieved by following the formula below using these factors:

i. The number of RBCs counted in the small squares
ii. The dilution of the cell solution
iii. The number of counted small squares
iv. The volume above one small square

RBC‟s/µl=

Number of counting BC's * Dilution
_____

Number of counted square * volume above one small square

V. PROPOSED METHODOLOGY

A. *Functionality of proposed methodology*

The overall Methodology of image processing techniques in the proposed method is described in below.

First of all an input image of already prepared slide is take from the camera attached to the microscope, then through different image processing techniques and image filters the extra unwanted information is removed from that input image. After removal of noise the area of interest that is the area where we need to count the blood cells are cropped from the image and by labeling algorithm of connected pixels blood cells can be count to put in different equations to abstained cell count report.
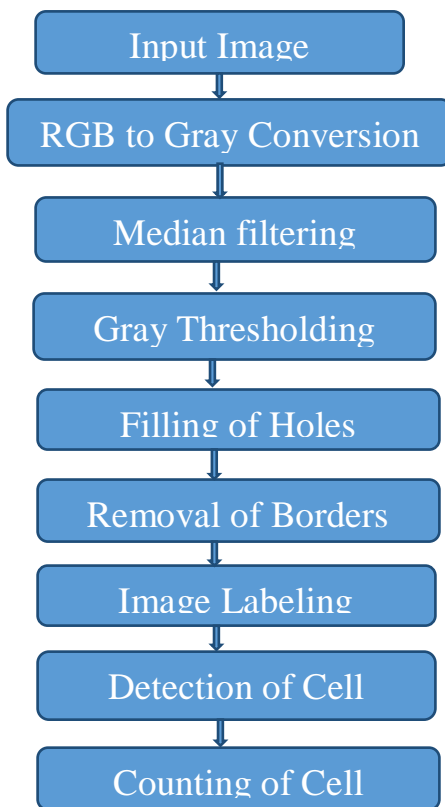

Fig.1.Flowchart

1. *Image Pre-processing :*

Step 1: Input image

In this, when you click on browse button- the current directory is opened, and from this you can select any patient's folder to calculate number of blood cells in his body. Like each patient's folder consists of blood images with the medical report of that patient.

Step 2: RGB to Gray conversion

Image read in step-1 is in RGB format. This image is to be converted in to grayscale format. After converting this image in to grayscale, practically source of noise is thermal noise and artifacts i.e. noise added due to body movement.

Step 3: Median Filtering

Median filtering is used to remove noise which is added at the time of capturing the microscopic blood images. This unwanted noise can be the dust particles that are present on the blood slide while preparing the slides.

2. *Image Segmentation :*

Step 1: Gray Thresholding

In this using thresholding algorithm removes the unwanted cells and extract and segment the image object and also clean the image [5].

Step 2: Filling Holes

Holes presented in the binary image form. This image is filled so that the blood cells are segmented properly.

3. *Image Post-processing:*

Step 1: Removing Borders

The cells occupying the border contains less information and has to be removed to reduce the complexity. The segmented image is labeled.

Step 2: Image Labeling

Labels the connected objects. The objects can have a value of either 4 or8, where 4 specifies 4-connected objects and 8 specifies 8-connectedobjects.

B. *Modules and Their Functionalities:*

Modules:

This system consists of three modules those are:

A. Patient Information Management
    1. Load Patient Information
    2. Set Test of patient.

B .Update information of Patient
    1 .Blood Cell Counting

C. Labeling and Particle Analysis.
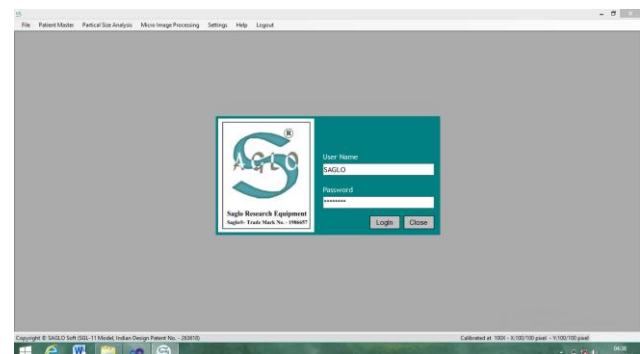   1. Printing

A. Patient Information Management

Fig. 2. Login page of the System

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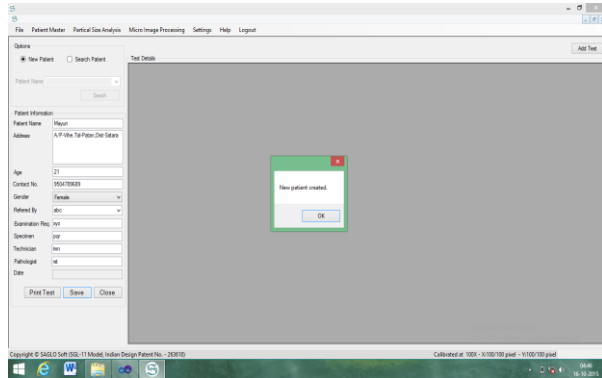
1. Patient Details:

Fig.3 Patient Details

In this module add information about patients for e.g. add patient name, address, and age, contact no, gender, referred by examination req, specimen, technician, and pathologist. After that save these information.

Suppose we want to search any particular patient information then you can easily search the patient. In this module you can add test, in this display the test details like group name, test description resultant count, normal range and comment.

In group name various test are included like W.B.C. count report, Haematology, Urine Examination Report. In add test we have get image.

In get image we can browse image select the camera then capture the image. Here display the cell details, cell range details, print cell details, print image, process in MS PAINT, Export image, Finalize result.

2. Print Patient List
In these generate the report and print the patient list.
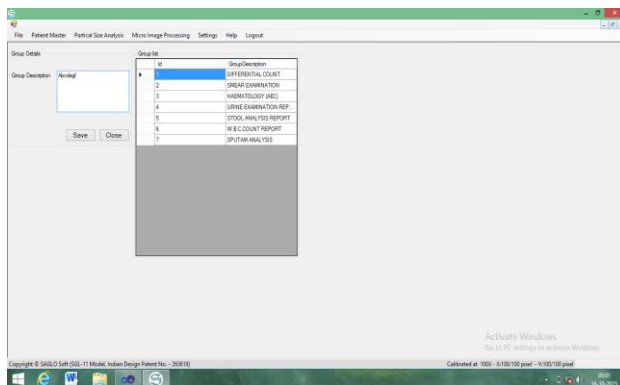
B. Test Management:
Test Groups

Fig .4 Group Detail

In these we can add group description like HAEMATOLOGY, W.B.C. Count Report, SPUTAM Analysis and save the group description.

3. Test Information
In test information add group name, Test description Result with unit, Normal Range and save the test information.
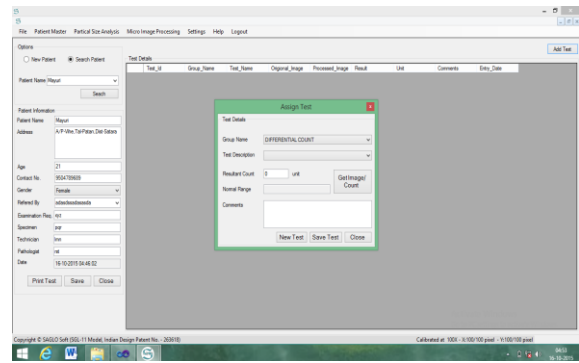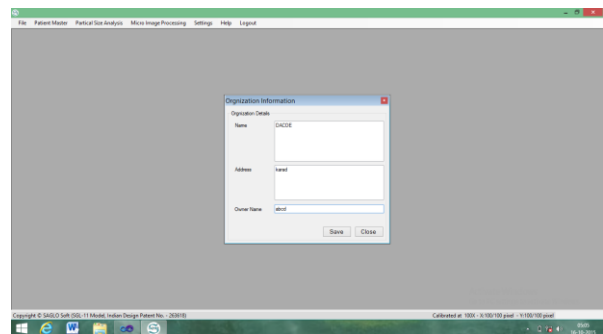

Fig.5 Add Test

Organization Details

Fig.6 Organization Details

In Organization details add name of Organization, Address, Owner name and save the organization details.
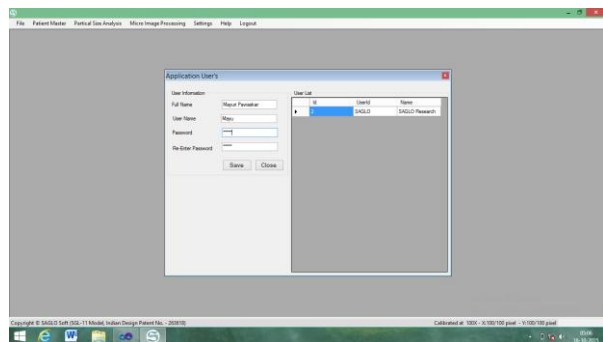
Application User

Fig. 7 Application User

In Application user add User information like a Full name Password, Re-Enter Password and save the application user.
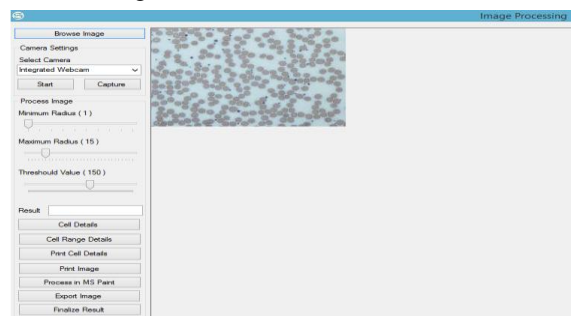
3. Cell Counting

Fig. 8 Capture Image

In this capture or browse the image and count the cell

VI. APPLICATIONS

This software used in Pathology Lab, Biomedical Center, Pharmacy College, Hospitals to count the number of cell automatically and provide the accurate number of cells and also manage the patient details management.

VII. FUTURE WORK

In this work it has been proposed an innovative method for a completely automatic identification of leukocytes from microscopic images, in order to provide an automated procedure as support for medical activity. The results obtained show that the proposed method is able to identify in a robust way the blood cells present in the image.

Proposed method for cell counting blood cells is similar for counting remaining two types of cell counting and through the same procedure we can develop another algorithm for detecting malaria parasite in the blood, malaria parasite also found in blood and the current method of detecting malaria parasite is to prepare the slide and study is under microscope to recognize malaria parasite in the blood, by improving our proposed algorithm we can also detect malaria parasite through computer vision technologies and techniques of image processing techniques. But this procedure would need a little advance microscope then the ordinary used in the clinical labs to achieve 100% accurate results.

VIII. CONCLUSION

This system has implemented the segmentation part and after testing this system it is concluded that, it is more timely efficient than the existing systems. It is reliable and cost effective than automated method. The aim of this system is to provide CBC i.e. complete blood Cell Count, which has been achieved by using the Powerful Image processing technique.

This system is more efficient in reducing the valuable time than manual system. The system is user friendly so that the pathologist can observe the blood cell sample image in different views. Also pathologist can get the result of blood cell test within 20 seconds to 1 min. as tested.

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