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Segmentation of WBCs using HSV Saturation and Blob Analysis Technique

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Abstract: ***Now we are in the 21st century technology makes an great impact on our life. so we decided to do our project in technology field. technology gives us knowledge of techniques and process which will help us to reduce our efforts.In medical fields most of applications are based on engineering field, so by using image processing techniques we decided to do work on project which will combine engineering and medical fields together so we did our project in biomedical field.So we are using matlab software to count the WBC's which will help to reduce cost required for counting and also reduces time which is required for counting.***

Keywords: Leukocytes, WBC's, HSV, saturation, Blob Analysis, count

I. INTRODUCTION

The process of counting leukocytes or WBC (white blood cells) has been an integral part in the field of medical diagnosis. It is perhaps one of the most frequently requested tests in all types of clinical trials. This process helps medical professionals to assess our overall health and diagnose wide range of illnesses including anemia, infections, leukemia and myeloma. [1]

In the past, there were two tested methods to perform this procedure. First is by manually counting leukocytes which is performed by experts with the use of a device called Haemocytometer. It is a method which depend its result in the skill of the expert performing the process and thus, the presence of human error is always a factor. The next one is through a technology called Hematology Analyzer which is an automated device that performs the counting and gives a more accurate result as compared to manual counting. However, not all medical facilities can afford it due to its costly nature.

Nowadays, in the advent of technology lots of researchers are resorting on the capabilities of image processing to be able to create alternatives for the aforementioned methods of leukocyte counting. Some of these works focuses on the automated classification of leukocytes from microscopic images by analyzing each cell's feature characteristic and performing supervised classification using SVM (Support Vector Machine). While other methods uses different image conversion techniques such as extraction of Y (Yellow) component on a CMYK (Cyan, Magenta, Yellow, and Key) color model and histogram equalization for image feature enhancements and some utilized HSV (Hue, Saturation, Value) color space and HSV thresholding for blood cell segmentation.

II. REVIEW OF LITERATURE

In this chapter we will demonstrate the various methods which involves different image processing techniques being currently implemented for the identification and segmentation of leukocytes. A Leukocyte Counting Using Image Processing ,In the application of image processing to identify and count the number of leukocytes on microscopic blood images, developing an efficient segmentation technique and counting algorithm is very critical. which uses various image conversion techniques.

The method includes the extraction of Y component from CMYK color model based on a converted RGB (red, green, and blue) image to highlight the features of leukocyte from red blood cells and platelets. Then used the features like area, size, and shape of leukocyte for segmentation and identification by incorporating watershed. The method was able to identify leukocytes affected by ALL (Acute LymphoblasticLeukemia) with 93% accuracy.

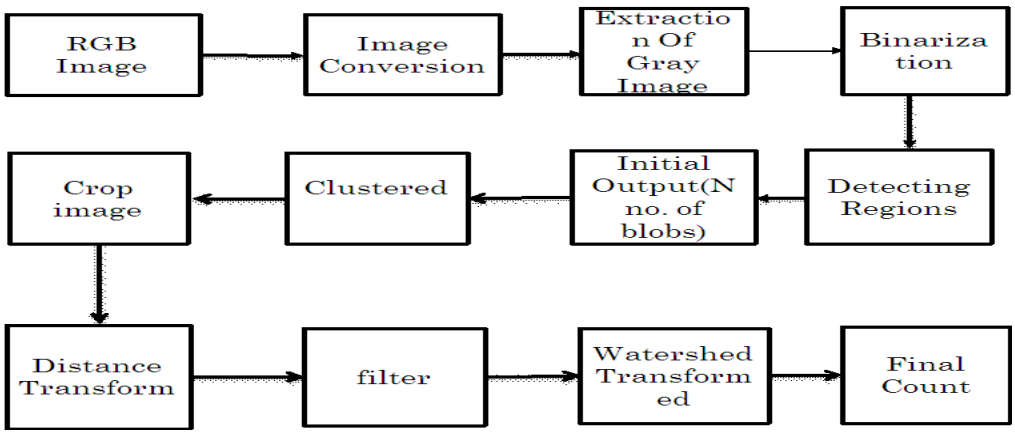
In the pursuit of advancement on leukocyte segmentation and counting Puttamadegowa et al. proposed a method which incorporates FCM and Snake algorithm to various image conversion techniques. The method was able to generate an accuracy of 96%. In order to have an accurate count of leukocytes it should be noted that the final segmented objects should be free, if not minimal, of unwanted objects or noise. utilized blob analysis and double thresholding to classify red blood cells and leukocytes by means of assigning a certain value to be considered as significant and all others are considered as noise on a binary image . Aside from being able to generate accurate results on segmenting and counting leukocyte, efficiency of a proposed method should also be taken into consideration. There has been a lot of researchers who used K-means clustering to segment leukocyte based on microscopic images such as works in. However, based on the research execution of K-means clustering alone would take.

"White Blood Cells Identification and Classification from Leukemic Blood Image," in IWBBIO international work-conference on bioinformatics and biomedical engineeringby L. Putzu and C. Ruberto[2]

This paper aimed to present the medical diagnostic system has the ability to segment the WBC and count the number of Eosinophil cells depending on mathematical, logical, morphological operations and median filter. Several Experiments on creative database are implemented using MATLAB R2011a environment to evaluate the performance of the system and the results reach to 95%.

This system consists of four levels to produce the required results that provide the proper information to support the medical diagnostic. In the first level collecting images responsible for provide required blood images that used in the test.

III. WBC COUNTING USING IMAGE PROCESSING



1) *RGB Image:* It is a original microscopic image contains colors having 2^{24}-1 intensity level that is 65537 levls .the memory size required to store the this image is 3 byte.[1]
2) *Image Conversion:* In this block the original image is converted into grey image using saturation component in HSV technique.
3) *Extraction of Grey Image:* The image is converted into grey image because it is easy to recognise image in grey scale. The grey image Require 1 byte memory to store an image.
4) *Binarization:* It is process used to convert grey image into a binary image wich contains result in the form of 0 and 1 where 0 represents black level and 1 represent white.
5) *Detecting Region:* The output of binary image is analysed and by using edge detection the detecting region consist of blobs can be monitored.
6) *Filter:* It is used to remove unwanted images and small spots that is blobs present in an image. And the dezzired output is taken.
7) *Distance Transform:* Here uses different transformation techniques such as image negative which is taken by using formula;

S=L-1-r

Where

S= Processed image
L= Intensity level
r=original input image

8) *Final Count:* In this we get final output of the image which gives count of image in the form of bobs at the output.

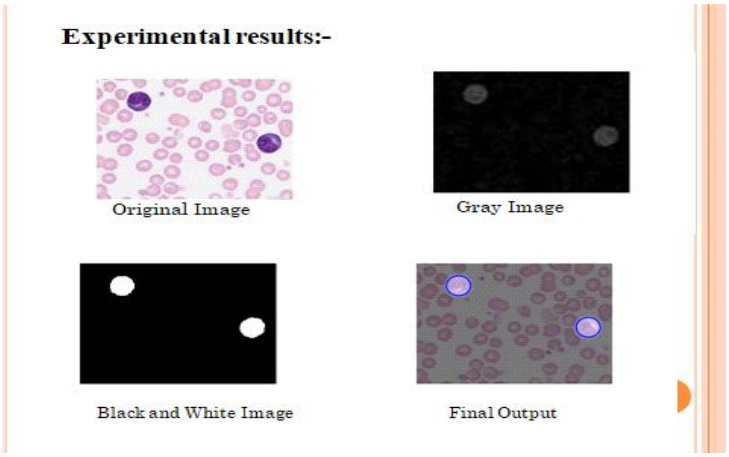
A. *Final Result*

This is the final output of our project first we have taken one original RGB image as shown in figure. The original image consist of WBC's which also called as Leukocytes. The original image also consist of RBC's which is represented in pink color while WBC's are in the purple color. Then we convert Original image into grey scale by using excitation of grey image using s component from HSV Saturation. The grey image consist of 2^8 intensity levels. To store one grey image it requires 8 bit memory.

By using Binarization Process for conversion The grey image is converted into black and white image .usually Black and white image indicates two Intensity levels .usually white represents 1 and black represents 0.Conveersion of any grey image into black and white shows easy detection for image. By using blob analysis technique the number of blobs present in an black and white image can be analyzed by its shape, size area , perimeters . also by using edge detection we can give that blobs edge color in blur so that we can easily recognize the WBC's in the blood.For simulation we have used MATLAB 2016 version

Table 1: WBC Count

Image	Manual Count	Automated Count	Accuracy (%)
1	3	3	100
2	6	6	100
3	6	6	100
4	9	9	100
5	1	1	100
6	2	2	100
7	6	6	100
8	2	2	100
9	2	2	100
10	14	12	90.91



In this paper we have taken 10 samples of microscopic blood images and by using segmentation techniques we can analyse the exact count of WBc present in an desired blood image.

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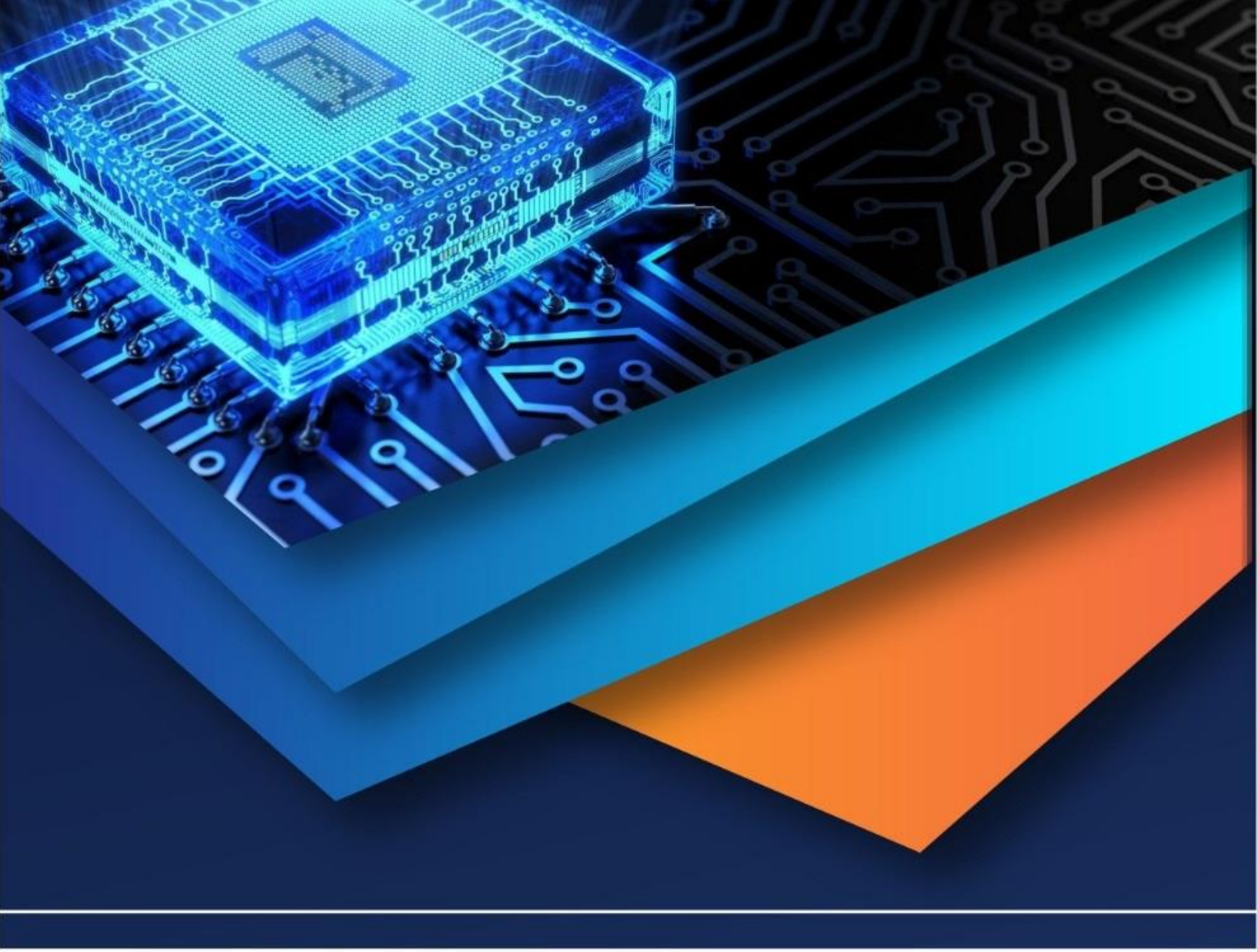

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