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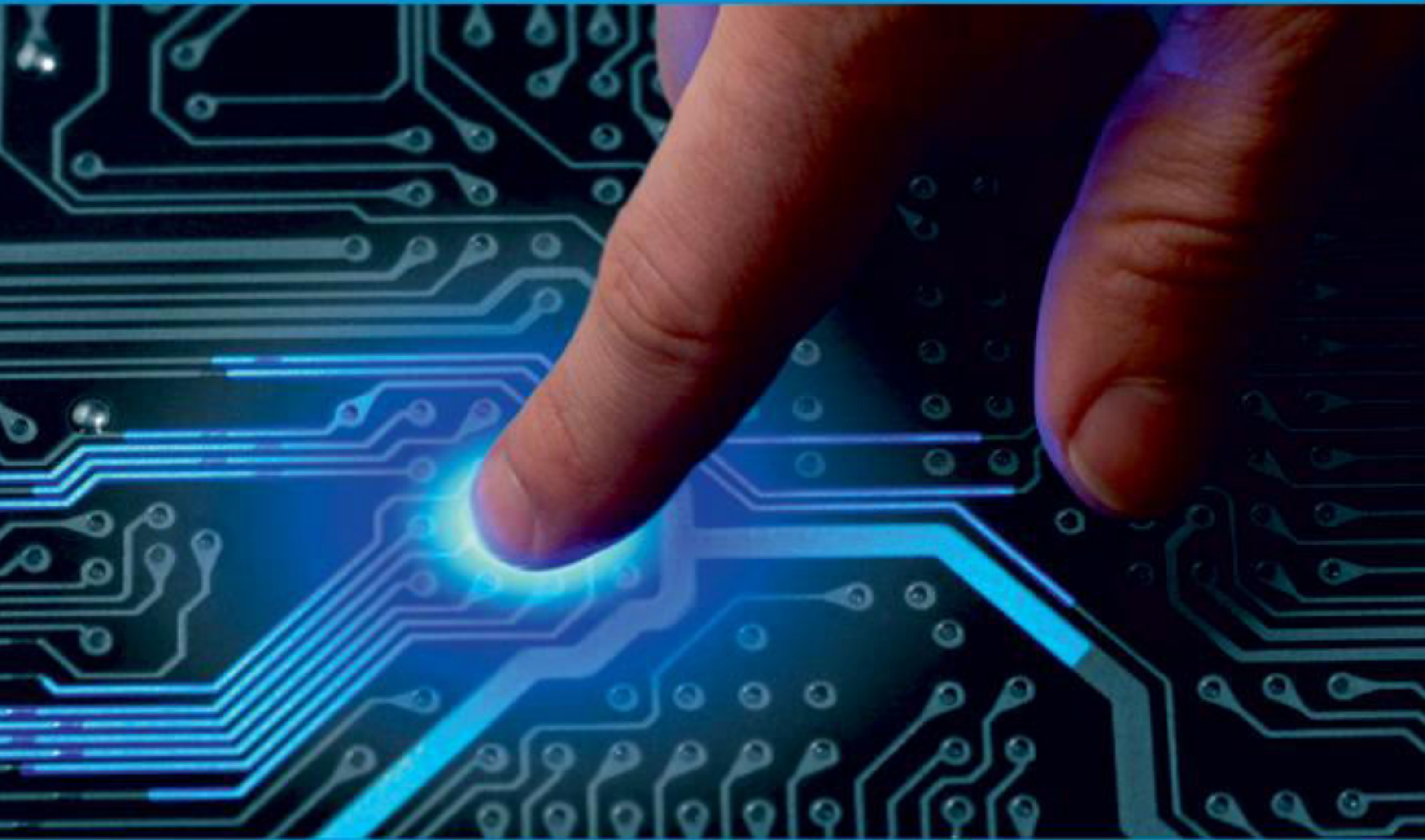

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An Automated Method for Counting Red Blood Cells (RBC's) Using Image Processing

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ABSTRACT: In healthcare centres, blood testing is one of the most significant medical examination tests. By counting RBCs(red blood cells) in images of blood cells can play a very great role in detection and helps in identifying various types of diseases such as anaemia, kidney diseases, leukaemia etc. Red Blood Cells, White Blood Cells, plasma and Platelets are the contents of the human blood. The state of health is defined by the complete blood count. Old traditional method used in the laboratories involves physical counting of blood cells using the device Haemocytometer. The process of counting the number of blood cells manually is very exhausting, consume lot of time, large number of technically skilled people are required. This existing system also contains expensive machines, which are not affordable by every laboratories. The objective of this paper is to produce a estimate on an image processing system that can automatically detect and count the number of RBCs in the blood sample image. In proposed work, images are classified on the basics of colour and texture. The steps involved in image processing are Image Acquisition, Pre-Processing, Image Enhancement, Image Segmentation and Counting algorithm . This image processing includes feature extraction using morphology, thresholding segmentation and counting of cells using Hough transformation. The proposed system will be faster, more accurate than the existing system.

KEYWORDS: RBC, Image Processing, Segmentation, Morphology, Hough Transform

I. INTRODUCTION

Different systems are coming forward in health care system from all over the world which are playing very important role in society and also in diagnosing the patient and in identifying the disease .Counting of RCB is one among them in order to identify the disease or disorder one individual of that particular patient.

An RBC count is a blood test that measures how many red blood cells you have. It contain haemoglobin, which carries oxygen. The cellular components of the blood cells can be classified into three types: Red Blood Cells, White Blood Cells and the platelets. These are classified using colour, size structure and shape of the nucleus and cytoplasm. The main function of RBC is to carry oxygen from our lungs to the rest of our bodies. Then it returns, taking carbon dioxide back to our lungs to be exhaled, Anaemia, Malaria and thalassemia are the diseases which are related to the blood. To verify the immunity and capability of the human body, the count of the RBC is very important. The diseases that related to blood are Anaemia, malaria and thalassemia. The variation in the RBC counting as excepted is a sign of the deficiency and the many diseases for one individuals in the medical field.

II. BOARD WORK

To observe the RBC and WBC that has been acquired from the microscopic images, thin glasses are used. Database is included in these images. At some point digital image processing contains the three colours that are; Red, Green and Blue which contains all the data of the microscopic images that are acquired. Then the images that are given as the input are converted into RGB form where only Green colour will be extracted for the further processing. After the completion of this process, the circle will be detected using the circular transformation, and at the end the circle which is green in colour will be counted as they includes the maximum value. Later, the image which has obtained (i.e. green colour image) contains the circular Hough transformation is applied to see the blood cells to detected the images. The output figure is as follows

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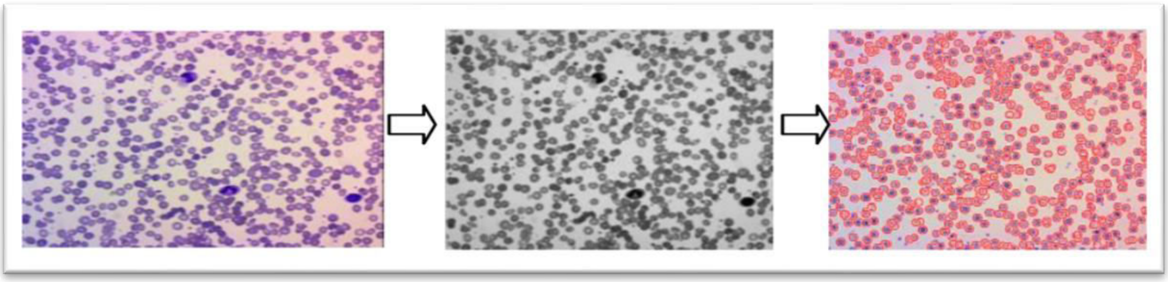

Figure : Input image gray image output image

III. PROPOSED SYSTEM

The proposed method consists of image acquisition followed by pre-processing and thereafter segmentation, feature extraction and counting of blood cells. The entire progression is initialized by acquiring the blood image, which is then transmitted to the further processing level then its thresholding image is generated for applying morphological functions thereafter, counting the total number of red blood cells. Input: Images of blood cells. Output: Count of Red Blood cells. Stepwise details of the proposed algorithm are as under:

Algorithm:

Step 1: Read the image from database. Quantize the image to make it compatible for processing

Step 2: Segmentation of the image is the second step. Segment of the image in constitute objects is done on the basics of some threshold criteria T. For this purpose segmentation based on thresholding is used. In this method, in order to extract objects from background, if the intensity value of image is less than some threshold value (i.e. $f(x,y) \leq T$,),then each pixel in image is replaced by lowest pixel value. If the intensity value of image is more than some threshold value (i.e $f(x,y) > T$.), then each pixel in image is replaced by largest pixel value .Thresh=T [x, y, p(x, y), f(x, y)] T(x, y) = 1, if f (x, y) > Threshold 0, if f (x, y) ≤ Threshold(8)

Step 3: Various morphological operations are applied on the output image from step 2. Example: median filtering, edge detection and erosion.

Step 4: Total number of red blood cells are calculated using Hough Transform using following logic.

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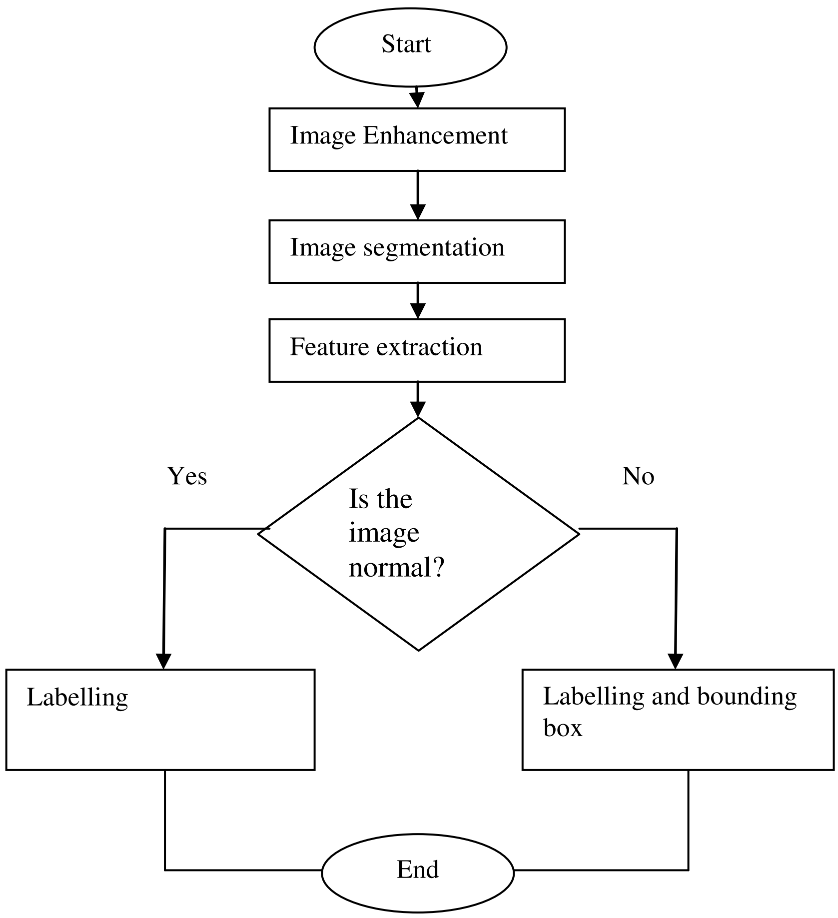

FIGURE : Workflow Classification

IV. IMPLEMENTATION

Problem Statement for Counting of RBC's value

- **Input** : Microscope image from internet
- **Process** :
  - Image acquisition
  - Thresholding segmentation
  - Texture feature extraction:
    1. Median Filtering
    2. Edge Detection
    3. Smoothing using erosion
  - Counting of cells using Hough transformation
- **Output** : Counting of RBC's value and detect anemia

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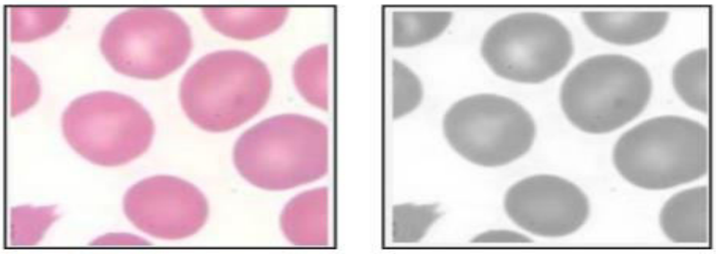
Design considerations

- The classification of the images into various disease types is done based on the features identified in those images by the classifier models.
- Pre-processing is carried out on the images using relevant methods that are best suited for the succeeding classifiers, after acquisition. 11 suited for the succeeding classifiers, after acquisition.
- For CNN, we have to first run algorithms to extract features that help the classifier.
- Thus ,on running images through the various classifier models, we get to know the disease name ,we check the accuracy manually and a comparison between these methods is performed.

Preprocessing

Conversion from RGB to Grayscale

- The intensity of the image is represented by Grayscale
- Since all blood elements colors are similar or close to background color, all acquires images will have low contrast.
- To store a single color pixel of an RGB color image we will need 8*3 = 24 bits i,e 8 bit for each color component.
- Grayscale images are much easier to work within a variety of tasks like in many morphological operation and image segmentation problem.
- Grayscale is a single layered image where as RGB is a multi-layered image. Thus it is easier to work with the Grayscale images.
- It is also easier to distinguish features of an image when we deal with a single layered image



(a) Input sample of blood cells (b) Converted Gray image

Image Segmentation

- image segmentation is a technique used to separate an image into its constituent regions or objects. Segmentation stops when object of interest is isolated.
- Let us consider a threshold value T, if the intensity of image a(x,y) is less than threshold value, each pixel in image is represented by black pixel. (i.e. $a(x, y) \leq T$).
- If the intensity of image a(x,y) is more than threshold value, each pixel in image is represented by white pixel. (i.e. $a(x, y) > T$).

Image Morphology for Feature ExtractionMorphology can be used to extract elements of any image which may be helpful in determining and representing the traits of image regions such as boundary extraction, morphological filtering etc

Median Filtering:

- Median filtering is a non-linear smoothing spatial filter often used for noise reduction, thereby enhancing the quality of the edges in an image
- Here 0's are appended at the edged and corners to the matrix which is the representation of the grey scale image

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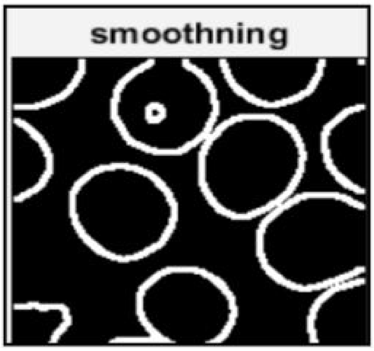
Smoothing Using Erosion:

- Image smoothing is used to enhance the quality of edges in an image .By using erosion we can obtain the Region boundaries.
- The state of a pixel in output image can be determined by applying the imperative in output pixel's value is the least of all the input pixel's neighborhood.
- It can be given by the following equation:
  Erosion= {Z/ (C) z⊆D}
  Image Boundary= Original image - Eroded image



RBC Count

Healthy person count :

Male : 4.7-6.1 million cells per mcL
Female : 4.2-5.4 million cells per mcL
Children : 4.0- 5.5 million cells per mcL

Anemia patient severity :

Male : Less than 4.7 million cells per mcL
Mild : 4.5 million cells per mcL
Moderate : 4.0 million cells per mcL
life threatening : 3.5 million cells per mcL

Female : Less than 4.2 million cells/mcL
Mild : 4.0 million cells per mcL
Moderate : 3.5 million cells per mcL
life threatening : 3.0 million cells per mcL

V. FUTURE WORK

With the development of science and technology, important role is played by computer forensics. Moreover with the increase in the cyber-crimes like hacking etc, need of computer forensics have felt, thus various tools and techniques have been developed for tracking the crime, These tools will play a vital role in the aspect of the recovery. There is need to make this tools more advance and enhanced to make computer forensics a full success and legally valid in law.

VI. CONCLUSION

This paper is based on an automated process for counting red blood cells. Image processing method as been used. The microscopic slides are used to count cells depending on the eye observations by specialists in exsisting system. Thus the exsisting system is more time-cosuming, less accuracy and inconsistent. In proposed system all the blood samples are captured in the Digital image format .Digital image is the input image which contains images of cells at

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arbitrary position. Various image processing and morphological operations are applied on the input image for counting RBC's automatically without human intervention. 93.66% accuracy can be observed using this automated method. By analysing this paper we can conclude that the proposed system can be implemented in lab to automate the process of counting RBC's. Thus the proposed system is more accurate and less time-consuming compared to the existing technique.

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