

Automatic Blood Cell Count Using Blob Detection Algorithm

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ABSTRACT

The red platelets, white platelets, and platelets are vital for human resistant framework. These cells attack the infection causing germs and protect the human body from diseases. White platelets are found in the bone marrow, they are emerged in the bone marrow and flow along the bloodstream. red blood cells sends the oxygen to our body. platelets are minuscule cells that help our body from clusters to quit dying. counting of cells through normal laboratory testing using microscope is common to everyone which is otherwise called as manual testing. Manual method cannot give a precise result, to solve this problem codes are generated, that helps to count the blood cells using images. Using image processing techniques and a blob detection algorithm the RBCs, WBCs and PLATELETs are differentiated from each other. The working database system keeps the records of the patients, respondents etc. Results show an accuracy of 96.32% for RBCs. Hence, the proposed system can create a benchmark in counting RBCs from the blood sample accurately when compared to the manual method.

Index terms- Blob-detection algorithm, Discrete wavelet transform, Feature Extraction, Artificial Neural Network, Median filter

1. INTRODUCTION

Hematopoiesis is the deterministic cycle of platelet arrangement occurring in the bone marrow. Mature platelets are created by a firmly controlled instrument from hematopoietic undeveloped cells.

Red platelets are small platelets that are significant for the soundness of human through conveying new oxygen all through the body though white platelets shields the body from contaminations. Complete Blood Count (CBC) includes blood testing to decide the constitution of the significant parts of blood which are platelets, red platelets and white platelets.

Irregularities of result based from references of typical tally of cells may demonstrate a hidden ailment that requirements further assessment. For this previous few years, CBC checking is quite possibly the most considered region of examination because of precision issue. Research facilities in the clinic in the Philippines are as yet utilizing the conventional technique for checking platelets. This was done in either manual strategy through hemocytometer or via mechanized technique through stream cytometer.

In this examination, it utilizes pictures of the blood to figure the quantity of red platelets, since research on clinical pictures is new innovation. Picture handling is a strategy which includes signal preparing and numerical method to change the picture into another type of wanted picture. Picture investigation is the extraction of critical data from a picture. Consequently, this paper doesn't include picture preparing just however examination also. These days, there are numerous methods of picture preparing and examination of platelet pictures.

This investigation utilizes sifting to keep a particular shade while desaturating the remainder of the picture. It likewise includes picture division to change the picture into various parts over to distinguish which of the cells are platelets, red platelets or white platelets. Mass recognition calculation assumes a significant part in this examination which principally recognizes the distinctions of each platelet before the cells are tallied.

2. LITERATURE SURVEY

The essential point of this paper is to discover the RBC and WBC check utilizing Digital Image Processing (DIP) from blood smear pictures caught through a compound magnifying lens. This paper presents a strategy to carefully examine the picture of platelets and discover the RBC and WBC check esteems from the blood smear tiny pictures. Plane Extraction of the infinitesimal pictures is done trailed by edge identification and morphological filling activity. Roundabout Hough change is performed for RBC tally, though limit is recognized for WBC. The acquired consequences of the investigation are contrasted and lab reports and an exactness of 91% is accomplished for RBC while a precision of 85% is gotten for WBC[1].

In this paper, we propose a robotized platelets tallying system utilizing convolutional neural organization (CNN), case division, move learning, and cover R-CNN methods. Red and white platelets are recognized, ordered, and tallied from tiny blood smear pictures. The acquired outcomes uncover exceptionally location pace of various platelets. Moreover, in contrast to other cutting edge strategies, our proposed technique can distinguish covered and blurred cells[2].

This paper explores picture change activities and generative antagonistic organizations (GAN) for information enlargement and cutting edge profound neural organizations (i.e., VGG-16, ResNet, and DenseNet) for the grouping of

white platelets into the five sorts. Moreover, we investigate instating the DNNs' loads arbitrarily or utilizing loads pretrained on the CIFAR-100 dataset[3].

The main objective of this paper is to give a blessing a picture measure fundamentally based framework that may precisely notice and tally the measure of RBCs and WBCs inside the tiny blood test pictures[4].

The paper proposes a mechanized strategy for tallying of red platelets utilizing picture handling strategies. The customary strategies for blood investigation include the manual checking of platelets saw under the magnifying lens. This strategy presents huge reliance on the abilities of the lab specialist and can cause mistakes. The computerized hematology analysers, then again, produce exact outcomes[5].

This paper explain Recognizable proof of red platelets (RBCs) is completed/done by the framework utilizing various strategies of picture handling tasks like pre-preparing, activities for morphology, marking and extraction of highlights to compute shape and size of the RBCs. Morphological properties can give data with respect to state of the cell. By these activities and counts, RBCs are arranged. There are 2 phases in red cell arrangement measure, first is the partition of RBCs to typical and unusual followed by strange cells characterization to three subclasses dependent on the cell shape and design. The point of this framework is to help pathologist by giving snappy outcomes by dissecting the smear tests. The fix of these illnesses is conceivable, when it is identified at a prior stage[6].

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3. EXISTING SYSTEM

Blood sample acquisition: Blood sample is collected with the help of Lancets and then Nikon E 100 is utilized to gather the minute picture. Image is captured manually viz. Using any type of Camera. Image is processed twice for counting RBC and WBC separately. RGB image - to count RBC Blue plane of the image - WBC.

Noise filtration :It is important to remove noise from an image.Noise can be low brightness, blurred image etc. Noises which were captured : Impulse noise, Salt and pepper noise and Gaussian noise.

Edge detection :the edges of the cells are detected using canny edge detection algorithm over the noise removed image. Now we get two types of images which are regular shaped cells and other with irregular shapes.

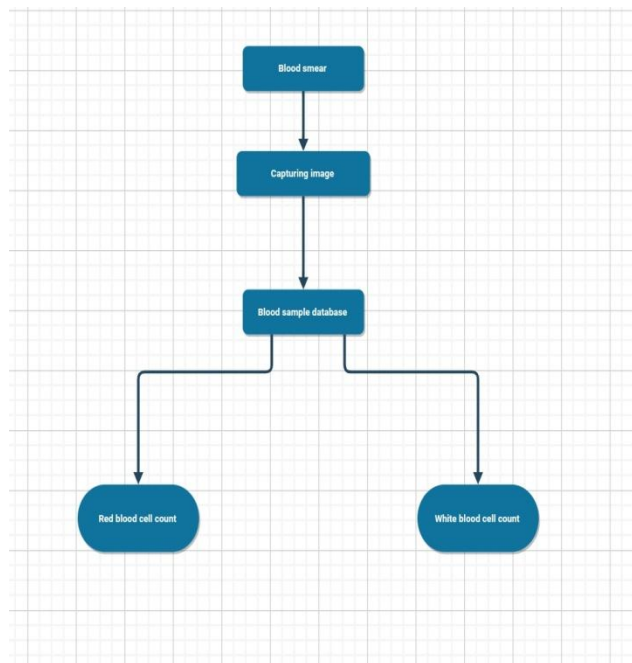


Fig 3:- Block Diagram Of Existing System

4. PROPOSED METHODOLOGY

"Prevention is better than cure". So, it is better to identify the disease in prior. Abnormal Blood cell count indicates presence of different types of cancers or any disease. Manual counting may lead to normal counting even in abnormal cases due to absent of counting overlapped cells. This paper objective is to overcome this problems which helps in reducing death rate due to cancers. Accuracy is very important in counting the blood cell. Manual method creates burden to the technicians for preparing report. Therefore, digital image processing techniques are used to count the blood cell and minimizes the errors. This paper introduces an effective algorithm called Blob detection algorithm that uses the image analysis techniques in differentiating the red blood cells from other cells in the blood sample and gives the count of cells accurately

4.1 DATA ACQUISITION:

Collect the blood sample and acquire microscopic image of blood sample . The acquired image is now processed to get the cell count and detect presence of any disease.

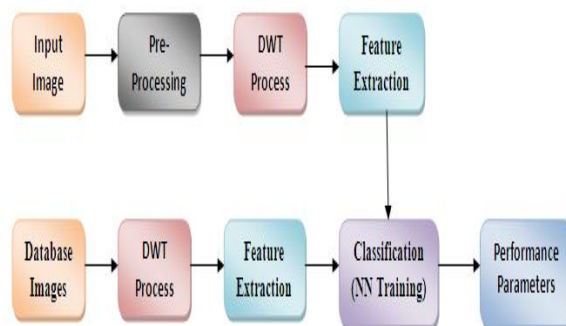


Fig4.1:- Work Flow Diagram

4.2 IMAGE PRE-PROCESSING:

This is the step where we acquire all the required data by filtering and processing the image. Apply filters to image to get proper image for processing. Noise filtration is in one among the filters. The acquired image is converted into different forms. The image can be converted into any form like binary image, black and white, Grey -scale image etc. Here we convert the image into Grey-scale image.

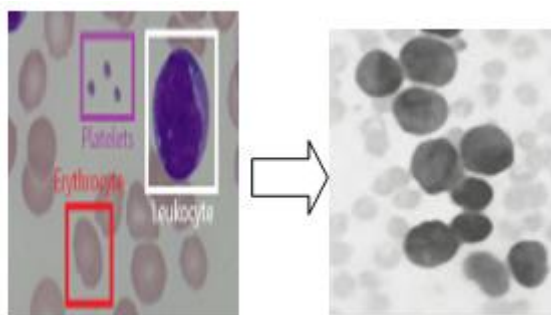


Fig 4.2:- grey-scale image conversion

NOISE FILTRATION :

It is removing the noise from the acquired image. Noise can be of different types viz blur image, low illuminous. Among the different noise filters, median filter is applied for the medical field images which gives best results.

MEDIAN FILTER :

Median filter is the best clutter filtration method for clinical related pictures. Every pixel worth will be supplanted by the middle of dim scale esteems in pixel(i,j) territory. A 3x3 area that is purchased in concentration with the pixel(i,j) is thought of and put away dependent on the force estimations of pixels in the climbing request. The power of the current pixel is the focal estimation of among the other pixel esteems. This channel is exceptionally viable in eliminating incautious commotion, salt and pepper from the information picture.

4.3 DISCRETE WAVELET TRANSFORM:

DWT is a mathematical tool which is used for compressing the image. The image is Compressed into four segments as LL,HL,LH,HH. First letter indicates the frequencies to rows, second to the columns. This tool is widely accepted in image compressing.

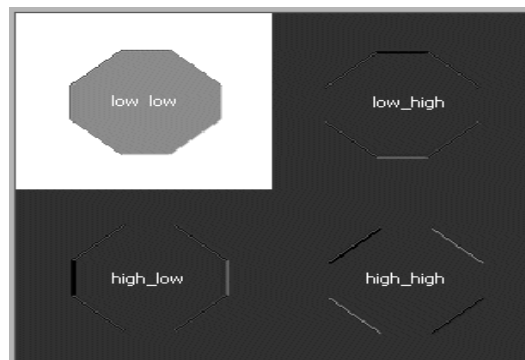


Fig4.3:- Wavelet Transform

4.4 FEATURE EXTRACTION:

Extracting the features from the input data is feature extraction. Features can be of different sets viz shape, colour, texture, hausdroff dimension which is widely used in medical and science filed.

The methodology for HD estimation utilizing the box counting technique is expounded underneath as a calculation::

- 1) Grey level image of the blood sample can be used to obtain binary image.
- 2) for detecting nucleus boundaries we use edge detection.
- 3) the obtained edges are again superimposed through the grid of squares.
- 4) then, HD can be characterized as :

R- number of squares in superimposed grids and

R(s) - number of involved squares

High HD indicated - degree of roughness is high.

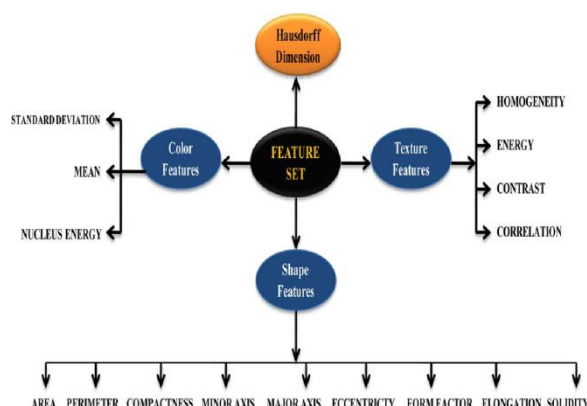


Fig 4.4 Feature Extraction Of Different Sets

4.5 BLOB DETECTION ALGORITHM:

Blob detection algorithm gives the final count of the red blood cells. This algorithm is utilized to separate the red platelets from white platelets and platelets. Straightforward Blob Detector, as the name infers, depends on a somewhat basic calculation portrayed beneath. The calculation is constrained by boundaries (appeared in intense underneath) and has the accompanying advances. Look down to realize how the boundaries are set.

1. **Thresholding:** Convert the source pictures to a few paired pictures by thresholding the source picture with edges beginning at the min limit. These limits are increased by the thresholdStep until max edge. So the principal edge is the min limit, the second is $\text{minThreshold} + \text{edge step}$, the third is $\text{minThreshold} + 2 \times \text{edge step}$, etc.
2. **Grouping:** In every paired picture, associated white pixels are gathered. We should call these paired masses.
3. **Merging:** The focuses of the parallel masses in the double pictures are figured, and masses found nearer than minimum Distance Between Blobs are blended.
4. **Center & Radius Calculation** The focuses and radii of the new blended masses are figured and returned.

4.6 ARTIFICIAL NEURAL NETWORK:

Any neural network has many layers in which every neuron has input and output connections. The input given is processed in every layer and final output is produced.

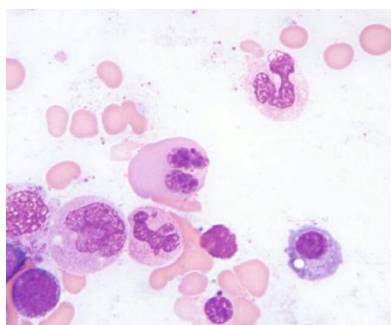


Fig 4.6:- Artificial Neural Network

- i) ANN is trained using perceptron learning rule .
- ii) Adaline rule is implemented in training ANN.
- iii) Gradient Descent rule is used in the process of minimizing cost function.
- iv) In converging ANN, analyze how learning rate is.
- v) Now each layer reduces the output produced to the next layer and gives final output.

Now the system is trained with the data set which is been compared with to give the count and detect the diseases.
RBC cell count to disease detection :

The paper main focus is to detect the diseases with abnormal RBC count.

5. IMPLEMENTATION:

The first stage of any vision system is image acquisition stage. This involves retrieving of image from a source that is automatically capturing images. After image acquisition, the next step is pre-processing, where the raw image is converted into a grey scale image. Later, the noise is removed by using median filter.

The next step is segmentation which uses discrete wavelet transform for image compression by decomposing the image into four different parts. This process continues until a final compressed image is obtained in the LL band.

After the segmentation step, the next technique is feature extraction, where the features are drawn out using grey level-co-occurrence matrix (GLCM). In this step, the feature extracted is size and this feature is used in blob detection algorithm to differentiate the cells and to give the final count of red blood cells.

The whole process is carried out in MATLAB. Matlab has the inbuilt code for image acquisition, pre-processing, discrete wavelet transform and feature extraction in the image acquisition tool box.
The final count of red blood cells is obtained.

The obtained datasets are compared with the default data sets that are trained using artificial neural network to detect if there are any abnormalities in the blood.

If the red blood cell count is less when compared to the default count then the diseases detected are:

- i) Anemia
- ii) Bone-marrow failure etc.

If the red blood cell count is more when compared to the default count then the person may have diseases like:

- i) polycythemia
- ii) kidney tumors
- iii) lung diseases etc.

Thus, in this study, the cells are differentiated, red blood cells are counted and the abnormalities are detected based on the red blood cell count.

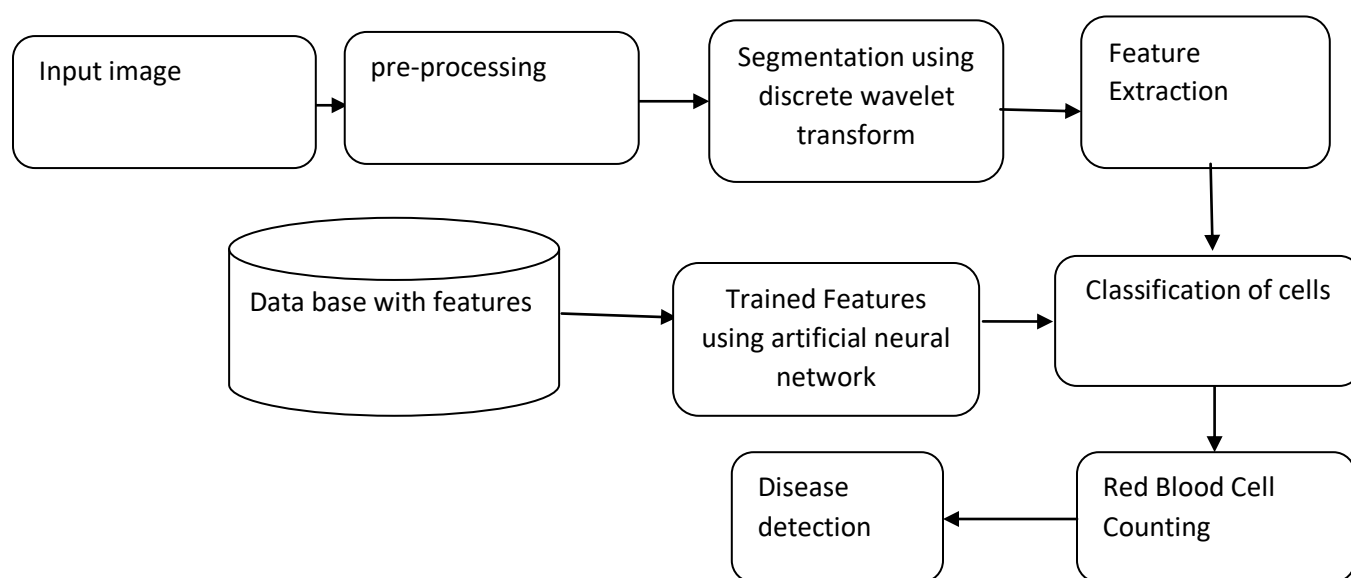


Fig 5:Architecture Diagram

6. CONCLUSION

The paper focused on the existing problem in counting and detecting the diseases. Done by digital image processing specifically with the help of Blob detection algorithm. Raw image is collected and converted to required form, filters are applied, features extracted and compared with data set and count is produced.

The paper presents a few prospects of picture division and grouping utilizing wavelet change. It is feasible to sum up that wavelet change give numerous prospects of identification of picture portion highlights attributable to its multi-goal properties and the likelihood to pick diverse wavelet works that are fitting for a given issue too. Portions limit signals were utilized for picture arrangement despite the fact that there it is feasible to utilize two dimensional wavelet change for discovery.

Strategies talked about in the paper have been applied to examination of states of infinitesimal pictures of gems. Comparable strategies can be utilized in different applications in a wide scope of interdisciplinary issues of surface investigation including biomedical imaging, handling of satellite pictures, correspondences and far off earth perceptions.

7. FUTURE WORK

The future work can be implement with other algorithms related to this process when perceive used methodologies have some constraints. Further examination will point on assortment of numerous examples to yield a better execution and building a general framework for malignancy arrangement

This paper focused only on detecting disease with only abnormal RBC. Can be improvised to identify the exact disease and can provide measures to cure as well.

8. REFERENCES

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