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Leukemia Detection In Blood Cell Images Using GLCM

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Abstract: Leukemia is a one type of cancer in blood or bone marrow. Bone marrow supplies blood cells. Leukemia occurs when there is a problem in the production of blood cells. It mainly affects the leukocytes, or white blood cells. Only by using detection and diagnosis process we can increase its cure rate. At present, identification of cancer cells is by inspecting the microscopic images visually. The segmentation is used to find the exact size, shape of the cancer cell and the area. Initially the image enhancement is used to provide the contrast and standardize the pixel values in the picture. After segmentation and Feature extraction, we have connected it to classifier to get the desired results. The tool we have used for identifying the presence of Leukemia is MATLAB.

Keywords: Blood cell counting, white blood cells, GLCM, leukemia , MATLAB.

I. INTRODUCTION

Leukemia is produced from the bone marrow. Leukemia can cause death if treatment is not started at correct time. A thin material inside each bone is termed as bone marrow. There are three type of blood cells in every human body, they are RBC (red blood cells), WBC (white blood cells) and PLT (platelets).

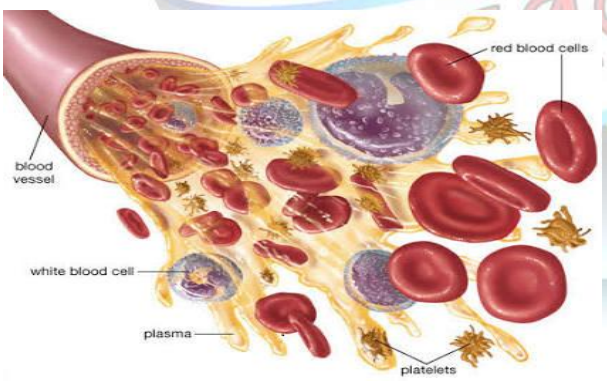

Fig.1.1 Blood components

The main reason of this paper is to detect leukemia occurrence. So we are going to concentrate only on the WBC count. Myeloid and lymphoid are the two types of stem cells. Myeloid blast which is emerged from myeloid stem cell is a cause for production of RBC, WBC and platelets. Lymphoid blast which is emerged from lymphoid stem cells is a cause for production of WBC.

Bone marrow induces abnormal white blood cells (WBCs).These abnormal cells should die after some short period of time. But actually they do not die and they become more in count. The normal white blood cells interferes with those abnormal white blood cells in performing their normal work. And this set of circumstances is known as Leukemia. Leukemia can be divided into Chronic and Acute leukemia.

Chronic Leukemia:-Abnormal white blood cells behaves like a normal white blood cells with gradual increase in their count.

Acute Leukemia:-Abnormal white blood cells do not behaves like a normal cells and they with rapid increase in number.

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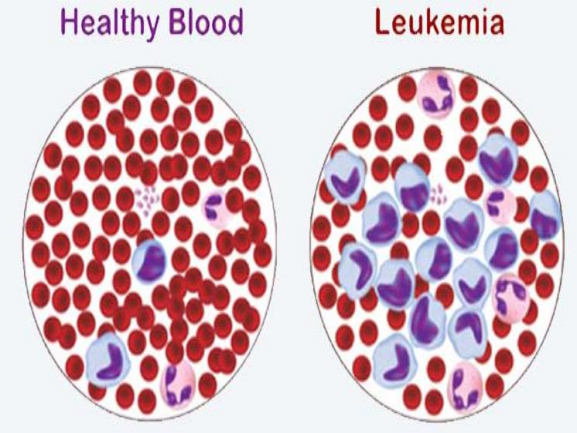

Fig.1.2 Healthy blood and Leukemia

II. RELATED WORK

A. Image Processing

Image processing is a modification of digital image which is used for computer algorithms; it is one type of the digital signal processing. It has many advantages while comparing to analog image processing. The build-up of noise & signal distortion problems during the processing may be avoided by using various range of algorithms at the input data. Mostly the images are classified as two dimensions & Multidimensional system where multidimensional system are used to process the digital image model. Image processing is a method which is used to accomplish image operation, so we will get the useful information regarding an image and also get the enhanced image.

It is one type of signal processing input is provided by the image and the final obtained value or information is the characteristics of the image associate with input. Currently Image Processing technology which is abruptly on-going compare to other field. It is the additional field for the signals and systems. But particularly choose the images only. DIP will be choosing the implement of computer system. it will be processing on image. That system used to carry out a competent algorithm, and input is provided by digital image after completing process the output will get the image. Mostly people are used for MATLAB. Processing of the digital images can be done through MATLAB application which used widely around the world.

Important image with an optical scanner or straightforwardly through advanced photography. Control or break down the image somehow. This stage can incorporate image improvement and data compression, or the image might be dissected to discover designs that aren't unmistakable by the human eye. For instance, meteorologists utilize picture handling to process satellite photos. Yield the outcome. The outcome may be the image changed somehow or it can be a report in view of investigation of the image.

B. Types of Digital Images

For Photographic purposes, there are two types of digital images, they are shading and gray scale. Shading images are made up of hued pixel while gray scale images are made up of pixels in various shades of dark.

Gray scale Images: A gray scale (or dim level) image is basically the main hues are shades of dark. The need behind separating such images from some other type of shading image is that less data should be serve every pixel. Truth be told a `gray' shading is one in which the red, green and blue parts all have square with power in RGB space, thus it is just important to determine a solitary force an incentive for every pixel, rather than the three powers expected to indicate each pixel in a full shading image.

Shading Images: it is vital (and relatively adequate) to give three examples (shading channels) for every pixel, which are deciphered as directions in some shading space. The RGB shading space is generally used as a part of PC shows, yet different spaces, for example, YCbCr, HSV, and are regularly used as a part of different settings.

C. Medical Imaging

Medical imaging is the procedure of making visual representations of inner parts of a body for clinical investigation and also for visual representations of the function of a certain organs or tissues. Medical imaging is used to uncover inner structures covered up by the skin, bones and also to monitor and to cure infection. Medicinal imaging additionally maintains a database of ordinary life systems and physiology to identify variations from the normal functioning. The fact that imaging of abolished organs and tissues can be performed for restorative reasons, such methods are normally considered piece of pathology rather than medical imaging

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Estimation and recording strategies which are not essentially intended to deliver images, for example, electroencephalography (EEG), magneto encephalography (MEG), electrocardiography (ECG), and others speak to different advancements which create information helpless to portrayal as a parameter graph versus time or maps which contain ideas about the estimation areas.

D. Blood cell Counting

Total blood count is a standout amongst the most instructive blood tests detecting any disorder or abnormalities and thus showing wellbeing conditions of cardio-vascular people. Most CBC gadgets, for example, hemocytometers and hematology analyzers are customarily executed in view of the Coulter rule, where a cumbersome hardware incorporates a few center partners containing actuators, fluid framework, and counter cup. These space expending electrical and mechanical parts introduced in the gadget oblige its application, control, and support. Accordingly, they must be utilized as a part of labs of clinics or research organizations. A scaled down biomedical gadget towards CBC would in this manner be exceptionally intriguing for purpose of-watch over elderly individuals. An elective technique for complete blood count is using optical microscopy method and Raman scattering technique.

In spite of the fact that the gadget ends up noticeably littler because of the disposal of the fluid framework, is an optical framework including laser generator is still huge, costly and stationary. Lately, without massive optical segments, focal point free contact imaging based techniques have been proposed to check platelets utilizing versatile gadgets, where the blend of microfluidic station and CMOS picture sensor (CIS) can understand a scaled down and compact CBC gadget. At the point when the platelets course through the station, their shadow pictures are caught by the picture sensor underneath and additionally handled for cell identification, order, and counting. Contact imaging offers favorable circumstances such as better light gathering effectiveness, bring down cost, diminished weight and size, low power prerequisites and convenience

1) The principle test of the contact-imaging based microfluidic cytometer, be that as it may, is the restricted determination without an optical lens. The platelets are normally in the size scope of 2– 12 μm,especially 2 um distance across platelets. This requires high spatial determination for cell location and acknowledgment. A reasonable recognition therefore requires little pixel size and little readout-circuit pitch, which are taken as hold-up in CIS outline and circuit usage at the device level. Also, to additionally upgrade the resolution, an information effective, continuous rectification calculation should be created for high determination at the system level. Others have acquired high determination utilizing a source moving strategy, where the image sensor catches a few diffraction visualizations from a similar protest, at that point a holographic picture is incorporated and remade from these moved multi-dimensional images.

2) Be that as it may, the source moving and multi-dimensional image imaging isn't appropriate for platelet considering the platelets continue streaming in microfluidic channels. All the more significantly, such a multi-outlines upper-resolution based adjustment is costly to be acknowledged with equipment. It needs to catch and spare sub-pixel shifts amid platelet discovery from around 100 reference outlines, in this way likewise postures stream rate point of confinement to the framework. In this manner, a solitary image handling for remaking and higher arrangement is profoundly fundamental in the microfluidic cytometer.

3) E. Diluting the blood

4) Take a drop of the blood for counting the blood cells. The blood cell density is very high, so we have to dilute it very much. The dilution that is usually performed is 1:200 bloods: isotonic solution. So for instance, we could take 1μL blood which is not diluted and include 199μL of isotonic arrangement**.**

III. PROPOSED METHOD

It is found that typical steps for the process of the proposed work are,

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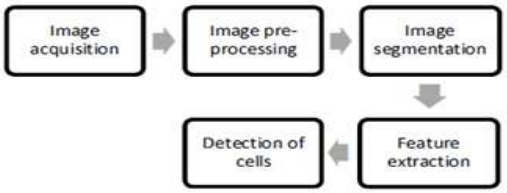

Fig.3.1 Overall steps of proposed work

5) A. Image acquisition

In this part, after some modification good quality blood cell images are taken as an input for proposed work.

B. Image preprocessing

The images which are taken as input may have some possibility of disturbances like noise, blurriness etc. The main aim of image preprocessing is to improve image data and to remove these unnecessary things for making suitable for our process. Image preprocessing is used to correct degradation in the input images. Pre-processing techniques involves enhancing contrast, removing noise, etc. The median filter is used in our process to remove noise and wiener filter is used for removing blurriness of input image.

C. Image segmentation

Image segmentation is an important method in image processing. Image segmentation is a task of simplifying the description of an image which will be easier to examine. For identification, separation, counting of white blood cells, image segmentation process is used. After image segmentation we have to separate white blood cells from other blood components. Image segmentation are of many ways. In this paper we are going to use k-means clustering method for image segmentation.

D. Feature extraction

GLCM is one type of feature extraction. GLCM is abbreviated as (Grey Level Co-occurrence Matrix) or Grey- Level Spatial Dependence Matrix. GLCM is a statistical process of analyzing texture which narrates the connections of spatial of every pixel .The information of texture of an image are gained by these statistics, they are contrast, correlation, energy, homogeneity.

Feature	Formula
Contrast(Cont.)	$\sum\sum(i,j)^2 C(i,j)$
Correlation(Corr.)	$\sum\sum\frac{(i-\mu_i)(j-\mu_j)C(i,j)}{\sigma_i\sigma_j}$
Homogeneity (Homo.)	$\sum\sum\frac{C(i,j)}{1+(i,j)^2}$
Energy (Enrg.)	$\sum\sum C(i,j)^2$

Fig.3.2 GLCM features

E. Detection of cells

Leukemia means blood cancer which is featured by the uncontrolled and abnormal production of white blood cells (leukocytes) by the bone marrow in the blood. Analyzing microscopic blood cell images, diseases can be identified and diagnosed early. Hematologist are using technique of image processing to analyze, detect and identify leukemia types in patients recently. Detection through images is fast and cheap method as there is no special need of equipment for lab testing.

IV.RESULT AND DISCUSSION

The proposed technique has been applied on microscopic blood slide images.

A.NORMAL CONDITION

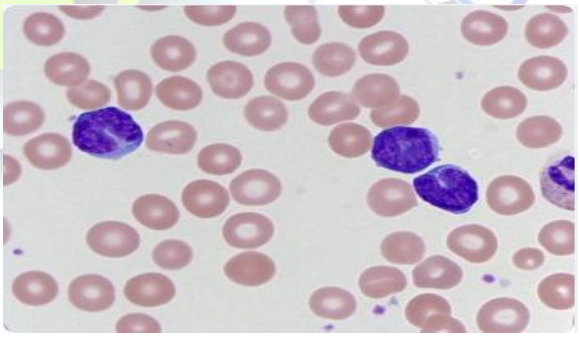

Fig.4.1 Input image

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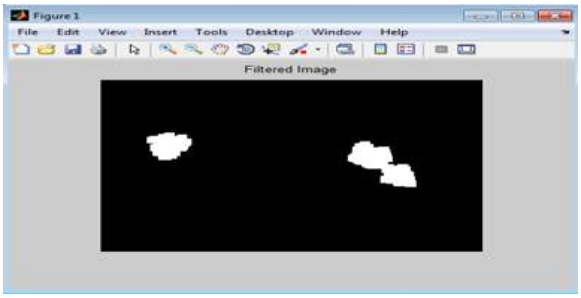

Fig.4.2 Filtered Image

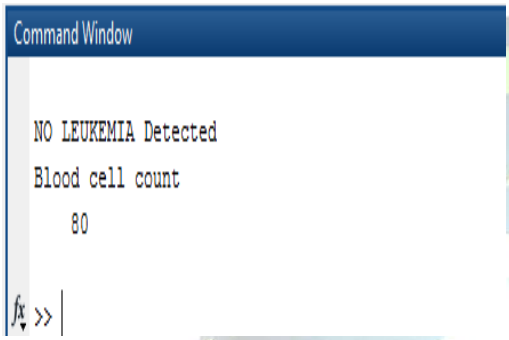

Fig.4.3 output image

B.LEUKEMIA CONDITION

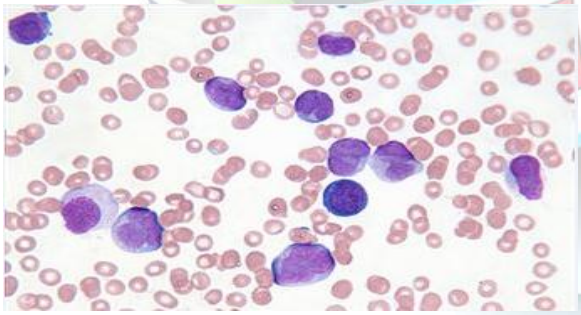

Fig.4.4 Input image

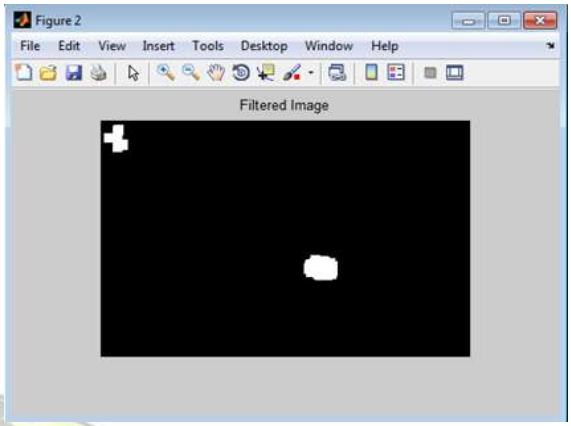

Fig.4.5 Filtered image

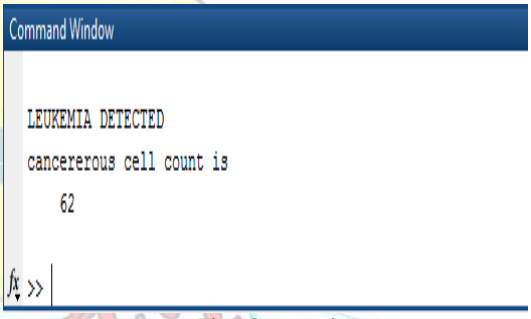

Fig.4.6 output image

V. CONCLUSION

In this section, the GLCM method obtained for the given input microscopic image are discussed. The normal condition blood cell image and leukemia condition blood cell images are discussed with the help of MATLAB using GLCM method. The output for both conditions are discussed above in this paper.

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BIOGRAPHY

Dr. D. Ramkumar did his bachelor of engineering in Electronics and Communication Engineering from the Indian Engineering College and the Masters degree in Applied Electronics with first class with distinction from Anna University . He received his ph.D (Image Processing) from Anna University. Currently he is working as a Associate professor in the department of ECE, Bharath Niketan Engineering College. His area of interest is image processing, biomedical, network and communication.

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