

Detection of Leukemia using Image Processing

Ali Baig Mohammad, P. Sainath, K. Chiranjeevi Babu, N. Chandra Mouli



Abstract: In olden days, cancer detection at early stage and its prevention became a difficult task to predict and enhance the stage and efficient image techniques were not available. Due to wrong analysis of cancer presence, patients are treated wrongly. In our method, we detect acute myeloid leukemia effectively. After plotting data from image histogram plot and knowing the segmented region, area of cancer can be obtained by classification of cancer and non-cancer cells. Wrong diagnosis leads to patient's death, so adequate steps are taken to make diagnosis accurate and to know the features. Effective usage of image tools and regions of infected part are extracted, and detection of cancer based on respective growth of region is observed which is 91 accurate.

Keywords: blood disorder detection, linear distinction, bar graph equalizing.

I. INTRODUCTION

A. Options of red corpuscle

The work of the red cell and its hemoglobin is to hold oxygen from the lungs to all the body tissues and to lungs harming substance, a stuff of digestion, to the lungs, any place it's discharged. In spineless creatures, oxygen-conveying shade is conveyed free inside the plasma; its fixation in red cells in vertebrates, so oxygen and greenhouse gas area unit changed as gases, is a lot of economical and represents a crucial organic process development. the red cells area unit sometimes spherical and a tiny low proportion area unit oval in traditional person.



Figure 1. Red Blood Cell

B. Features of white blood cell

White blood cell is also called as leukocyte and it contains nucleus and defends the body against infection.

An abnormal increase in white cell number is leukocytosis. Based on their appearance under a light microscope, white cells are converted into lymphocytes, granulocytes and monocytes. White cell count may increase due to physical exertion, convulsions, certain disease states.

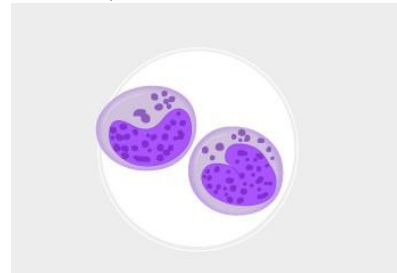


Figure 2. White Blood cell

C. Types of Leukemia

D. Acute Lymphocytic Leukemia (ALL)

ALL of men are the most common compared to womenTh is exists in children 1-12 years of age and 40-year-old males. Here white blood cells are affected is known as ALL.

E. Acute Myeloid Leukemia (AML)

It arises in patients of 1 year of age and old age. This myeloid row is impaired by stem cells. The main signs of acute myeloid leukemia are elevated spleen and bone pain.

F. Chronic Lymphocytic Leukemia (CLL)

At an early stage, it does not show any symptoms. This happens in elderly patients suffering from diseases of old age. Lymphocytes are affected.

G. Chronic Myeloid Leukemia (CML)

Genetic modifications take place in myeloid cells at a preliminary stage. This form of leukemia can arise in all but the most severe is after 45years for adulthood.

II. RELATED WORK

Image enhancement and performing arithmetic operations and segmenting the desired part for effective extraction of cancer part.[1]. In this paper, passing the ultra-sonic waves through the organs of the body. this model consists of two folded process. The first step block based hard and soft thresholding on pixels on wavelet domains divide the non-overlapping blocks. The next step has restoration of the boundaries and textures in the wavelet domain leads to removal of the blurring effect of the cells and the resultant of the two process by increasing the contrast shows us observable cells.[2][16]

In this paper, they have discussed about the human action recognition and its applications by using surveillance video. The major challenges are variance and noise in the data.

Revised Manuscript Received on December 30, 2019.

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In this model three steps were followed. The process of 3D skeletal joint by enhance sequence based view invariant transform and in next process transformation of the joint location to convert RGB image by a color coding technique, the third process to perform the human action recognition by means of class task, the main theme of this paper state of the art methods.[3][17][19]

In this paper, discussion is about the diabetics and recognition of formation of the color image. Enhancement for removal patches and removing the thresholding techniques. They used in the support vector machine to extract feature set image. They can give the statistical measurements and techniques.[4]

In this paper, they had discussed about the brain cancer detection in noisy image. In this model they reduced the noise using Edge adaptive total variation denoising technique. In this model they are reducing the noise of the mean shifting clustering.in SVM to detect the tumor in the image.in brain tumor detection, precision is increased the noisy images.[5][15]

De-speckle the noise is done by removing the noise and obtaining the output image but obtaining mean, variance and wavelet selection is used for thresholding technique and segmenting the edges was improved using wavelets in this paper.[6]

The classification of flower images from database and database is divided into 4 parts. Training of images and different patterns of features from images can be learned using CNN and better accuracy is observed based on cut-off values.[7]

Colors, texture, shape features are extracted and selecting a region and spreading the region in image plane using set theory. Analyzing different features based on number of levels of inputs based on sets can be observed using this paper.[8][20]

The paper for the most part centers around the recognition of Leukemia and gives a more extensive scope of Leukemia grouping into its four fundamental sorts. Three division calculations were utilized. An enormous number of highlights were removed to make the recognition procedure increasingly exact [9][13][14]

This examination contains identification of blood malignant growth cells furthermore, arrangement of the kinds of leukemia from minuscule image tests utilizing image processing. The proposed strategy separates the highlights in minuscule pictures by inspecting changes on different parameters like surface, geometry, hues what's more, measurable examination input. The framework ought to have high dependability, exactness and adequacy, less preparing time, littler blunder, less cost and should be powerful. Early ID of leukemia yields in giving the proper treatment to the persistent.[10]

In this paper they have discussed about the occurrence problems of the images on the different growth of tumors For the improvement of the quality of the image they are used low processing. strategy in the view of the median filter using gaussian principles.[11]

III. PROPOSED WORK

Loading an image in MATLAB and performing enhancement and contrast stretching on image. Convert the image from rgb to gray and Then extracting the features based on thresholding and obtaining cancer parts and area, eccentricity, perimeter, length of infected part using region analysis. After identification of infected areas, set the threshold range to estimate the presence of cancer. Then by using morphological operations, set the background characteristics and perform operations to extract background and foreground. Perform image segmentation to apply hole filling operations to the infected area. Label the background for adequate measuring of area and geometrical and shape analysis is observed. Then utilize multiple images and classify cancer cell and non-cancer cell and analyze the outcomes efficiently using image tools and classifiers and pixel intensity, range can be known. Accuracy can be predicted based on the outcomes and measures to verify different shapes and sizes of cancer. Ostu's Thresholding plays a vital role in extracting features. The difference between cancer and non-cancer images are trained and tested. Other module is to remove noise from the image and perform thresholding and background extraction and image segmentation using sobel edge detection, hole filling to know areas. Then covert image into binary and observe the results.

A. Block Diagram

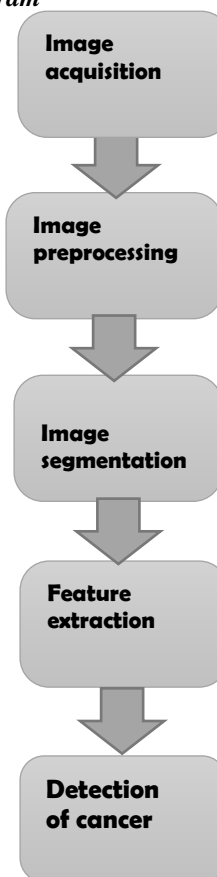


Figure 3. Pattern of steps for automatic identification of blood cancer.

B. Overview of Process

Figure 3 provides a detailed overview of the sequence of steps taken to detect and identify leukemia effectively.

C. Image acquisition

Tiny pictures of platelets are procured with the assistance of advanced magnifying instrument. Computerized magnifying lens which has camera inside it is in pattern to procure advanced pictures of cell.

D. Image Preprocessing

Microscopic images that are obtained are noisy due to massive stains and manual interference. Here, noise is primarily outlines. Therefore, we are filtering images to eliminate undesirable noise. Some past examinations demonstrated that the picture upgrade method like contrast enhancement can improve therapeutic image quality. In this upgrade procedure, pictures are improved to make it appropriate for further phases of handling. Platelet pictures are upgrade with the assistance of straight difference improvement system. Well known complexity enhancement method is histogram equalization and concentration of the image as needed [8].

E. Image Segmentation

Image segmentation of tiny hemoglobin images are done in order to locate the abnormal WBC structure. Division of pictures implies parceling the picture into a lot of pixels. An amazing technique for cell exploration which uses platelet energy and shape information to strengthen core segmentation. Precision of highlight extraction of pictures is depending of legitimate division of white platelets. WBCs division implies segmentation of cores of anomalous cells. In leukemia persistent white platelets has irregular structure of cores.

F. Feature extraction

While investigating information, the serious issue emerges because of the quantity of factors included that require a lot of memory and calculation. This issue is overwhelmed by highlight extraction [8]. The extraction of features begins with a fundamental data arrangement and yields enlightening and non-redundant esteems, leading to better human translations.

The below are the features identified if leukemia is detected

G. Geometrical

This encompasses geometric characteristics such as cell volume, perimeter, radius, eccentricity, symmetry and concavity [10].

H. Texture

WBC cell texture characteristics include correlation factor, entropy, contrast and power.

I. Statistical

Mathematical factors such as mean, variance, standard deviation and skew of the object matrix histogram.

J. Algorithm

1. Blood cell's initial microscopic image is obtained and inserted into the process.
2. Modification of the color image of the RGB molecule to a gray image.
3. Undergo on image operation such as linear contrast enhancement and histogram equalization.
4. Addition of linear contrast image and histogram image.
5. Subtraction of linear contrast image and histogram image

6. Then add the two image which are output of step4 & step5.
7. Using thresholding method, the image of step6 is converted into binary image.
8. After that remove the noise by using the filters.
9. Perform the sobel operation to the image of step8.
10. Hence, the blood cancer is detected.

K. Histogram equalization

Histogram Equalization is a PC picture preparing system used to improve differentiate in image. It achieves this by adequately spreading out the most regular power esteems, for example loosening up the power scope of the image.

IV. SIMULATION RESULTS

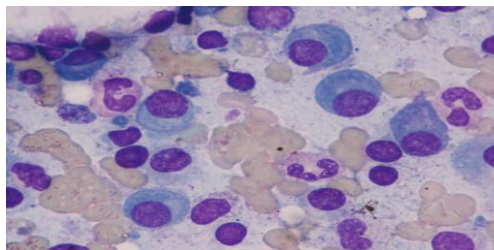


Figure4 (a)-Original image

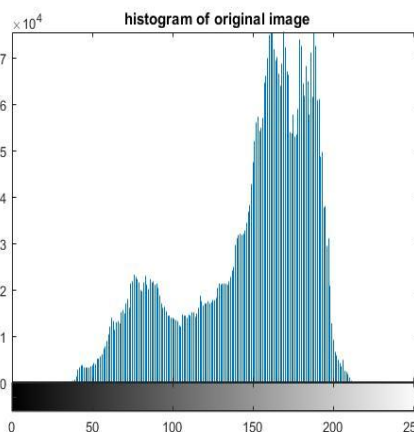


Figure4(b)-Histogram plot of original image.

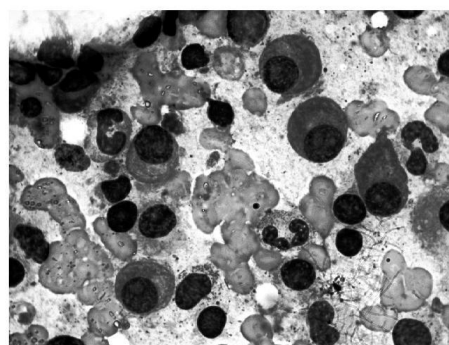


Figure4(c)-Histogram Equalization of original image.

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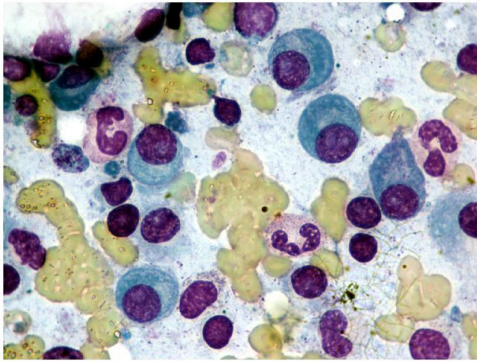


Figure4(d)-Contrast Stretching of original image.

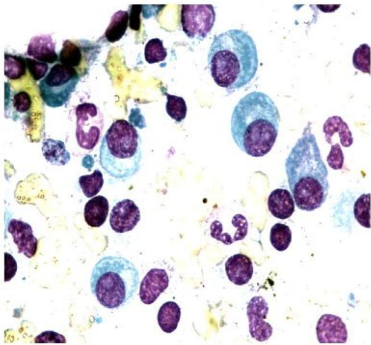


Figure4(e)-Adding of histogram equalization and Contrast Stretching.

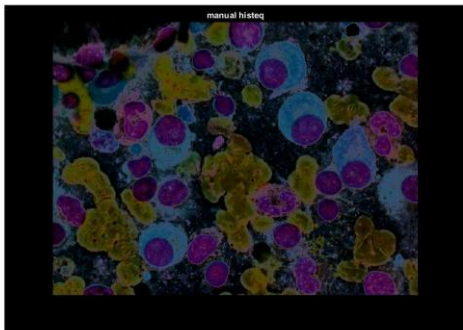


Figure4(f)- Subtraction of histogram equalization and Contrast Stretching.

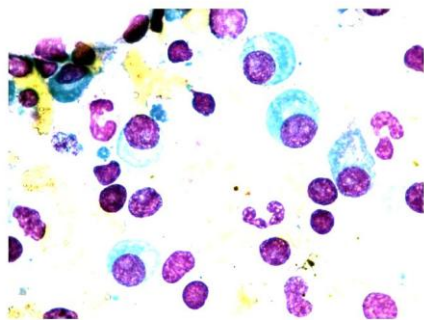


Figure4(g)-Adding of fig(d) and fig(e).

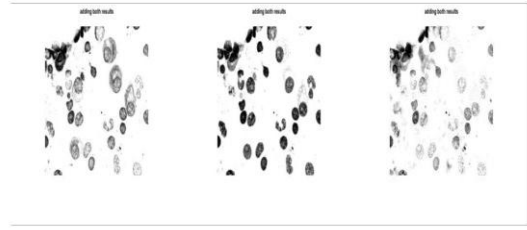


Figure4(h)-Applying Averaging Filter

V. CONCLUSION

The motivation behind this paper was to apply image processing methods in choosing nearness of leukemia in white platelet. Image segmentation of different leukemia types, for example, Acute Lymphocytic Leukemia (ALL), Chronic Lymphocytic Leukemia (CLL) are obtained utilizing MATLAB which is 91 precise. Image processing method for leukemia determination is efficient and less expensive as contrast with the old research center testing strategy.

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