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Automatic Detection Method of Leukaemia by Using Segmentation Method

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Abstract: In this paper, we are introducing the Disease of Leukaemia or called cancer of blood cell. Number of methods have been introduced for the effectiveness of white blood cell segmentation, multispectral imaging analysis technique like histogram equalization and threshold, k-means clustering, active contours, watershed transform, and many more. These techniques alone not give a significant segmentation rate, that's why it is better to develop a system which is hybridize with certain segmentation techniques in order to achieve a better segmentation rate in overall procedure. As a new approach we are going to develop a system comprises of techniques like fuzzy c-means clustering, gradient based watershed transform and initial pre-processing done through HSV color transform.

Keywords: [1], HSV color Transform [2], Extract Saturation Component [3], Fuzzy C-means clustering on HSV transformed Image [4], Morphological Operations & Reconstruction Process [5], Gradient Based Watershed Transformation [6], Final Segmented Image (Segmenting leukocytes and blast cells).

I. INTRODUCTION

Leukemia is a disease or we can say it is a type blood cancer. It is characterized by an abnormal accumulation of white blood cells (leukocytes) and its precursors which disable its function of fighting infection. There are two types of acute leukemia: Acute Myeloid Leukemia (AML) and Acute Lymphoid Leukemia (ALL). The difference between the two types of leukemia depends on the happening of the disease. AML occurs on the myeloid line of the blood cells. On the other hand, ALL is characterized by the excessive lymphoblasts in the bone marrow.

Early analysis and treatment gives assuring authorization of recovery to the patient affected with leukemia, provided the patient responds well to the treatment. A complete blood count (CBC) test will first be performed on patient who present with symptoms linking to leukemia. The procedure includes total and differential count of white blood cells present in the peripheral blood. Furthermore, morphological, immune-phenotyping and cytogenetic examination of blasts obtained from the bone marrow are the standard diagnosis procedure. Highly skilled resources are needed to study this abnormalities and classification. The process can be tedious, time exhaustive and costly.

Image enhancement and segmentation are at the first stage of image processing, and is considered as the most crucial for successful feature extraction and classification of leukemia in end stage. The computerized image processing analysis presents major difficulties due to: the complex contents of an image, consisting dissimilar classes cells; influence of image quality by the staining and clarification inconsistencies; clustered cells and blur boundary between nucleus and cytoplasm in many cases.

II. PROBLEM STATEMENT

This Paper focuses on AML, a disease caused by the abnormal growth and development of early no granular white blood cells. It starts in the bone marrow outburst cells which grow into granulocytes, that is white blood cells containing small particles, or granules. As the blast cells build up they hamper the body's natural ability to fight infection and stop bleeding. Therefore, the disease requires immediate treatment. Moreover, AML has eight subtypes (M0–M7), all exhibiting similar morphological characteristics. The microscopic study of human blood has led to the conclusion that a set of methods, including microscope colour image, segmentation, classification, and clustering can permit the recognition of patients suffering from leukaemia. Machine learning is one of the methods used in image processing for detection of blast cells. This research focuses on AML and the classification of the eight subtypes mentioned previously, M0 to M7. This is an important issue since they require different treatment. All subtypes share extensive similarities which make identification under a microscope difficult, time-consuming and physically tiring for the hematologists.

III.METHODOLOGY AND PROCESS

As a new approach we are going to develop a system comprises of techniques like fuzzy c-means clustering, gradient based watershed transform and initial pre-processing done through HSV color transform.

A. HSV color Transform (Convert Image from RGB to HSV)

The main aim of pre-processing is to generate suitable image for succeeding steps. In preprocessing first an original image is transformed into a RGB color space. on the other hand, RGB color space is not approving for image processing. Because in RGB color space the intensity information is rated in all three dimensions. So, the RGB image is converted into a HSV color space to re-generate the concentration information to one dimension. The main task in pre-processing is to changed RGB image

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to HSV image. To convert RGB to HSV image we are using median filter. The median is calculated by first sorting all the pixel values from the window into statistical order, and then replacing the pixel being measured with the middle (median) pixel value.

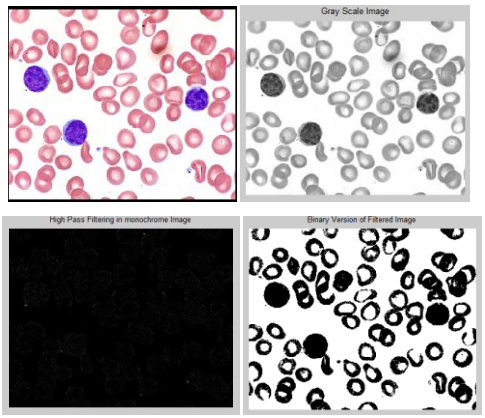

Figure1. a) Original Blood cell image b) gray scale image
c) High pass filtering in monochrome images
d) Binary version of filtered images

B. **Extracted Saturation components**

This method analyze the image characteristic vectors which are used by Quadratic distance result and helps in recovery process .The HSV colour model is used. To extract the colour feature, colour median filtering is applied recursively to deemphasize noises for pre-processing and colour histograms are intended. The median filter is to run from beginning to end the signal entry by entry, replacing each entry with median of neighbouring entries. After feature origin, the pixel features are clustered into groups using the fuzzy c-means clustering algorithm if the result is to be superior. The doubt images are processed and transform to different colour space for better performance, then similarity matrix can be intended using fuzzy clustering of images. The distance between the two images is therefore found and image having minimum distance that is the images similar to query image is recover and displayed. The use of colour features has become increasingly important. With the facilitate of colour features, objects in an image can be distinguished easily. The more commonly used color models are RGB (red, green, blue), HSV (hue, saturation, value), etc color model. Color histograms are used in extracting the color features of images.

C. **Fuzzy C-means clustering on HSV transformed Image**

Fuzzy c means clustering method with thresholding for blood image segmentation is introduced. The paper focuses on comparison of fuzzy c means clustering algorithms with proposed method for blood images. To estimate the nonlinear image region segmentation, quantitative statistical measures have been used, for example the gray level energy, separate entropy, relative entropy, common information and information redundancy.

A technique to form multiple queries based on the collective features of different images is build up. This technique allows users to have a better manage on the search criteria, therefore a advanced retrieval performance can be achieved. Use the Gradient Magnitude as the Segmentation Function Use the Sobel edge masks, imfilter and some simple arithmetic to calculate the gradient magnitude. The gradient is high at the margins of the objects and low inside the objects.

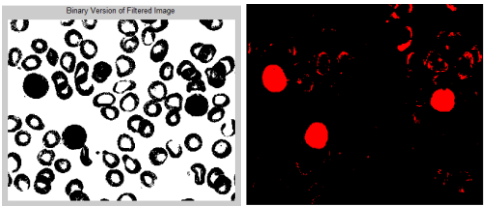

Fig. 2 A Fuzzy C-mean clustering on extracted saturated image of Blood cell

D. **Morphological Operations & Reconstruction Process**

Morphology is used for image processing based on shape and form of objects. Morphological methods apply a understanding element to an input image, creating an output image at the same size. The value of each pixel in the input image is based on a evaluation of the corresponding pixel in the input image with its neighbors. By decide the size and shape of the neighbor; you can build a morphological operation that is sensitive to specific shapes in the input image. The morphological operations can first be distinct on color images where the foundation image is planar.

The morphological operations are separated in four segments-

Erosion- It is the procedure of color improvement and things to see the white blood cells of given image.

Dilation- modify a background pixel to foreground if it has a foreground pixel as a 4-neighbor.

Opening- removes all pixels in region that are too small to contain the structuring element.

Closing- Consists of dilation followed by erosion and can be used to fill in holes and small gaps.

E. **Gradient Based Watershed Transformation**

A researcher proposed methods for segmentation of white cells based on morphological operation, gradient magnitude and watershed transform. First image acquisition method is used then segmentation is done to separate the blast cell and back ground. For this process, RGB image is changed into HSV color model and saturated component is extracted for new processing and then find the gradient magnitude for the saturation component. This is used for edge detection. Additionally, sobel, canny, prewitt operators are used for the edge detection. After extracting the white cells from the image and removal of the background and red cells, dilation or erosion process is approved. Then watershed transform is carried out to split the connected cell. Thus, leukemic cell

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can be identified and this method gives very accurate result.

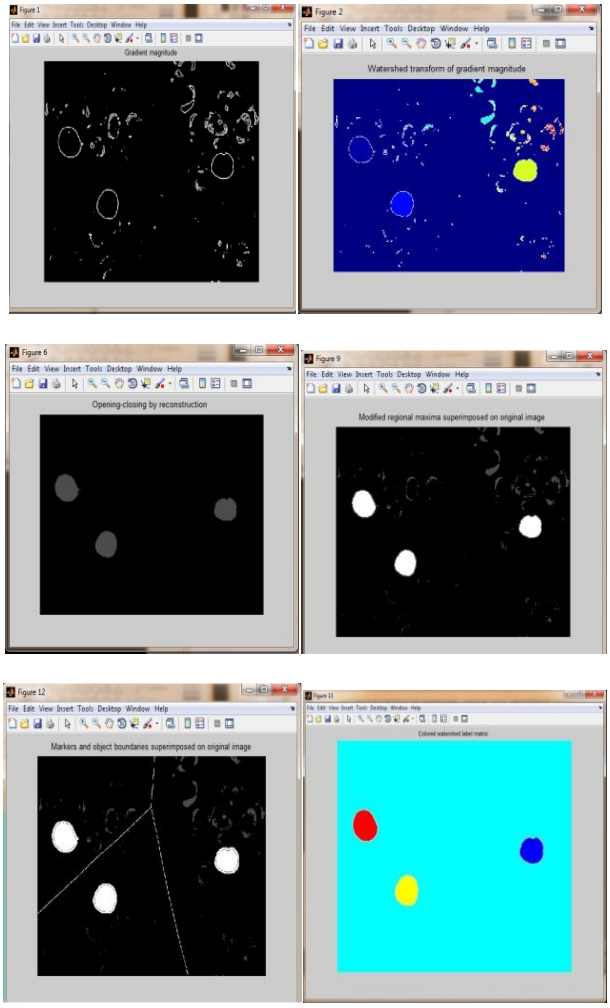

Fig3. A) Gradient Magnitude B) Watershed transform on Gradient Magnitude
C) Opening-Closing by reconstruction
D) Modified regional Maxima superimposed on original Image E) Markers and object boundaries superimposed on original Image
F) Coloured watershed Matrix.

F. **Experimental Result**

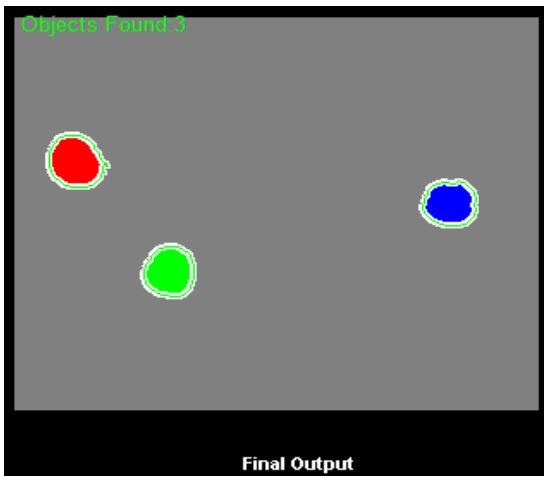

Fig.4. Detection of Leukaemia of blast blood cell

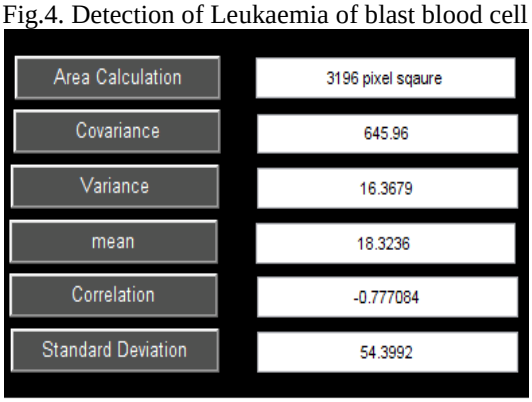

Fig. 5. Extracted output of blood cell image

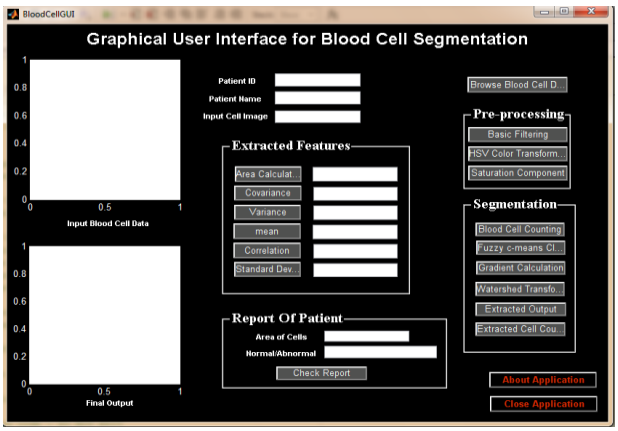

Fig.6.Graphical user interface for blood cell segmentation tool

IV. CONCLUSION

The Number of methods have been apply and calculated. Merits and demerits of dissimilar methods are derived from investigational results. It is concluded that proposed method: shape based features finding is more accurate than other methods for counting leukemic cells and it also gives highest accuracy. To detect different types of geometrical shape of cells like basophiles, eosinophil, lymphocytes, monocytes etc. shape based features are used and according to count of immature cells, disease can be diagnosed. Future Research resulting from these Paper Developing effective methods for automated marginal note of digital pictures continues to inspire computer scientists.

REFERENCES

[1] Puiri, V., Scott, F.: Morphological Classification of Blood Leucocyes by Microscope Image. In: CIMSA 2004 - IEEE lntemational Conference on Computationvl Intelligence far Memrement Systems and Applications, Boston, MA. USA. IEEE, Los Alamitos (2004)

[2] Ritter, N., Cooper, J.: Segmentation and Border Identification of Cells in Images of Peripheral Blood Smear Slides. In: The Thirtieth Australasian Computer Science Conference (ACSC), Research and Practice in Information Technology (CRPIT), Victoria, Australia. Australian Computer Society (2007)

[3] Zamani, F., Safabakhsh, R.: An unsupervised GVF Snake Approach for White Blood Cell Segmentation based on Nucleus. In: 8th

International Conference on Signal Processing, ICSP, Guilin, China (2006)

[4] Jiang, K., Liao, Q.G., Dai, S.-Y.: A Novel White Blood Cell Segmentation Scheme Using Scale-Space Filtering And Watershed Clustering. In: Proceedings of the Second International Conference on Machine Learning and Cybernetics, Xi'an (2003)

[5] Yampro, P., Pintavirooj, C., Daochai, S., Teartulakarn, S.: White Blood Cell Classification based on the combination of Eigen Cell and Parametric Feature Detection. In: Industrial Electronics and Applications, Singapore. IEEE, Los Alamitos (2006)

[6] Moreira, J., Deutsch, A.: Cellular Automaton Models of Tumor Development: A Critical Review. Advances in Complex System 5, 247–267 (2002)MATHCrossRefMathSciNet

[7] Bankhead, A., Heckendorn, R.B.: Using evolvable genetic cellular automata to model breast cancer. In: Genet. Program. Evolvable Mach., pp. 381–393 (2007)

[8] Guieb, E.C., Samaneigo, J.M.: Image Noise Reduction Using Cellular Automata. In: CMSC, p. 190 (2007).

[9] Mohapatra, Subrajeet, Sushanta Shekhar Samanta, Dipti Patra, and Sanghamitra Satpathi. "Fuzzy based blood image segmentation for automated leukemia detection." In Devices and Communications (ICDeCom), 2011 International Conference on, pp. 1-5. IEEE, 2011.

[10] [2] Lim, Huey Nee, Mohd Yusoff Mashor, and Rosline Hassan. "White blood cell segmentation for acute leukemia bone marrow images." In Biomedical Engineering (ICoBE), 2012 International Conference on, pp. 357-361. IEEE, 2012.

[11] [3] Fatma, Mashiat, and Jaibir Sharma. "Identification and classification of acute leukemia using neural network." In Medical Imaging, m-Health and Emerging Communication Systems (MedCom), 2014 International Conference on, pp. 142-145. IEEE, 2014.

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