ENGINEERING IN ADVANCED RESEARCHSCIENCE AND TECHNOLOGY

ISSN 2352-8648
Vol.03, Issue.01
June-2022
Pages: -328-335

DETECTION OF LEUKEMIA USING IMAGE PROCESSING TECHNIQUE

[1]Nadimpalli Susmitha, [2]Mukkamalla Mounika, [3]Shaik Ruksana, [4]Myneni Srinivas, [5]Ogirala Radha Krishna Reddy, [6] Dr. Sakhamuri Suryanarayana

[1, 2, 3, 4, 5] Student of ECE dept., Kallam Haranadhareddy Institute ofTechnology, Guntur.
[6]Professor of ECE dept., Kallam Haranadhareddy Institute ofTechnology, Guntur.

Abstract: Leukemia is a blood cancer, which usually origins in the bone marrow and affects the body's ability to fight against infection. In India fewer than 1 million cases of leukemia are reported every year. Some of the common symptoms are skin rashes, bleeding, feeling tired, fever and increased risk of infections. It is very important to detect leukemia at early stages. Traditional methods (such as microscopic analyses of blood smears) of detecting Leukemia are time consuming, not cost effective and totally dependent on medical personnel. To overcome these drawbacks we propose an automation algorithm using image processing for the detection and classification of Leukemia using processing tool MATLAB. In this process inputs are the microscopic images, and these images are processed using image processing techniques.

Keywords: *Leukemia; blood smear; image processing.*

Introduction: Leukemia is a name of a blood disease; it is a cancer of blood cells. Leukemia disease grows very rapidly hence it has to be detected as early as possible. It originates in bone marrow when bone marrow produces large number of white blood cells or abnormal White Blood Cells. Leukemia has four major types: Acute Lymphocytic Leukemia (ALL), Acute Myelogenous Leukemia (AML), Chronic Lymphocytic Leukemia (CLL) and Chronic Myelogenous Leukemia (CML)(3).

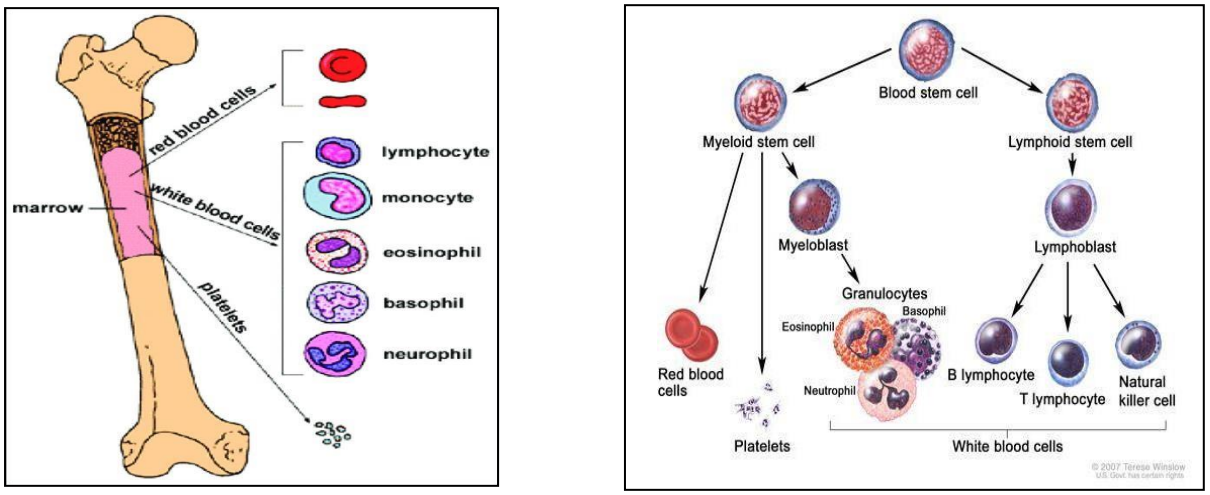

Fig.1 (a) bone marrow and blood components; (b) White blood cells evolution

Fig. 1 (b) shows, stem cell evolves into myeloid stem cells or into lymphoid stem cell. Myeloid stem cell evolves into myeloid blast. Red blood cells (erythrocytes), white blood cells (leucocytes) and platelets are generated from

the myeloid blast. Lymphoid stem cell also evolves and leads to the lymphoid blast which will finally generate white blood cells. There exist five types of white blood cells in blood which are lymphocytes, myelocytes, neutrophil, basophil and eosinophil. In leukemia, abnormal white blood cells are being produced by the bone marrow. Leukemia can be classified based upon how fast it becomes severe. Leukemia can be classified based upon how fast it becomes severe. Leukemia is classified as chronic or acute.

- Chronic Leukemia – Infected white blood cells perform like normal white blood cells andgradually it increases and become severe.
- Acute Leukemia – Infected white blood cells do not perform like normal cells and they increaserapidly in count and become severe.

Leukemia is detected manually by experts under microscope. This manual examination method is costly, time consuming and totally depends on operator's knowledge and skills. Detection through Digital image processing overcomes the above problems. Digital image processing requires images as the primary input, and do not require expensive lab equipments. To automate the process of detection of leukemia many image processing algorithms have been developed. This system takes microscopic blood smear images as their input. Depending on type and quality of the image various image processing techniques are used to get desired output.

Previous Work:

Symptomatic radio-graphy assigns the technological parts of medicative pictures and specifically in acquiring therapeutic images. Dr.s.Venkatachalam [1] presents the pre-processing strategies for the leukemia injected cells where the final aim is to generate the elements which describe types of leukemia. The undertaken issues contain: the cell segmentation [1] by using the watershed change, determination of distinct cells, and texture quality, statistical and geometrical examination of the cells. Image Processing procedure is commonly used as one of the element under imaging research. These strategies are valuable for representation, enhancement, segmentation and numerous more operations which are helpful for processing medicinal image which perhaps MRI, CT or whatever other images acquired through one of the imaging methodology. One of the advantages of utilizing these methods is to identify any abnormality from the norm in the image of medical application. Some of these application in detecting tumor, blocked vessels or here and there broken joints. [2] Vinay Parameshwarappa.al proposed a strategy for recognizing one such variation from the norm saw in brain image. Utilizing a portion of the traditional picture handling devices and Fourier transform.

According to Bhagyashri G.Patil [3] overview, as of late Lung growth cell is gaining the consideration of therapeutic and affected groups under the most recent times in light of its high prevalence unified using hard treatment. Insights from 2008 demonstrate that lung disease, all through world, is the one that assaults the best number of people. Early identification of lung growth is essential for fruitful treatment. There is couple of strategies accessible to identify dangerous cells. Here two techniques for division, for example, thresholding and watershed are utilized to distinguish the disease cell and too discover better approach out of them. Fundamental mathematical process hypothesis are presented at initially, utilized for identifying the edges and additionally the [4] tumor lung cells MRI and CT images. Since, salt and pepper noise are more pervasive in medical images the routine techniques are not successful in sifting salt and pepper noise. [4] Numerical morphological processes are utilized to identify the edges and the disease cells. Morphological disintegration is a decent channel of salt and pepper commotion. The trial results demonstrate that the proposed calculation is more proficient for restorative picture de-noising, edge location and recognizable proof than the normally utilized layout based on edge identification calculations and morphological edge recognition algorithm.

Proposed System:

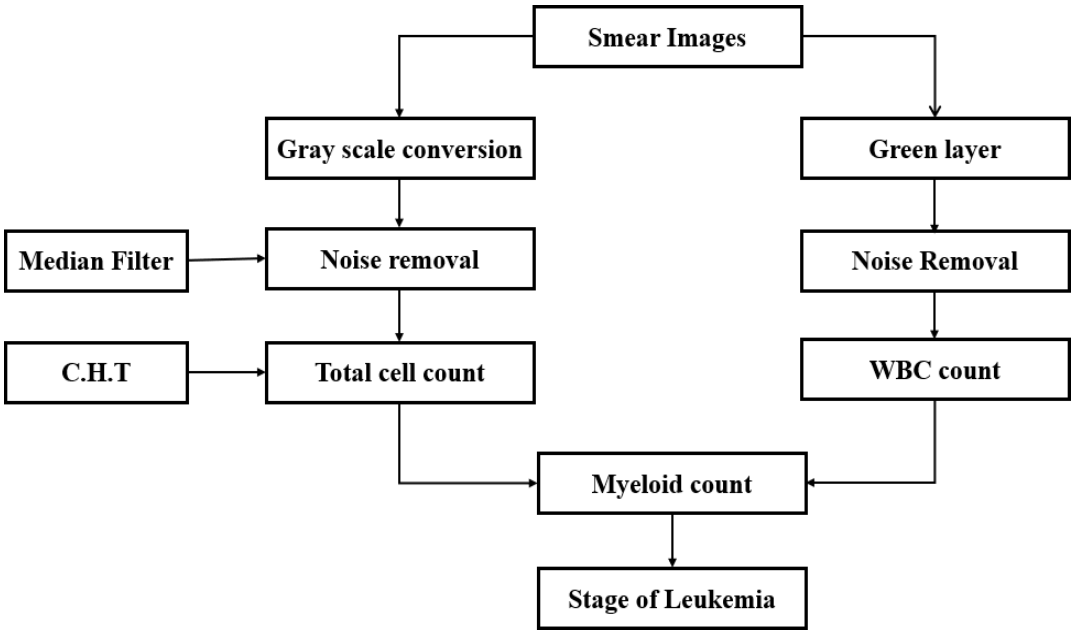

Fig. 2 Block Diagram of proposed System

Fig. 2 shows the steps involved in the proposed system:

Smear Images - A blood smear is a sample of blood that's tested on a specially treated slide. For a blood smear test, a laboratory professional examines the slide under a microscope and looks at the size, shape, and number of different types of blood cells.

RGB to Gray Conversion - The function converts the image by eliminating the hue and saturation information while retaining the luminance. Initially it Read and display an RGB image, and then convertit to grayscale.

Median Filter - The median filter is a non-linear digital filtering technique, often used to remove noise from an image or signal. Median filtering is very widely used in digital image processing because, under certain conditions, it preserves edges while removing noise.

Circular Hough Transform - Circle Hough Transform or Circular Hough Transform (CHT) is a feature extraction technique which detects circles in imperfect images. The provided source code finds radius of a given circle using CHT. The process involves drawing of circles of some radius 'r' on the edge of the given circle. If there are more than two intersections at the center of the given circle, then the radius of the that circle has been found, which is equal to 'r'.

Image Segmentation - Binary images are produced from colour images by segmentation. Segmentation is the process of assigning each pixel in the source image to two or more classes. If there are more than two classes then

the usual result is several binary images. Edge detection also often creates a binary image with some pixels assigned to edge pixels, and is also a first step in further segmentation.

Bwareaopen - Remove small objects from binary image BW2 = bwareaopen(BW,P) removes all connected components (objects) that have fewer than P pixels from the binary image BW, producing another binary image, BW2. This operation is known as an *area opening*. The default connectivity is 8 for two dimensions, 26 for three dimensions, and conndef(ndims(BW), 'maximal') for higherdimensions.

Myeloid Count – The Myeloid count is achieved by the WBC count ratio to the Total cell count. Basedon the Myeloid count the stage of the Leukemia is displayed.

Experimental Results:

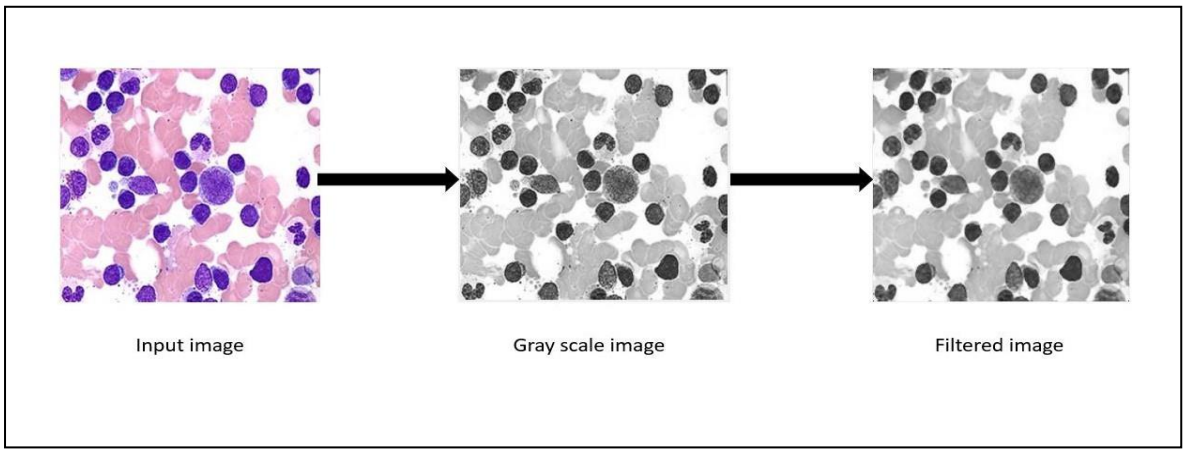

Fig. 3 Total cell count process

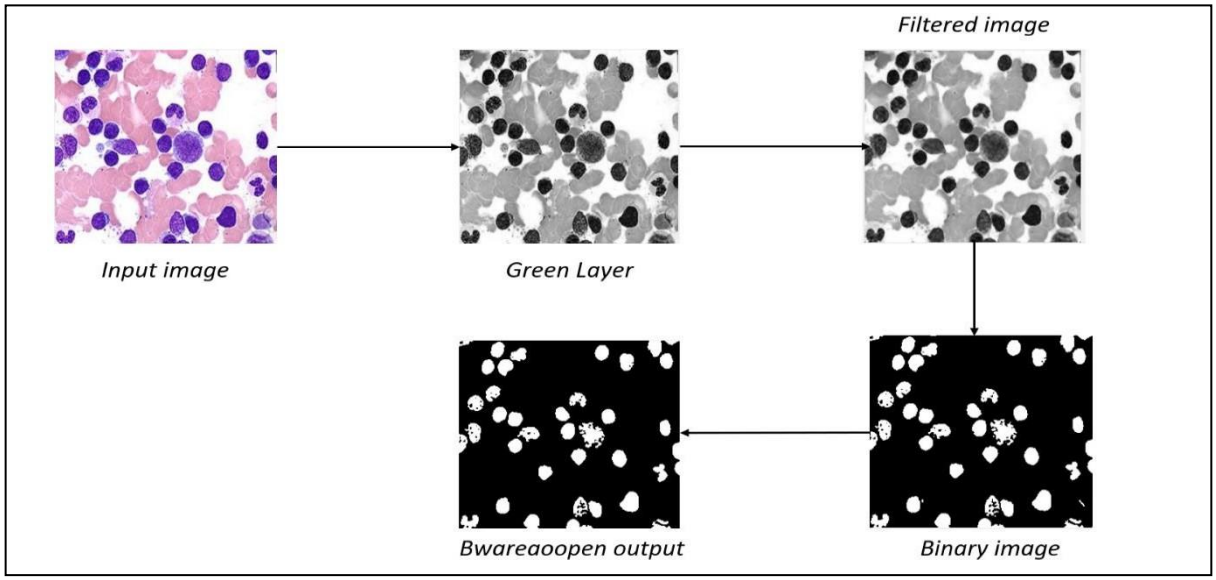

Fig. 4 Process for WBC count

The microscopic image has been sent to the proposed system, then the system converts the image into gray scale image, later noise is removed using a median filter and then circular hough transform is performed on the filtered image to count total cells. The total cell count is given to the Myeloid count. Similarly for WBC count we initially converts the image into a green scale for our project convenience, later noise is reduced using median filter and the filtered image is converted into an binary image and we calculate WBC count using a strel function and the WBC count is given to the Myeloid count. Basedon the myeloid count we detect the stage of leukemia.

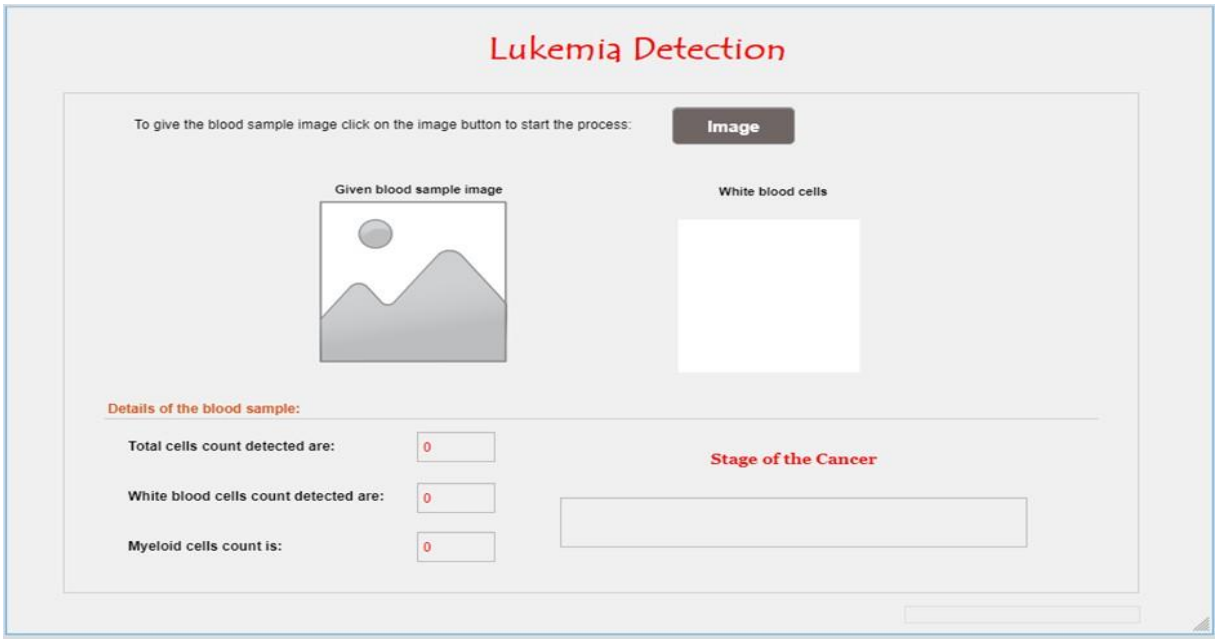

Fig. 5 UI of the system

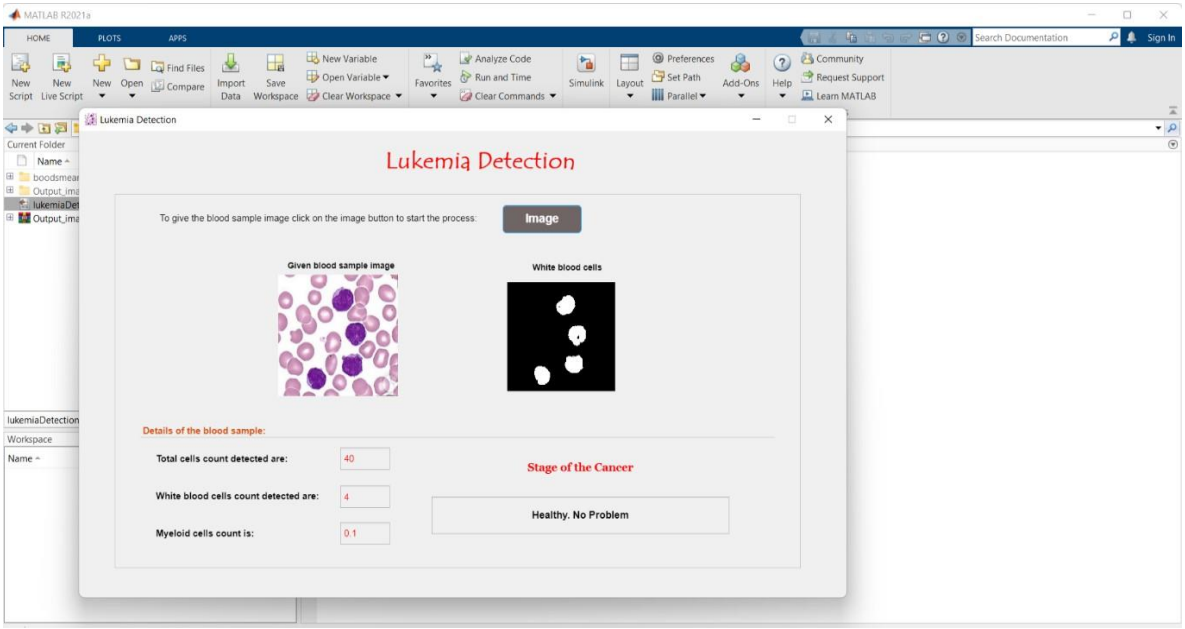

Fig. 6 Output

Conclusion:

The main focus of this paper is to propose an automated system which can detect the leukemia from the microscopic images to improve the accuracy and reduce the time to detect than the manual approach. So many lives can be saved by using the proposed automated approach of leukemia detection. The accuracy achieved in the proposed system is 91.03%. We hope this approach will be beneficial for today's fast life and early detection of leukemia without any need of costly tests and with a better accuracy.

References:

[1] Sos Agaian, Senior Member, IEEE, Monica Madhukar, and Anthony T. Chronopoulos, Senior Member, IEEE, Automated Screening System for Acute Myelogenous Leukemia Detection in Blood Microscopic Image, Ieee Systems Journal, 2014 Ieee.

[2] Romel Bhattacharjee, Lalit Mohan Saini, Robust Technique for the Detection of Acute Lymphoblastic Leukemia, 2015 IEEE Power, Communication and Information Technology Conference (PCITC) Siksha O Anusandhan University, Bhubaneswar, India.

[3] Mashiat Fatma, Jaya Sharma, Identification and Classification of Acute Leukemia Using Neural Network, 2014 International Conference on Medical Imaging, m-Health and Emerging CommunicationSystems (MedCom).

[4] Shubhangi Khobragade1, Dheeraj D Mor2,Dr. C.Y.Patil 3, Detection of Leukemia in Microscopic White Blood Cell Images, 2015 International Conference on Information Processing (ICIP) Vishwakarma Institute of Technology. Dec 16-19, 2015.

[5] Jakkrich Laosai and Kosin Chamnongthai, Acute Leukemia Classification by Using SVM and K- Means Clustering, Proceedings of the International Electrical Engineering Congress 2014 155 | P a g e

[6] Ashwini Rejintal, Aswini N, Image Processing Based Leukemia Cancer Cell Detection, IEEE International Conference On Recent Trends In Electronics Information Communication Technology, May 20-21, 2016, India.

[7] Ansha Beevi S.1, Remya R.S.2, An Overview on Acute Lymphocytic Leukemia Detection using Cell Image Segmentation, IOSR Journal of Computer Engineering (IOSR- JCE) e-ISSN: 2278-0661,p-ISSN: 2278-8727, PP 22-29.

[8] Mausumi Maitra, Rahul Kumar Gupta, Manali Mukherjee, Detection and Counting of Red Blood Cells in Blood Cell Images using Hough Transform, international Journal of Computer Applications (0975 8887) Volume 53 No.16, September 2012.

[9] A.S.Abdul Nasir, M.Y.Mashor, H.Rosline, Unsupervised Colour Segmentation of White Blood Cell for Acute Leukaemia Images, 2011 IEEE Conference.

[10]Rupinder Kaur Sandhu, Dr. Raman Maini, Automated Detection of Leukaemia, Volume 8, No. 5, May-June 2017 International Journal of Advanced Research in Computer Science.

[11] Malwinder singh1,Meenakshi bansal 2, A Survey on Various K-Means algorithms for Clustering, IJCSNS International Journal of Computer Science and Network Security, VOL.15 No.6, June 2015.

[12] Biplab kanti das, Krishna kumar jha, Himadri sekhar dutta, A New approach for Segmentation and Identification of Disease Aff ected Blood Cells, 2014 International Conference on Intelligent Computing Applications.

[13] Rege M.V.1, Dr.B.W. Gawli2, Detection of Leukemia in Human blood sample through Image Processing, A Review IJMTER-2015

[14]J.Hari,A.Sai Prasad,S.Koteswara Rao, Separation and Counting of Blood cells using Geometrical Features and Distance Transformed Watershed, 2014 2nd International Conference on Devices, Circuitsand Systems (ICDCS).

[15]S. Pavithra, J. Bagyamani, White Blood Cell Analysis Using Watershed and Circular Hough Transform Technique, International Journal of Computational Intelligence and Informatics, Vol. 5: No.2, September 2015.