**ABSTRACT**

Health care services play a vital role in the conversion of modern cities into smart cities. In this work, we present a pervasive and calibre computer aided plasma scrutiny service for the counting and detection of white plasma cells (WBC) in the plasma specimen. WBCs also called leukocytes or leucocytes, are the cells of the immune system that are involved in defending the body against both infectious disease and foreign invaders. Analysis of leucocytes provides valuable evidence to therapeutic experts, helping them in isolating different important hematologic syndromes such as plasma cancer and AIDS (Leukemia). However, this task is liable to error and can be time-consuming. In Projected system, the image is pre-organized and then the images are compared using OTSU based Threshold method. After that ANFIS (Artificial Neural Fuzzy Inference System) is used to classify the disease types.

**KEYWORDS:** Acute Lymphoblastic Leukemia, White plasma cells (WBC), OTSU based Threshold method, ANFIS.
is stabilized in brightness and the background noise is removed to element the redundant data. The Eigen space for the image is set to build by calculating biggest Eigen values in-order to upturn the resolution of position as predicted by OVIDU GHITA, we connected these points in Eigen space and unidentified positions can be estimated[4].

Normal Plasma Cel Vs Leukemia Plasma Cell

Proposed approach:
In Proposed system, the image is pre-processed and then the images are segmented using OTSU based Threshold method [5]. More number of features trained through in Histogram of oriented features, angle, magnitude and gradient parameters takes to implement. After that ANFIS (Artificial Neural Fuzzy Inference System) is used to classify the disease types.

Block diagram:

Block diagram explanation:
Input:
Image called as a group or collection of pixels in the arrangement of rows and column manner. The total rows and column values of multiplied only incidence of the image[6]. Here the image first considered as RGB format. Pixel: - a small particle of an image. Size: images are taken from bioinformatics research laboratory format of images *.bmp and *.jpg all available, dimensions of image like 211x239.
Preprocessing:

Preprocessing is the foundation implementation to regularize the taken input image for following process. Regularize process are, Re-sizing Gray scale transfiguration, Noise elimination.

Conversion to GreyScale:

A Gray-scale Image is supposed to Comprehend Only ‘grey’ colour where the Red, Green and Blue Colour Constituents are said to Have Identical Intensity Values and so Processing Becomes Flexible When we Specify only a Single intensity Value for Each Pixel. Instead of taking Three Intensity Values required to be Quantified for each Pixel in a ColourImage[6]. Microscopic Images are found to possess the Primary Colour (RGB). So, for further processing, it must be Converted to Gray-scale Images.

Resize:

Resize the images to a new width and height. To make the image scale proportionally, use 0 as the value for the wide or high parameter. For instance, to make the width of an image 150 pixels, and change the height using the same proportion, use resize (150, 0).

Filtering:

Median Filtering is a nonlinear method used to cut off noise from images. It is widely used, as it is very effective at removing noise while conserving edges. It is particularly effective at removing ‘Salt and Pepper’ type noise. The Median Filter works by moving through the image pixel by pixel, replacing each value with the Median value of neighbouring pixels[7]. The pattern of neighbours is called the ‘Window’ which slides pixel by pixel over the entire image.
Segmentation:
Image Segmentation is the process of segregating an image into various parts. This is conventionally used to distinguish objects or other pertinent information in digital images.

Otsu Threshold:
Threshold based segmentation it takes actual intensity and reflection intensity values by weighted vector and class variance output of image like black and white.
1. Weighted (intensity)
2. Class variance
3. Mean
4. Final step is threshold (foreground and background separation).
The most common way to convert a Grey –Level Image into a Binary Images is to select a single Threshold value(T). Then all the Grey Level Values below T will be classified as Black(0)i.e. backgrounds and those above T will be White(1)i.e. objects.
The Thresholding operation is characterized by
\[ g(x,y) = \begin{cases} 
0 & \text{if } f(x,y) < T \\
1 & \text{if } f(x,y) > T 
\end{cases} \]
Where (x, y) =>Represent Grey value
G(x, y) =>Represent Threshold Image
F(x, y) =>Represent Grey Level Image

Hog feature extraction:
The Histogram of Oriented Gradients (HOG) is a feature descriptor used in computer vision and image processing for the purpose of object detection.
Histogram: The graphical representation of pixel intensity of a given image. The intensity level steadily changes based on three parameters like,
Angle, magnitude and gradient features.
Angle is defined as in image in two directional views. X and Y directions.
X represents in Ix
Y represents in Iy
Angle is = a tan (Ix/Iy);
Magnitude & Gradient: The samples of pixels varied in two types same intensity level and different values of intensity.
Represents, sqrt (Ix2 + Iy2)
Saturation of contrast level among different region in image. It can be gained through angle and magnitude values[8]. For that we take 8 x 8 patch and analyze the values.
The most important problem in generation of features of blood cells that characterize them in a way enabling the recognition of different blast types with the highest accuracy. The features to be used are for nucleus of Lymphocytes and Myelocytes.

- Geometrical Features – which includes area, radius, perimeter, symmetry, concavity, compactness, solidity, eccentricity, elongation, form factor will be obtained.
- Texture Features – which includes homogeneity, energy, correlation, entropy [18], contrast, angular second momentum will be obtained.
- Color Features – the RGB color spaces will be transformed into HSV or L*a*b color spaces. Their mean color values will be obtained.
- Statistical Features – the mean value, variance, skewness, kurtosis of the histograms of the image matrix and the gradient matrix for RGB or HSV or L*a*b color space (whichever appropriate) will be obtained.

**Anfis classifier:**

A neuro-fuzzy approach as a combination of neural networks and fuzzy logic has been launched to overcome the individual weaknesses and to offer more fascinating features. The ultimate goal of applying such a system is to get rid of indistinct information present in an image such as pixel grayness, ambiguity, and geometrical segmentation of the image and the uncertain interpretation of a scene. This manipulates, respectively, the learning capabilities and the descriptive power of systems, thus providing results characterized by a high interpretability and good degree of accuracy[9].

The types of Leukemia are

**Acute myeloid leukemia:**

Acute Myeloid Leukemia (AML), also known as Acute Myelogenous Leukemia or Acute Non Lymphocytic Leukemia (ANLL) is a cancer of the myeloid line of blood cells, characterized by the rapid growth of unusual white blood cells that hoard in the bone marrow and meddle with the production of normal blood cells. AML is the most common acute leukemia affecting adults and its incidence increases with age. Although AML is a relatively rare disease, accounting for approximately 1.2% of cancer mortality in the United States, patients with AML often has several non-specific (general) symptoms. These can include:

- Weight loss
- Fatigue
- Fever
- Night sweats
- Loss of appetite
Chronic myelogenous leukemia:
Chronic myelogenous leukemia (CML), or chronic granulocytic leukemia (CGL), is the white blood cells cancer. It is a form of leukemia characterized by the amplified and tolerant growth of predominantly myeloid cells in the bone marrow and the addition of these cells in the blood... In Western countries it accounts for 15-20% of all adult leukemia and 14% of leukemia overall (including the pediatric population). Symptoms comprise:
- Weakness
- Feeling tired
- Weight loss
- Fever
- Night sweats

Acute lymphoblastic leukemia:
Acute lymphoblastic leukemia (ALL) or acute lymphoid leukemia cancer of the white blood cells, characterized by the over increase of cancerous, immature white blood cells—known as lymphoblast’s. ALL persons have, lymphoblast’s that are overproduced in the bone marrow and continuously multiply, causing damage and death by inhibiting the production of normal cells—such as red and white blood cells and platelets—in the bone marrow and by scattering (infiltrating) to other organs[10]. ALL is most common in childhood with a peak incidence at 2–5 years of age, and another peak in old age.
The symptoms include:
- Anemia
- Dizziness
- Frequent or unexplained fever and infections
- Weight loss
- Excessive and unexplained bruising
- Bone pain, joint pain
- Breathlessness

Database:
A database is an ordered collection of schemas, tables, queries, reports, views, etc. The data are characteristically organized to model aspects of reality in a way that supports processes requiring information.

OUTPUT:
Normal
Benign
Malignant
Graphical user interface (GUI):

As the procedure of managing MATLAB script for each and every image separately is difficult and hazardous, a user interface is designed to make the process of detection fast and user friendly. With the help of the GUI, the operator cannot only load, segment and sort the lymphocytic cell, but also the data for the particular cell can be saved for future. Reference. Here flexibility is provided in the case of selecting intensity for any image. The contrast of the image can be adjusted without human intervention as well as manually. For the image selected in the GUI image space, have to be segmented first, then parameters are to be calculated and stored, next with the help of Manual check, the data will be classified and the result will be displayed.

Conclusion:

In this analysis, we have projected an image segmentation and classification of electron microscope images and extracting geometric features of leukocyte cells. The experimental results obtained by gray level thresholding and ROI. The proposed method is more consistent and computationally cheap and yet yields equivalent classification. It could be improved further by better pre-processing methods and feature sets, which will be taken up in our future work. This method of identification and classification of leukocytes can also be extended in neural network based diagnosis which helps to improve the identification performance.

REFERENCES