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A REVIEW: CLASSIFICATION OF WHITE BLOOD CELLS USING COMPUTATIONAL INTELLIGENCE TECHNIQUES

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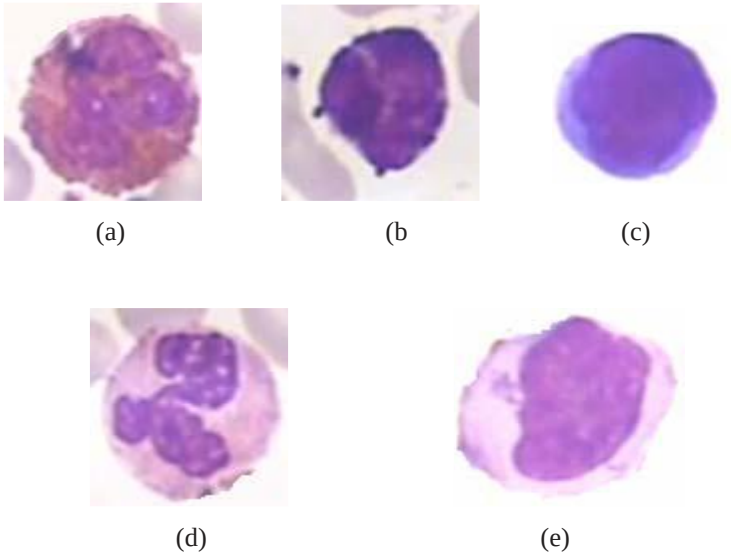
Abstract: BLOOD tests are frequently employed to evaluate human health. One of the most straightforward blood tests is to quantify and identify the blood cell types. A complete blood count (CBC) is primarily a measure of these cellular components and is one of the most routinely ordered blood tests by clinicians. CBCs, especially white blood cell (WBC) count, provide physicians with key information valuable for diagnosing many different disease states including: anemia, leukemia, autoimmune disorders, fungal, and bacterial infections as well as Recognition and inspection of white blood cells in peripheral blood can assist hematologists in diagnosing many diseases such as AIDS, Leukemia, and blood cancer. Thus, this process is assumed as one of the most prominent steps in the hematological procedure. This Purposed work purposes the tasks of extracting, classifying and segmenting the Five Types of White Blood Cells using more efficient supervised learning approaches for more accurate and computationally efficient segmentation.

Index Terms **- MatLab, Nuero Solution Software, Microsoft excel, Various Transform Technique**

I. INTRODUCTION

Blood tests are frequently employed to evaluate human health. One of the most straightforward blood tests is to quantify and identify the blood cell types. A complete blood count (CBC) is primarily a measure of these cellular components and is one of the most routinely ordered blood tests by clinicians. CBCs, especially white blood cell (WBC) count, provide physicians with key information valuable for diagnosing many different disease states including: anemia, leukemia, autoimmune disorders, fungal, and bacterial infections as well as a host of other ailments [11], [12]. Currently there are two methods primarily used to obtain a CBC, specifically a WBC count. The first requires a clinician or trained lab specialist to prepare blood smear slides, stain them, and then manually count different WBC types using a hemocytometer under a microscope [13]. To do this they must dilute specimens in a red blood cell (RBC) lysing solution to remove RBCs and count WBCs. Manually counting WBCs is laborious and requires specialized medical equipment and trained personnel. The second method employs a flow cytometer, an extremely bulky and expensive piece of equipment, to perform the cell count [14]. This method requires treatment of the whole blood sample using several reagents; typically, RBC lysing solutions and costly antibodies. However, this technique has an extremely high efficiency in accurately identifying and quantifying different WBC sub-types.

Blood cells are consisted of red blood cell white blood cell, and platelets. White blood cells (WBCs) are the cell of the immune system for protecting the body against both infection disease and foreign invaders. WBCs are also called as leukocytes. Leukocytes are also called immune cell because of its function. WBCs are divided into granular cells and non-granular cells. The granular cells are neutrophil, eosinophil, and basophil. The non-granular cell are monocyte and lymphocyte. These five type of WBC cells are different in proportion into the diseased and non-diseased blood. Doctors use these fundamental ideas as the criteria to determine the type or severity of this disease as a result, the study of WBC classification has a remarkable value for medical diagnosis system.



(a) (b (c)

(d) (e)

Fig. 1. Five major groups of white blood cells in peripheral blood. (a) eosinophil, (b) basophil, (c) lymphocyte, (d) neutrophil, and (e) monocyte.

Each type of WBC helps in diagnosing many ailments. high number of neutrophil in blood indicates cancer disease, high lymphocyte inform about AIDS and high monocyte and eosinophil refer to bacterial infection. For this reason, an automated system is essential for recognizing this five types WBC image[2].

II. RELATED WORK

The blood cell segmentation process is the isolation of the cell from the surrounding complex background then to divide the cell into its morphological structures such as nucleus and cytoplasm. To this point, there is no universal segmentation technique for all kinds of medical image modalities; it is application specific. Ongun et al. [4] used active contour models (snakes and balloons) to segment the WBCs.

Morphological structure features, such as shape and texture features, are used for the recognition and classification process. They considered twelve classes of WBCs. A general survey of WBC segmentation techniques was presented by Adollah et al. [5]. Mohamed et al. [6] presented an effective technique for WBC nucleus segmentation based on an effective contrast enhancement and thresholding. They presented false object elimination technique to reduce segmentation error.

Theerapattanakul et al. [7] used the active contour method for the segmentation of the WBCs. They used double thresholding then they try to find the nucleus of the WBC that has strength greater than the threshold value. A preliminary circular contour (snake) is placed on the nucleus locations found. The final stage is to use the active contour model with gradient flow vector force as a guide to drive the snake contour surrounding the WBC to be extracted. A structure for segmenting white blood cells was suggested by Sadeghian et al. [8]. They divide the WBC into two structures: nucleus and cytoplasm. As for their algorithm, separating the nucleus is based on morphological analysis, whereas separating the cytoplasm is based on gray level thresholding. In their study, 92% accuracy was accomplished for nucleus segmentation and 78% for cytoplasm segmentation. Their planned method has shortage as it is applied on sub images to ease the implementation.

Theera-Umpon [9] established an automatic segmentation technique for microscopic bone marrow WBC images. They use the fuzzy C-means (FCM) algorithm and mathematical morphology. FCM algorithm is applied to segment each cell image to form patches. Binary morphological operations are used to smooth out cells and nucleus and to get rid of small patches.

An automatic system for blood cell identification based on bone marrow images is presented by Markiewicz et al. [10]. They develop Gaussian kernel Support Vector Machine (SVM) to select the diagnostic structures for feature extraction of the morphologically preprocessed images. In their study, they revealed that they accomplished an accuracy of 87%.

An algorithm for the detection of Red Blood Cells (RBC) in urine image was developed by Cao et al. [11]. An improved Sobel operator was used to preprocess the images, then the RBCs were localized using Hough transform. Principal Component Analysis (PCA) is used to extract the features, and LDA (Linear Discriminant Analysis) is used for classification.

Angulo and Flandrin [12] propose a technique to automatically differentiate the working area of peripheral blood smears stained with May- Grünwuald Giemsa. The well extend part of the smear is defined as the optimal area. In the first stage of their algorithm, they analyze the input images using morphological mathematical operations to extract the RBCs. On the other hand, they count the number of the connected components from the three kinds of particles then they calculate the coefficient of spreading and the coefficient of overlapping. They do so in the second part.

Ramoser et al. [13] present a fully automated segmentation approach for WBC segmentation. It is said to be robust with respect to cell appearance and image quality. Cytoplasm and nucleus properties are distinguishable based on a set of features. Different cell types are classified using pairwise SVM. Evaluation on a set of 1166 images (13 classes) resulted in 95% correct segmentations and 75%.

III. PROPOSED Methodology

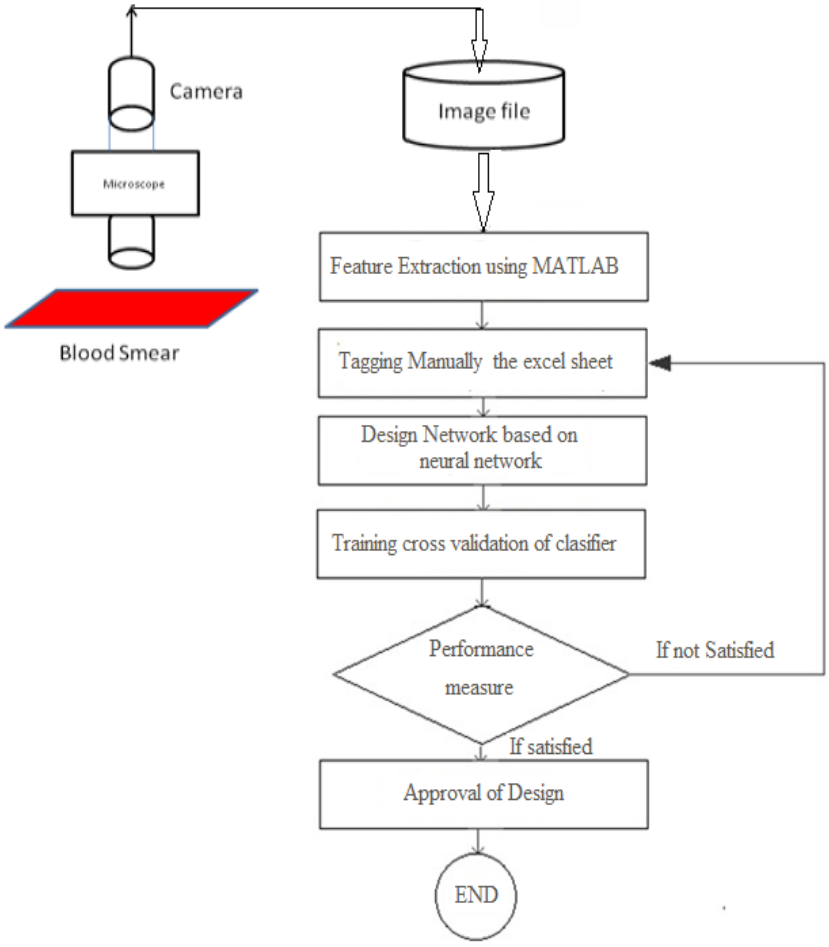


Fig 2:Flow Chart

It is proposed to think about the grouping of five sort of WBC images using Neural Network Approaches. Information securing for the proposed classifier intended for the Recognition of five type of WBC images .The most vital un corresponded includes and in addition coefficient from the images will be extricated. In order to extract features, statistical techniques, transformed domain will be used.

Computational Intelligence techniques include the following well-established techniques.

i) Statistics
ii) Learning Machines such as neural network.
iii) Transformed domain techniques such as FFT, WHT, HISTOGRAM etc.

For choice of suitable classifier following configuration will be investigated.

i) Support Vector Machine.
ii) Modular Neural network.
iii) Generalized Feed Forward Neural Network

For each of the architecture, following parameters are verified until the best performance is obtained.

i) Train-CV-Test data
ii) Variable split ratios
iii) Retraining at least five times with different random initialization of the connection weights in every training run.
iv) Possibility different learning algorithms such as Standard Back-Propagation, Conjugate gradient algorithm, Quick propagation algorithm, Delta Bar Delta algorithm, Momentum
v) Number of hidden layers
vi) Number of processing elements of neurons in each hidden layer.

After regions training & retraining of the classifier, it is cross validated & tested on the basis of the following performance matrix.

i) Mean Square Error
ii) Normalized Mean Square Error
iii) Classification accuracy
iv) Sensitivity
v) Specificity

In order to carry out the proposed research work, Platforms/Software's such as Matlab, Neuro solutions, Microsoft Excel will be used.

IV.RESEARCH OBJECTIVE

i) To maintain the correctness & accuracy in five type of WBC images Classification even though the input images are contaminated by known or unknown noise.
ii) To increase the classification accuracy for the five type of WBC images.

V. CONCLUSION

This paper demonstrated how to using artificial neural networks (ANN) could be used to build accurate five type of WBC images classifier and i am also try to achieved result more accurate and reliable.

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