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# A Comparative Study of Segmentation and Classification Techniques in WBC

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**ABSTRACT**

*The immune system in our body is made up of a of cells, tissues, and organs that work together to protect from the virus. One of the important cells involved is white blood cells, which is also known as leukocytes. The white blood cells are classified into Monocots, Neutrophils, Basophils, Eosinophils, and Lymphocytes. The variation of counts in the white blood cells leads some other disease. Suppose you have any disease, you wanted to test for blood very effective and accurate manner. Basically, test for blood diagnosing is based on the count of White blood cells. Now, these days the manual method for blood test takes more tedious and inefficient. So use our computer science knowledge to remove the error in the medical fields. In this paper discuss the various techniques in white blood cells segmentation and classification using machine learning. It gives deep knowledge which can be used in cell segmentation and classification process.*

***Keywords: Blood Smear Microscopic Images means Clustering, BLOB analysis, Fuzzy C means, Snake contours, Machine learning.***

## I.INTRODUCTION

We know that blood is a fluid tissue having the complex structure. The blood cells are basically three types, they are Red blood cells, white blood cells, and platelets [1]. The red blood cells contain hemoglobin which carries oxygen through the body. The main duty of platelet is clotting the blood, which has disc- shape having 2-4 um diameters. White blood cells play the important role in immunity of the human body, which is also known as leucocytes. The process of development and maturation of leucocytes is called leucopoiesis. The infants up to one year of age have 6000-16,000/l of white blood cell count in blood. In case of adults contain 4000-11,000/l of counts in blood [3]. So according to the different age domain, the count of white blood cells is different. The eosinophils in white blood cell have min role in allergic reactions, while basophils have the functions for allergic responses. Like this, each type of white blood cells has different function for the immune system. The automatic white blood count cells detection is the very difficult process. The accuracy of feature extraction also depends on the segmentation and classification. The classification of white blood cells has some have some common steps. First, we wanted to collect the digital image of blood cells. After that do some enhancement techniques and extract the feature [1]. Finally, the extracted feature is segmented and classified into the different group. The above-mentioned steps are used in every method in different ways. In this paper have the review about the white blood cells segmentation and classification.

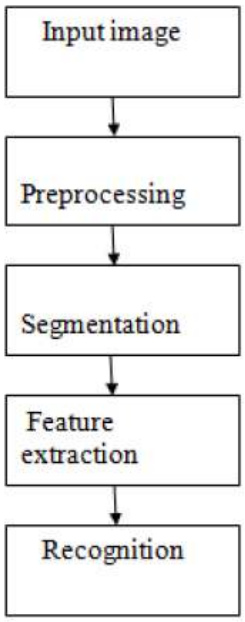


Fig. 1. Common Block diagram

## II.LITERATURE REVIEW

In this section describe the various technologies used for segmentation and classification of leukocyte. There is a different kind of approaches used for every stage. The most important technology is described below.

A. Segmentation and classification using k-means algorithm

In this approach contain four stages. The input is given as RGB image of blood smear, and finally, the white blood cells are extracted. The proposed system converts the RGB digital image of blood smear into L*a*b* color space [2].Which represent lightness and color opponents elements. The main advantage of this color space is that it is designed to approximate human vision. The according to change in value L then, color changes. Suppose the value of L in the color space is zero it is denoted as black color. Also, the positive value of a* denoted as green color [2]. So use all these information the data save in a* and b* is fed into k means clustering. Also, extract the nucleus cluster and done the morphology operations. Then form a mask and the nuclei are subtracted from the prime image, the entire procedure known as nuclei segmentation part. The cluster has only information about a*, b* values of max, min, and mean. According to the number of the clusters, there has the number of initial seed points. Where the distance is calculated by using squared Euclidean distance[2].The next stage contains the information from the L*.The second seed point consists the data from the lightness and forms a cluster. This stage is called background estimation and extracts the background also given a mask. The last stage is known as cytoplasm segmentation where, subtract both mask and enhanced the contrast. Then values from the b* is used and form the cluster and form another cytomask. At last, can extract the white blood cells from the digital image of the blood smear.

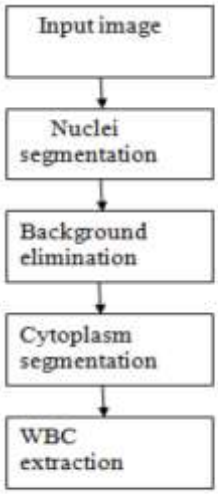


Fig. 2. Proposed block diagram of KMC

B. Classification using Double Thresholding and BLOB Analysis

The proposed method used to classify the red blood cell and white blood cells separately. The input taken digital image of the blood smear. Then it is converted into the binary image because the blob analysis works on the binary image .Here use the recursive grassfire algorithm to find the objects .It scans the entire image from left to right and top to bottom[4].The algorithm looks in four different directions and finds the object pixels. The annular ring ratio is used to identifies and locate the blood components by processing an image of thin blood films and compute the size of cells [5]. Finally classified into white blood cells and red blood cells. But it needs more clear background and foreground relation.

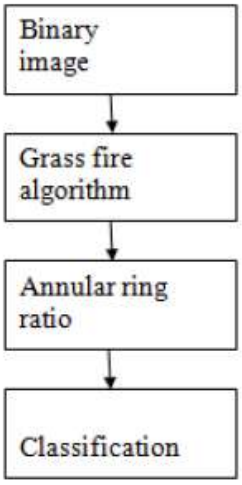


Fig. 3. Proposed block diagram of Blob Analysis method

C. Segmentation Using Fuzzy C Means and Snake algorithm

The preprocessing stage contains RGB image to grayscale image conversion. After that median filter is used to filter each pixel and normalized the data. We know that FCM technique is one of the data clustering approaches, which groups the data into different clusters. In case of FCM identifies the possible

Number of iterations within a time period. Then obtain the image size [6].Also, calculate the possible distance size by the use of repeating structure. The given dimension is concatenated for the size of an image. To get possible distance, large data items are generated by repeating the matrix. The iterations

are started by recognizing the large data components vis--vis the pixel values[8].When the possible identification gets elapsed the iteration stopped. The snake algorithm used to map deformable model to the particular image. The snake algorithm calculates average distance, calculate the minimum energy points, calculate the curvature energy, normalized the curvature energy, normalized the curvature energy, recalculated the average distance, and determine the boundary points[10].Finally, the images are fused using fusion rules. So my proposed system reflects the image processing and classification stage. The quality of the digital image is the more important factor for identifying the features. The first stage effects the more enhancements of the images. Depending upon four sets of features the blood cells are identified and segmented. The last stage containing the classification of white blood cell and its type in an effective manner. This review paper is the help to more about the segmentation and classification of the cells.

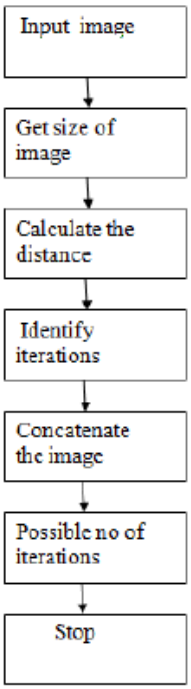


Fig. 4. Proposed block diagram of FCM

## III. DISCUSSION

There is more research still doing in blood cells count and classification. The existing system which, used for counting and classification have more limitation and disadvantage. The image of blood taken as the digital image .Most of the methods use the image enhancement and cleaning the image. The feature extraction has another role in the process. Because it is depending upon the final result. The segmentation and classification are based on some different types of features. Identifying each type of white blood cell has a challenging part. So this review helps to get more details about the different types of segmentation and classification process.

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