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Article

Automated Recognitions of White Blood Cells

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A B S T R A C T

Healthcare services are important part of cities. Now a day's healthcare plays important role in the transformation of cities into smart cities. Leucocytes play a vital role in immune system which helps to protect the body against both infectious disease and foreign invaders. Identification of leukocytes in blood smear provides important information to pathologist as well as doctors to analyze and predicts different types of hematic diseases, such as AIDS and blood cancer (Leukemia). Most of the time, the health professional are interested on leucocytes in white blood cells only. Digital image processing procedures can help them in their examine and detecting. For example, disease like cancer and AIDS is detected based on the total count of the WBC in the human body. In the proposed framework, leucocyte is first segmented into two dominant elements, nucleus and cytoplasm, followed by extraction of features. The identification of leucocytes can be done with the help of adoptive gradient vector flow snake algorithm.

Keywords: Health Care in Smart Cities, Image Classification, Image Segmentation, Leucocytes Classification, Mobile Cloud Computing, Medical Image Analysis

Introduction

Leucocytes play a vital role in immune system which helps to protect the body against both infectious disease and foreign invaders. Identification of leukocytes in blood smear provides important information to pathologist as well as doctors to analyze and predicts different types of hematic diseases. White blood cells play a role in reducing inflamm3ation in the body. A high white blood cell count could mean that there is inflammation somewhere in the body, such as can occur in the gastrointestinal tract of people who have Inflammatory Bowel Disease (IBD). The White Blood Cell (WBC) count is also sometimes known as a leukocyte count or white count. A WBC count is typically done along with another common blood test, the Complete Blood Cell count (CBC). A WBC count is the number of white blood cells per volume of blood and is reported in either thousands in a microliter or millions in a liter of blood to handle those problem we have proposed this system The main goal of White blood cells separation is to isolated leucocytes from other dissimilar components in human blood image sample. A human blood smear image consists of four components, which are the background, red cells (un-nucleated cells), white cell's nucleus and cytoplasm. WBC looks as rather darker than the background and red cells look in an in-between intensity level. Also, there is shape difference in cells and their nucleus.

Literature Review

In past decades it is observed that traditional methods used such as Manual Method and Rack Analyzer Method for calculating the Leucocyte in blood sample. The most economical and quick solution in this case is to provide Digital Image processing.

Yampri et al.[1] proposed automatic thresholding using a green color component to provide a high contrast between the nucleus and cytoplasm. The noise remaining in the segmented image is then removed using a basic morphological process, while the nuclei and cytoplasm are segmented using an adaptive contour. However, some WBCs (neutrophils and eosinophils) can have more than one nucleus in a cell, making it difficult to discriminate accurately between the cytoplasm and the nuclei.

Dorini et al.[2] proposed a watershed transform based on connectivity for the segmentation of nuclei, for which they use an image forest transform, a general tool for the design of image processing operators. Meanwhile, size distribution information is used to separate the cytoplasm from the background and RBCs, where a series of morphological openings are performed using structuring elements of increasing size. While effective for certain nuclei, problems are encountered when the shapes of the cytoplasm are not round and the sizes change according to the types of WBCs.

Chinwaraphat et al.[3] proposed a clustering of WBC components using a modified fuzzy c-mean clustering technique. The modification is based on an iteration of false scattering color replacement by using a neighboring color data. However, manual cropping is required for the test images and a performance comparison with other methods is not evaluated.

Ko et al.[4] leukocyte from images using merging rules based on mean shift clustering and boundary remover rules.

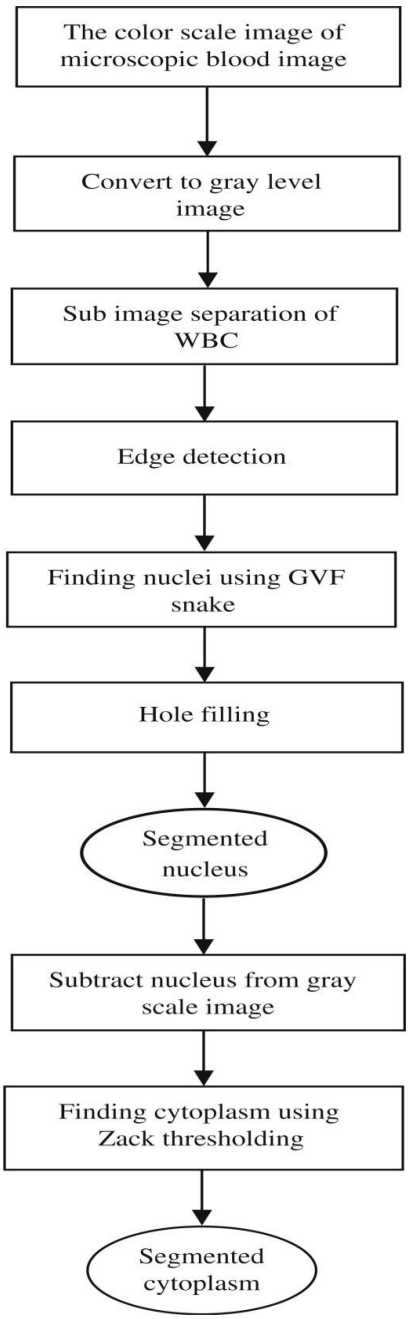
Sholeh[5] used different algorithms for WBC enhancement and segmentation. Platelets and noise were removed from blood smear images using morphological operations. To smooth the cell shape, opening and closing operations were performed. Segmentation of WBC was done by obtaining the blue channel. Next, the five types of WBCs were segmented, counted and classified. Then, the segmented image was labelled for leukocytes counting, followed by features extraction such as major axis length, minor axis length and average axis length.

Sedat Nazlibilek et al.[6] presented another approach which applies image enhancement on blood smear images prior to segmentation of WBCs using Otsu segmentation algorithm. Then, a set of morphological operations were used for removing unwanted objects and filling the holes.

Prinyakupt and Pluempitiwiriyawej[7] have used thresholding and mathematical morphology for segmentation of cell nucleus. Morphology is a mathematical operation that applies addition/subtraction on blood smear images to separate WBCs, RBCs and platelets. Threshold segmentation was done to partition the image into background and foreground and the optimal threshold value for the segmentation of WBCs was then selected.

Ravikumar[8] conducted a comparative study of two techniques known as standard Extreme Learning Machine (ELM) classification technique and Fast Relevance Vector Machine (FRVM) for segmentation. In comparison to FRVM, ELM classification technique performs well in local maxima. However, overall performance of ELM is not satisfactory.

Muhammad Sajjad[9] Describes the Leukocytes Classification and Segmentation in Microscopic Blood Smear: A Resource-Aware Healthcare Service in Smart Cities The goal of WBC segmentation is to separate leucocytes from other different components in blood image To design a system for automatic detection of WBC cells for more precise results using canny detection algorithm.



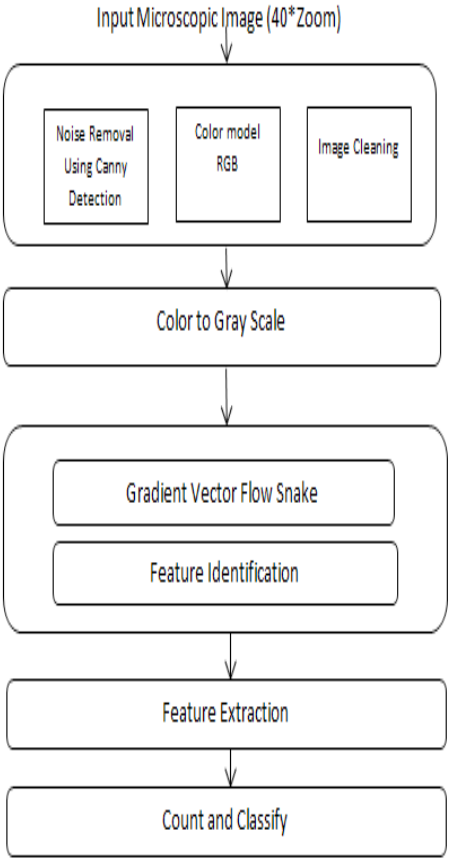


Figure 1.The proposed framework of the WBC segmentation scheme

Methods used for Blood Examination

- Canny Edge Detection
- Finding Nuclei Using GVF Snake
- Segmented Nucleus
- Subtract Nucleus From Gray Scale Image
- Finding Cytoplasm Using Zack Threasholding
- Segmented Cytoplasm

Conclusion

As we conclude that Health care service is most important in the society so this system is highly useful to pathologists and medical technicians for clean and properly stained blood cell sample image can be processed and approximate results can be drawn.

The system is user friendly that is easy to handle so that the pathologist can detect the blood cell sample image in different views. Also, pathologist can get the outcome of blood sample test within 20 seconds to 1 min. as tested. Also, we have compared lively, the results of our system with existing one in laboratory. And they proved to be correct as sure by the pathologist.

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