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A Study of Red and White Blood Cell Counting Using Watershed Algorithm: A Review

Manpreet Bawa
Department of Computer Science
Guru Kashi University
Talwandi Sabo, India
manpreetbawa89@gmail.com

Er.Meenakshi Garg
Department of Computer Science
Guru Kashi University
Talwandi Sabo, India
manpreetbawa89@gmail.com

ABSTRACT
The microscopic images of a blood stream contains RBCs, WBCs and Platelets. Pathological inspection of an infected cell based on the disease, is solely dependent on subjective assessment which usually leads to significant inter-observer variation in grading and subsequently resulting in late diagnosis. Morphological methods and iterative thresholding are used for red blood cell segmentation, and boundary curvature calculations and Delaunay triangulation for red blood cell clump splitting. The major problem of overlapping cells while counting by segmentation using morphological watershed transformation and regional maxima computation providing high degree of accuracy.

Keywords
Keywords are your own designated keywords which can be used for easy location of the manuscript using any search engines.

1. INTRODUCTION

Content-based image indexing and retrieval has been an important research area in computer science for the last few decades. Many digital images are being captured and stored such as medical images, architectural, advertising, design and fashion images, etc. As a result large image databases are being created and being used in many applications. In this work, the focus of our study is on medical images. A large number of medical images in digital format are generated by hospitals and medical institutions every day. Consequently, how to make use of this huge amount of images effectively becomes a challenging problem [1]. In the field of biomedicine, because of cell's complex nature, it still remains a challenging task to segment cells from its background and count them automatically [2-5].Among all of the body's tissues, blood is unique due to its existence as the only fluid tissue. A blood cell can be any type of cell normally found in blood which falls into four categories.

I. SEPARATING RBC, WBC AND PLATELETS

Thus far, an image is formed with solid objects; before separating the Clumped cells and counting, RBCs, WBCs and Platelets should be separated into three sub images. This task could be done by a step- by-step iterative method: Find the area(A) of the objects in the blood stream image (Image after morphological (operations). Obtain minimum and maximum area of the objects. Set the value of maximum area as the area of WBC's. Estimate the size of the RBC and Platelets using the size of WBC. Let the A1, A2 and A3 represents the average area of the WBC's, RBC's and Platelets.

2. DISTANCE TRANSFORMS

Watershed segmentation produces good results for gray level images with different minima and catchment basins. For binary images, however, there are only two gray levels 0 and 1 standing for black and white. If two cells are connected together in a binary image like Fig. 1.1, only one minimum and catchment basin will be formed in the topographic surface. To use watershed to segment the connected cells, we need to use distance transforms (DTs) to preprocess the image to make it suitable for watershed segmentation.

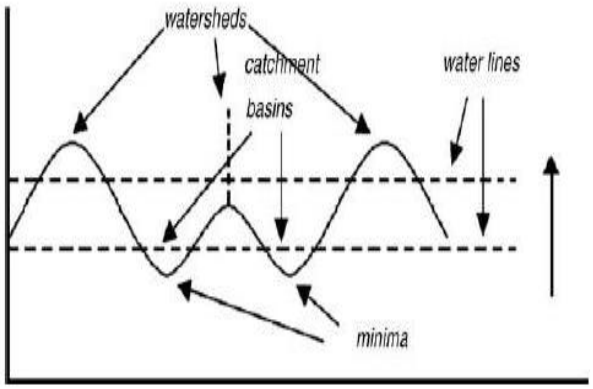

Fig. 1. Watersheds and Catchment basins. Basins are defined as connected regions with local minimum to which any incident rainfall will flow.

The watershed can be visualized as those ridges from which water would be equally likely to fall towards either of two or more catchment basins. In this article, we define the DT of a binary image as the distance from every pixel of the object component (black pixels) to the nearest white pixel.

3. LITERATURE SURVEY

J.Hari [2014] has proposed the field of biomedicine, blood cells are complex in nature; the microscopic images of a blood stream contains RBCs, WBCs and Platelets. Pathological inspection of an infected cell based on the disease, is solely dependent on subjective assessment which usually leads to significant inter-observer variation in grading and subsequently resulting in late diagnosis. However automatic assessment of required cell count still remains a challenging task as many of the cells are clumped in an image and proper segmentation is the primary aspect. This paper aims at segmentation of blood cells for counting. Auto threshold, Chessboard distance measure and watersheding are used for segmentation of blood cells.[1]

Hemant Tulsani [2013 In this paper, we present an approach for counting blood cells during blood smear test. The approach presented in this paper eliminates the major problem of overlapping cells while counting by segmentation using morphological watershed transformation and regional maxima computation providing high degree of accuracy. Simulation results of counting red blood cells (RBCs), white blood cells (WBCs) and platelets in blood smear test images are also presented.[2]

S. S. Adagale1[2013] have proposed Biomedical image processing has experienced intense growth with interdisciplinary research field attracting expertise from computer science. Medical image processing assists doctors to diagnose diseases and minimizes the workload. Especially image segmentation is a technique that is useful to explore the details of image. Counting and segmenting red blood cells images are challenging task in the cellular embryology and pathology. Different neural network algorithms are used for image segmentation and counting such as Pulse Coupled Neural Network (PCNN), Multilayer Perceptron (MLP) neural networks etc. Applying these algorithms for segmenting and counting on overlapped blood cells images gives less accurate results and diagnosis is not very efficient..[3]

Venkatalakshmi.B[2013] has proposed The major issue in clinical laboratory is to produce a precise result for every test especially in the area of Red Blood Cell (RBC) count. The number of red blood cell is very important to detect as well as to follow the treatment of many diseases like anaemia, leukaemia etc. Red blood cell count gives the vital information that help diagnosis many of the patient's sickness. The old conventional method of RBC counting under microscope gives an unreliable and inaccurate result depends on clinical laboratory technician skill. This method puts a lot of strain on the technician. Another method for RBC counting uses the automatic hematology analyzer, this machine is very costlier. So it is not possible all the hospital's clinical laboratory implement such an expensive machine to count the blood cell in their laboratory. This paper introduces an efficient and cost effective computer vision system for automatic red blood cell counting using image based analysis.[4]

Heidi Berge1[2011] has studied Quantification of the extent of malaria parasite infection (parasitaemia) continues to rely on time-consuming manual microscopy of Giemsa-stained blood smears. We present an algorithm that counts red blood cells in thin blood smear images, the first step in the determination of malaria parasitaemia. Morphological methods and iterative thresholding are used for red blood cell segmentation, and boundary curvature calculations and Delaunay triangulation for red blood cell clump splitting. Our results compare well with those of published semi-automated methods, with an absolute error of 2.8% between manual and automatic counting of red blood cells.[5]

4. PROBLEM DEFINITION

In this research work different problems are studied from the review of different researchers. Their are different problems that are given below:

- The major problem of overlapping cells while counting by segmentation using morphological watershed transformation and regional maxima computation providing high degree of accuracy.
- The watershed segmentation suffers with the problem of over segmentation.
- There is less accuracy, poor reliability, and strong subjectivity. The diagnosis is defined as the process of finding out what kind of disease a certain patient has and those diagnosed must always be accurate. Sometimes a wrong diagnosis may lead to situation that wrong dosage of drugs given to the patient, some cases it may lead to loss of patient life.

5. METHODOLOGY

This research work is to implement the theft security system based on face reorganization. It is based upon GUI (graphical user interface) in MATLAB. It is an effort to further grasp the fundamentals of MATLAB and validate it as a powerful application tool. There are basically different files. Each of them consists of m-file and figure file. These are the programmable files containing the information about the images. An automatic RBC and WBC counting using computer vision which helps to perform the counts accurately using image based analysis from which the blood smear image taken by the digital camera attached with the microscopic setup. There are several steps involved in the process of estimating the Red blood cells and White Blood cell. These are input

image acquisition, preprocessing, segmentation, feature extraction, RBC and WBC counting. In the pre-processing step the original blood smear image taken under microscope is converted into saturation image. Segmentation is done by histogram thresholding and morphological operations. Next step is feature extraction which is through morphological operations to differentiate between different cells i.e., red blood cell, white blood cells, platelets and background. The final step is to find out the number of Red Blood Cell and White Blood Cell from the blood smear image by using Hough Transform.

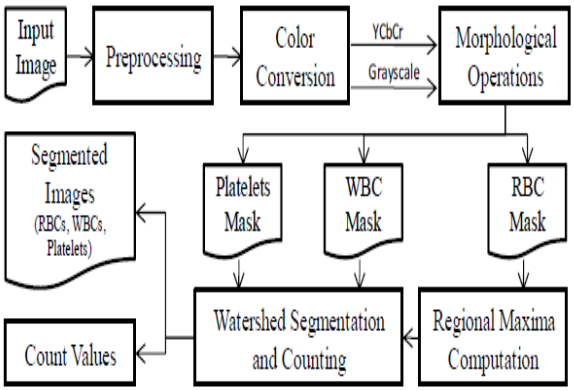

Fig.2.. Block diagram of count the blood cell

6. CONCLUSION

Many digital images are being captured and stored such as medical images, architectural, advertising, design and fashion images, etc. As a result large image databases are being created and being used in many applications. In this work, the focus of our study is on medical images. A large number of medical images in digital format are generated by hospitals and medical institutions every day. There are different problems related to this work that is studied from the literature survey. In the future this work is implemented with different methods.

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