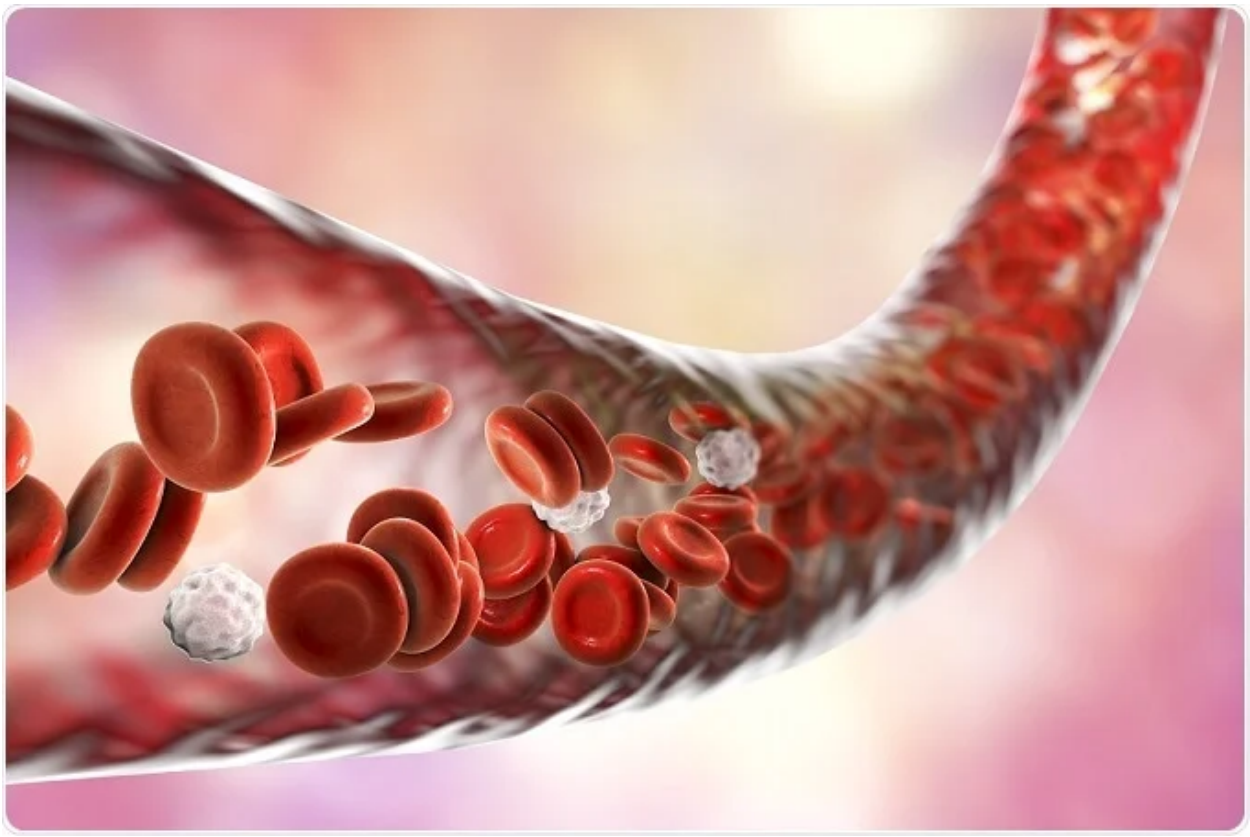

28. Automatic Red Blood Cell Counting using Watershed Segmentation

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Github Repo link

Overview

A large number of medical images in digital format are generated by hospitals and medical institutions every day. These images are then used for diagnosis purposes. One of the significant challenges in the clinical laboratory is to produce a precise result for every test, especially in Red Blood Cell count. Red blood cell is one of the crucial elements that help us diagnose many patients' illnesses. Manual counting with the help of a microscope gives an unreliable and inaccurate result depending on the clinical laboratory technician's skill. One better way is an automatic hematology analyzer, which can be costlier. The analysis of these blood cells can give us an indication on how the body is reacting to infections, for example when infection occurs, the production of the WBCs increases, which ultimately leads to the abnormal high or low counts of these cells. One more case we can take, the presence of bacterial infection is diagnosed from increasing WBC count. Plus, specific low vitamin may come from a decreased RBC And thrombocytopenia is referring to low platelet count. These indications can help us in finding various problems in the body.

Goals

In the field of biomedicine, because of the cell's complex nature, it still remains a challenging task to segment cells from its background and count them automatically.

So, we will make use of the properties of the blood cells, which includes texture, color, size and morphology of nucleus and cytoplasm. Based on these parameters we can categorize the blood cells into 4 categories, which includes, RBCs, WBCs, platelets and plasma.

1. Segment all the blood cells with the help of the most appropriate method described in the paper.
2. Count no. of these blood cells present in the sample .
3. Create GUI which can help us visualize these blood cell counts. (One of the tool is MATLAB app)

Specifications

Image Segmentation

To the original pic (Blood.jpg), we will apply image segmentation to describe the region shape, such as boundaries, skeletons and texture.Thresholding is one of the methods to

extract and segment the object from the background.After applying thresholding the image converts into a binary image.

Edge detection performs poorly on cell segmentation for blood, hence we apply iterative Otsu's approach based on circular histogram for the leukocyte segmentation. It can also be used for color image segmentation.Color images are a very rich source of information, because they provide a better description of a scene as compared to grayscale images.

In order to reduce noise and enhance the image, we have two image processing methods. They are (a)Hue Saturation Image and (b) Green Component Image.

Counting Method

We will use the result from several morphological operations on RBC segmentation result and gradient magnitude as a mask with the watershed algorithm to form a marker-controlled watershed algorithm to determine the number of RBC along with the Hough transform technique. We will use MATLAB/python as our primary language and we will implement all the essential aspects using them. There are several techniques mentioned in the paper, with each having distinct advantages and disadvantages. We will go through them, and with the proper algorithm, we will detect and segment red blood cells and estimate the number of red blood cells.

Milestones

I. Having read the paper we will start with the important components of the code and note down the points for our final presentation.

II. We would compile the code starting from image segmentation to the counting of the red blood cells.

III. Having done the coding component for the aspect of the paper along with the final presentation coming along with notable points we then intend to make the GUI most suitable to demonstrate to any user what the workings are.

IV. The above milestones are enough to demonstrate our involvement with the project but there is more than one way to do image segmentation and counting of the red blood cells and if time permits we then would like to

implement other said methods in order to show the comparison between them.

Timeframe

	Description of Work	Start and End Dates
Frame 1	• Work on the important components and concepts of the paper. Which will involve understanding the image processing techniques involved in the paper. • We will also Implement codes for those processing techniques and try to get best results possible.	10th November - 19th November
Frame 2	• The compilation of the whole code and the work of the GUI would go hand in hand.	20th November - 24th November

Frame 3	• If time permits then we would try different methods of image segmentation and counting and show the comparison. In the given paper also several processing techniques are mentioned which will help us in exploring more of these techniques. • Work on the demonstration of the project and final presentation.	25th November - 29th November