DETECTING DENGUE FEVER WITH PLATELETS COUNT

Using Image Processing Techniques

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Abstract : Dengue fever is a kind of severe fever caused by the interaction of humans with a virus which is known to be carried by mosquitoes, specifically of the type *Aedes Egypti*. The aim of this paper is to describe the techniques used for the detection of Dengue fever by taking a count of platelets present in the input images.

IndexTerms **- platelets, viral, dengue, CLAHE, Otsu**

I. INTRODUCTION

Dengue fever is a disease caused by mosquitoes. It is a tropical disease and is spread by several species of the Aedes type, in particular *A.Egypti*. The dengue virus contains five types of infection where one of them gives a lifelong immunity to the disease whereas others provide short term immunity. Getting prone to multiple infections results in the increased risk of the intensity of the fever. Various tests are available for the detection of dengue fever which includes injecting antibodies to the virus or its RNA. The dengue fever, after the World War II has become common in more than 110 countries and about 50 to 528 million people are infected each year, out of which 10,000 to 20,000 suffer the devastating consequence of death. Research has been done to directly target the virus inside the blood. In this paper, we are describing the techniques we have used to count the platelets for detecting the dengue fever.

II. SYSTEM ARCHITECTURE

The system architecture for the platelets count consists of five modules namely:

Fig: Modules in Image Processing

a) Image Acquisition

This module describes the process of obtaining images for the image processing procedure. This is the first and the foremost module in the entire procedure. The images to be obtained have a great impact on the entire procedure. The images to be chosen should have a direct relevance to the requirements. The how, where, what, how much questions of the images are answered in this module. The images obtained should be well matched and proper to work with further modules.

b) Image Enhancement

The second module of the image processing procedure deals with the clarity and refinement of the obtained images from the previous module. The obtained images or the dataset of images sometimes may not entirely fulfill the requirements of the procedure. In such cases, the image clarity and visual properties have to be improved, so as to get the desired outputs. This module describes various techniques adopted to improve the images.

c) Image Segmentation

The most important module of the system architecture. Image segmentation, as the name defines, is the process of segregating or dividing the images based on the certain position and entity requirements. The images are divided, so as to reduce the processing of unwanted portion of the image and to save time. If the segmentation is not covered properly, it may lead to the failure of the entire system.

d) Image Labelling

Image labeling is one of the image analysis techniques which can name the connected region in a binary image. Labeling checks the imported image and groups its pixels into components based on pixel availability, for instance platelets are labeled, i.e. all pixels in a connected component have comparable pixel intensity values and are somehow associated with one another.

e) Counting of Platelets

The last module of the architecture involves counting of the platelets through the designed techniques, after the successful completion of the previous modules.

III. TECHNIQUES

The various techniques adopted under each of the modules in system architecture for platelets counting process is as described below:

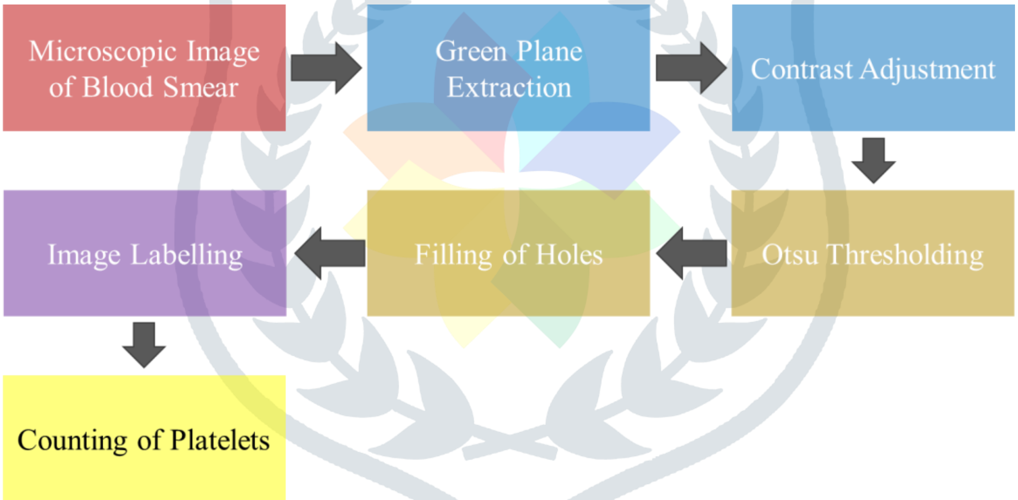

Fig: Techniques used in Image Processing

a. Microscopic Image of Blood Smear

A drop of blood is taken in a slide and prepares a monolayer of blood using another slice where the cells are divided sufficiently. A drop of immersion oil onto slide is to be seen ensuring it is totally air dried subsequent to recoloring. Wright-Giemsa Stain and buffer blended to get ready with blood smears. The advanced camera is associated with a magnifying lens which catches tiny computerized picture of blood smear. Caught picture is annexed to PC for examination.

b. Green Plane Extraction

Before segmentation the RGB color image is split into three planes such as red, green and blue. The green plane so extracted is clear with feature that we need to split platelets. So, the green plane of the imported image is taken for further process. The other two plane such as red and blue are not suitable for analysis with clear feature.

c. Contrast Adjustment

The image may lack contrast when there are no sharp differences between black and white. To change the contrast or brightness of an image we make use of Contrast-limited adaptive histogram equalization (CLAHE). CLAHE works on little areas in the image, called tiles, as opposed to the whole image. Every tile's contrast is upgraded.

d. Otsu Thresholding

The contrast adjusted image is converted to binary image based on threshold. The gray *thresh()* function uses Otsu's strategy to produced image with black and white pixels. The binary image obtained is inverted i.e. background representing black and cells in it representing white.

e. Filling of Holes

One of the morphological operations called flood fill operation is performed on binary image. This operation repair gaps in the binary image. Flood fill in binary image changes connected background pixels (0s) to foreground pixels (1s), ceasing when it achieves object limits. Little openings and substantial gaps are isolated utilizing fill holes operator. Here the platelets are considered as little gap and it effectively extracted from other blood cells.

f. Labelling

Labelling checks the imported image and groups its pixels into components based on pixel availability, for instance platelets are labeled, i.e. all pixels in a connected component have comparable pixel intensity values and are somehow associated with one another.

g. Counting of Platelets

Counting cells manually is a tiresome process for humans if given a large data set of microscopy images. This task can be achieved much faster by means of labeling techniques.

IV. Results

The system designed with the above described techniques counts platelets from the given input images. The first step is the enhancement and segmentation process. Next, the system counts platelets and gives the count as output. The obtained count output is compared with threshold count to determine the dengue fever result as positive or negative. The overall accuracy of the system is found to be lying in the range of 80% to 85% with separate datasets for positive and negative results.

V. Applications

1. In pathology labs for yielding quick result.
2. In hospitals and health centers for primary detection of the disease.
3. To carry out the recovery procedure faster than, waiting for the result through conventional method.
4. In research field by doctors and pharmacists to study the disease.

VI. Conclusion

In this paper, the overview of dengue is discussed with the estimation procedure. The survey of the various image processing techniques is reviewed and that have been used to diagnose dengue. It is helpful in estimate the count of platelet using image processing technique successfully. Compared with the manual counting of platelets the proposed system is taken less time. Compared with automatic analyzer this system is cost efficient. Despite with these advantages there is a problem in counting overlapping cell. Future research will motivate with various morphological operation to overcome weakness. Further with the help of platelets count, stages of dengue virus infection is also identified using image processing technique.

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