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Development of Low Cost System for Estimating RBC, WBC Count Using Image Processing

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ABSTRACT

Blood-related diseases are one of the most widespread and rampant vector-borne diseases in tropical countries like India. With an ever-increasing population and enormous stress on resources like land and water, new avenues open for insects like mosquitoes to breed and propagate the virus. The traditional lab method for the detection of diseases in a human's anatomy involves extracting the blood and subjecting it to various tests to count and detect the number of blood cells. An abnormally low platelet count would indicate the presence of the virus in the body. The usual method undertaken by labs all over the world is the use of the conventional chemical procedures, which may take a few hours to produce the result. The proposed system for the low cost estimating of RBC and WBC is developed using image processing techniques and canny edge detection algorithm. The obtained results are analysed and compared with the conventional methods, and results are obtained with an accuracy of 91.2.

KEYWORDS

Raspberry Pi, RBC, WBC

1. INTRODUCTION

Blood related diseases are one of the most widespread and uncontrolled vector-borne diseases. With an ever increasing population and enormous stress on resources like land and water, new avenue open for insects like mosquitoes to breed and propagate the virus. While mosquito control is one of the most effective methods of prevention of Blood related diseases, an equal amount of attention should be paid to the diagnosis of these diseases to prevent further spread. The traditional lab method for the detection of dengue in a human's anatomy involves extracting the blood and subjecting it to various tests to count and detect the number of platelets. An abnormally low platelet count would indicate the presence of the virus in the body. The usual method undertaken by labs all over the world is the use of the conventional chemical procedures which may take a few hours to produce the

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results. However with the advent of smarter technologies, it is possible to reduce the time taken to a mere few seconds. Image processing is another highly useful tool to combat these shortcomings. Through image processing, only a portion of the blood smear can be analysed and examined under a microscope and the obtained platelet count can be projected to cover the whole smear. The Proposed System is on an implementation of image processing based automated counting of RBCs and WBCs from blood image.

The complete blood count (CBC) is the blood test used to evaluate the health of person and to detect the disorders like anemia, infection and leukemia. The presence of blood disease is first discovered by a blood test such as CBC. In medical diagnosis CBC is important to detect the immunity and capability of the person. There are four types of blood cells such as Red Blood Cells (RBC's), White Blood Cells (WBC's), Platelets and Plasma. These types of cells can be differentiated by using texture, colour, size and morphology of nucleus and cytoplasm. White Blood Cells (WBCs) are also known as leukocytes which is an important part of immune system. It also protects the body by removing bacteria and viruses. Leukocytosis which indicates the existence of infection, leukaemia or tissue damage.

The Red Blood Cells (RBC's) are also called erythrocytes and their function is to carry oxygen and collects carbon dioxide from lungs to the cells of body. The Red Blood Cells contains protein called haemoglobin and the presence of inner and the outer layers of protein give red colour to blood. Haemoglobin does the work of carrying oxygen and an abnormal count of RBC's leads to anaemia which results in mental tiredness, illness, weakness, dizziness. This provides an efficient way to overcome any drawbacks which conventional laboratory methods possess. The traditional machine learning techniques are generally used more in simple tasks. But these techniques are generally more difficult to fine tune and stray cases of data may sometimes lead to erroneous results. Thus with the help of image processing, the images can be classified according to the required purpose. This proposed system mainly deals with the use of image processing for the purpose of image classification. The image was collected using an A-delta vision microscope of 1000x zoom. For the purpose of image processing, the image was subjected to pre-processing techniques like Otsu thresholding, contour extraction and the platelets were finally counted using connected-component image labelling technique.

2. RELATED WORK

An automatic RBC and WBC counting method were introduced and in this method the number of RBC was calucluated. The first step is input acquisition of input image then follows pre-processing method which includes contrast enhancing, feature extraction is done to differentiate between RBC and WBC and conversion of original blood smear image to saturation image . Introduced a method for automatic RBC counting using Hough transform (Venkatalakshmi B, 2013). The detection and counting of Red Blood Cells have been done on five microscopic images and discussion has been made by comparing the Results (M Maitra 2013). The image processing technique for counting of RBC and WBC. The objective is to produce a survey on an image processing based system that automatically identifies and counts number of Red Blood Cells and White Blood Cells in the sample image by using image processing which includes 6 steps (Akshay ap. sahastrabuddhe 2016).

An automatic RBC and WBC counting method. There are several steps involved to estimate the number of RBC. The first step is input acquisition of input image then follows pre-processing method which includes contrast enhancing, feature extraction is done to differentiate between RBC and WBC and conversion of original blood smear image to saturation image (Vinutha H Reddy,2014). The morphological image analysis along with principles and applications in which he used fluid fill operation to fill the background area connected to the edges to identify the holes (Soille.P 2003).