DETECTION OF CANCER IN HUMAN BLOOD SAMPLE BASED ON MICROSCOPIC IMAGES.

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ABSTRACT

At the moment, identification of blood disorders is through visual inspection of microscopic images of blood cells. From the identification of blood disorders, it can lead to classification of certain diseases related to blood. This paper describes a preliminary study of developing a detection of leukemia types using microscopic blood sample images. Analyzing through images is very important as from images, diseases can be detected and diagnosed at earlier stage. From there, further actions like controlling, monitoring and prevention of diseases can be done. Images are used as they are cheap and do not require expensive testing and lab equipments. The system will focus on white blood cells disease, leukemia. The system will use features in microscopic images and examine changes on texture, geometry, color and statistical analysis. Changes in these features will be used as a classifier input. A literature review has been done and Reinforcement Learning is proposed to classify types of leukemia. A little discussion about issues involved by researchers also has been prepared.

1.INTRODUCTION

Medical imaging has become one of the most important visualization and interpretation methods in biology and medicine over the past decade. This time has witnessed a tremendous development of new, powerful instruments for detecting, storing, transmitting, analyzing, and displaying medical images. This has led to a huge growth in the application of digital image processing techniques for solving medical problems. The most challenging aspect of medical imaging lies in the development of integrated systems for the use of the clinical sector. Design, implementation, and validation of complex medical systems require a tight interdisciplinary collaboration between physicians and engineers. Main objective of analyzing through images is to gather information, detection of diseases, diagnosis diseases, control and therapy, monitoring and evaluation.At the moment, identification of blood disorders is through visual inspection of microscopic images of blood cells. From the identification of blood disorders, it can lead to classification of certain diseases related to blood. One of the most feared by the human disease is cancer. Leukemia is a type of blood cancer, and if it is detected late, it will result in death. Leukemia occurs when a lot of abnormal white blood cells produced by bone marrow. When abnormal white blood cells are a lot, the balance of the blood system will be disrupted. The existence of abnormal blood can be detected when the blood sample is taken and examined by hematologists. Microscopic images will be inspected visually by hematologists and the process is time consuming and tiring. The process require human expert and prone to errors due to emotion disturbance and human physical capability that is of course have its own limit. Moreover, it is difficult to get consistent results from visual inspection. Visual inspection also can only give qualitative results for further research. Studies show that most of the recent techniques use all information about blood for e.g. number of red blood cells, hemoglobin level, hematocrit level, mean volume corpuscle and many more as the parameter for classifying diseases such as thalassaemia, cancer and etc.

2.BACK GROUND

Blood is the main source of information that gives an indication of changes in health and development of specific diseases. Changes in the number or appearance of elements that formed will guide health condition of an individual.

2.1. LEUKEMIA

Most blood cells produced from the cells in the bone marrow called stem cells. Bone marrow is a soft material found in the middle of each bone. Stem cells will mature and become some kind of blood cells. Each blood type has their own function. Blood components consist of:

a. Red blood cells (erythrocytes) - carry oxygen to tissues and back to the lungs with carbon dioxide.

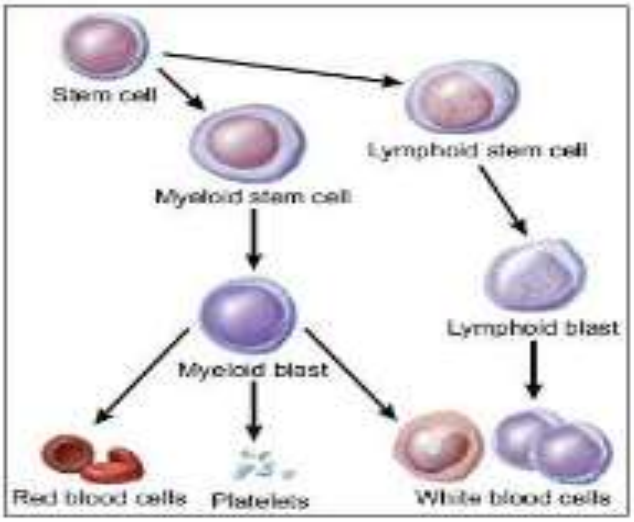
b. White blood cells (leukocytes) - Defending the organism from infection. There are several types of white blood cells.

c. Platelets – helps blood clotting to control bleeding.

d. Plasma - The fluid in blood containing dissolved ions needed for cell function and consists of sodium, potassium, chloride, hydrogen, magnesium and iron.

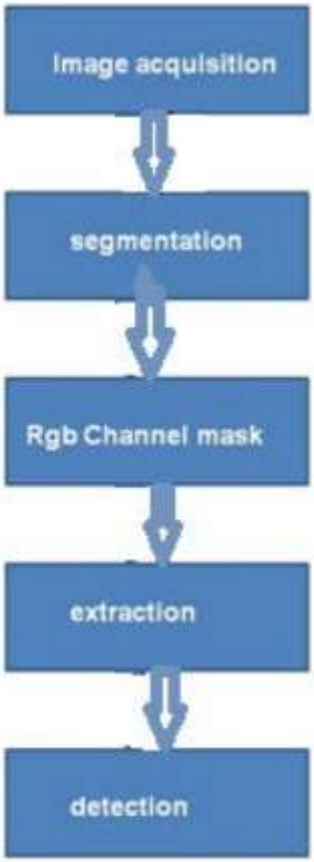
2.2. BLOOD CELL RESEARCH

Some research has been done in automating the process of blood cell identification and next can diagnose the patient correctly. Some of them are who develop a system to identify and classify malaria parasite through microscopic images of blood cells. They use morphology approach and the major requirements in developing this system is the best techniques for segmentation of blood cell images. classify thalassaemia patients by using neural network and genetic programming. They did not use microscopic images but they use matured blood cell, platelet and reticulocyte information for eg cell percentage, hemoglobin level, hematocrit level, mean volume corpuscle, hemoglobin width distribution and etc to identify thalassaemia patients, thalassaemia traits and normal. The result acquired is using multi layer perceptron (MLP) with 2 hidden layers. Training data results have maximum accuracy 99.27%, mean accuracy 98.16% and standard deviation of 0.64%. While testing data results have maximum accuracy 88.72%, mean accuracy 84.44% and standard deviation 2.41%.



3.RESEARCH METHODOLOGY

From the literature, it is found that typical steps for the process of automating blood recognition are mentioned beow.



1. Image Acquisition

Blood image from slides will be obtained from nearby hospital with effective magnification.

2. Preprocessing

During image acquisition and excessive staining, the images will be disturbed by noise. The noise may be due to illumination or shadows that make region of interest (ROI) appear as blurred image region. Background will be excluded since our ROI will be white blood cells. During this preprocess, image enhancement will be done as the contrast enhancement technique is capable to improve the medical image quality.

3. Segmentation

Segmentation of white blood cell (WBC) and determine ROI that is nucleus for WBC only. This is because in leukemia cell images, the cytoplasm is scanty . So, focus will be on nucleus of WBC only. Determination the types of WBC should be done from the nucleus. Only lymphocytes and myelocytes should be considered and need to determine them whether they are blast cells or not. Others like neutrophils, basophils and eosinophils should be excluded. Once the blast cells are determined, then proceed to the next step. Sub images containing nucleus only will be considered. This is to reduce errors since there are similar color scales in WBCs with other blood particles.

4.Feature Extraction

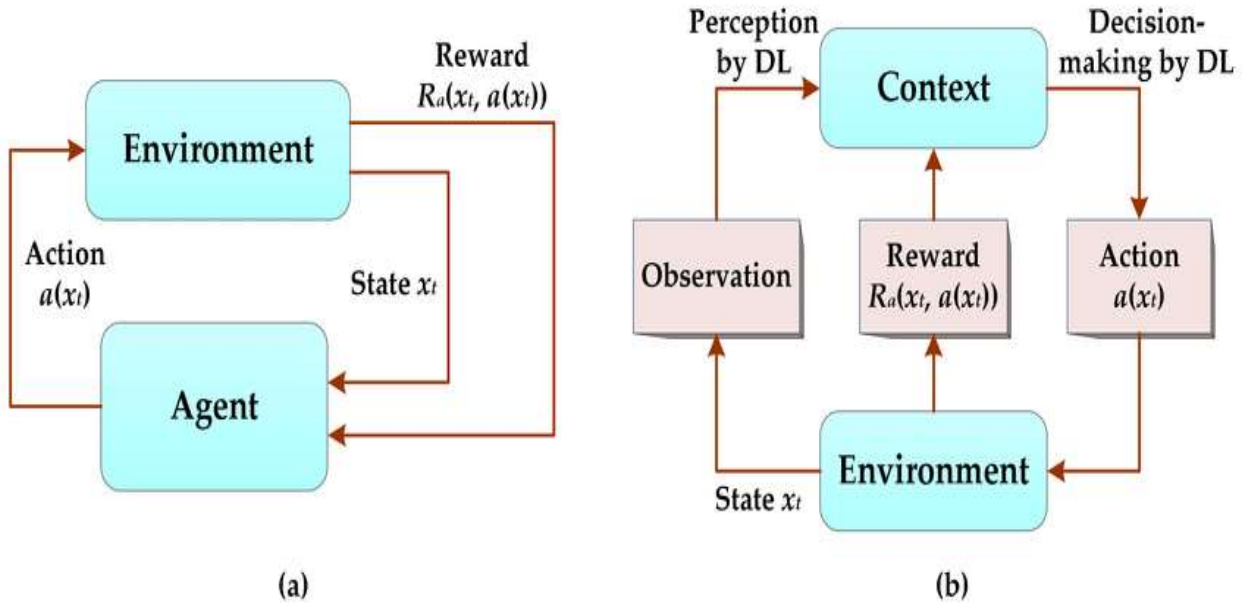
The most important problem in generation of features of blood cells that characterize them in a way enabling the recognition of different blast types with the highest accuracy. The features to be used are for nucleus of lymphocytes and myelocytes:

• Geometrical Features – which includes area, radius, perimeter, symmetry, concavity, compactness, solidity, eccentricity, elongation, form factor will be obtained.
• Texture Features – which includes homogeneity, energy, correlation, entropy, contrast, angular second momentum will be obtained.
• Color Features – the RGB color spaces will be transformed into HSV or L*a*b color spaces. Their mean color values will be obtained.
• Statistical Features – the mean value, variance, skewness, kurtosis of the histograms of the image matrix and the gradient matrix for RGB or HSV or L*a*b color space (whichever appropriate) will be obtained.

5.Classification

Classification is the task of assigning to the unknown test vector to a known class. In this step, a reinforcement learning algorithm is proposed. The RL approach will classify the types of leukemia into ALL, AML, CLL and CML. The Basic Model Of RL The idea behind RL is an intelligent agent learns on how to act with its environment in order to maximize rewards that it gets with respect to predefined measures. The agent will require a trialand-error learning in its action to achieve the optimal goal. An agent will first learn the state of the environment and interact with the environment. Environment receives the action from the agent and change into a new state.

The agent receives the new state of environment and obtains a reward or punishment from the environment. The agent will receive the reward/punishment from the environment based on the action done towards environment. The agent will get knowledge and learns how to react towards the highest reward. It also should choose actions that tend to increase the overall sum of values of the rewards. The agent will use a strategy that we called as action policy in order to choose an action towards environment. If a certain system's action causes the positive reward of the environment, the system generating this action will strengthen this trend, as this is a positive feedback process. Otherwise, the system generating this action will diminish the trend. RL include model- based algorithm that is Sarsa method and model-irrelevant algorithm that are Temporal Difference and Q-learning.



4.DISCUSSION

Things that need to be discussed are to resolve some issues about the blood cells. One of the issue s is the problem on the blood cell itself. Claim that their system fail in classification processes for some of the blood cells. Some of the cells can be deformed to arbitrary shape due to environment pressure. Takes note on their algorithms that does not separate overlapping cells

5.CONCLUSION

This research involves detecting the types of leukemia using microscopic blood sample images. The system will be built by using features in microscopic images by examining changes on texture, geometry, colors and statistical analysis as a classifier input. The system should be efficient, reliable, less processing time, smaller error, high accuracy, cheaper cost and must be robust towards varieties that exist in individual, sample collection protocols, time and etc. Information extracted from microscopic images of blood samples can benefit to people by predicting, solving and treating blood diseases immediately for a particular patient.

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