UNIVERSITI TEKNOLOGI MARA CAWANGAN PULAU PINANG

PARTICLE SWARM OPTIMIZATION BASED BLOOD IMAGE SEGMENTATION FOR AUTOMATED LEUKEMIA DETECTION

MUHAMAD FITRI ZAKWAN BIN MOHD YAMAN

Faculty of Electrical Engineering

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ABSTRACT

Leukemia is a disease that affects blood forming cells in the body. The cell growth in acute leukemia disease occur rapidly and uncontrollable. Therefore, early detection of the disease is necessary for proper treatment management. Recently, computer-aided detection and diagnosis (CAD) approaches have been developed to assist medical staff interpreting medical images. Image segmentation is one of the important role in CAD for diagnosing and verifying the disease like such as leukemia. The conventional method of image segmentation was quite lack in performance. This is due to the inconsistency of background intensity of the image used where the data provided cannot accurately collect for the process to be done. To overcome such a problem, this paper presents the method for lymphocyte image segmentation by using a Particle swarm optimization (PSO). A microscopic blood images were used to identify the white blood cell (WBC) that has a leukemia or not. The blood sample slide image was segmented to remove the Red Blood Cell (RBC) and the unwanted background and will leave only the White Blood Cell (WBC) image. For the segmentation technique, the proposed method is based on the S-component (Saturation) of HSI (Hue, Saturation, Intensity) colour model. The S-component is obtained and fed into the PSO to perform the segmentation process. The study also proposed a new method that utilized centroids obtained from K-means as initial centroid for PSO, called hybrid K-means-PSO. The results of the proposed methods are benchmarked against the most commonly used method, K-means clustering to evaluate its effectiveness in segmenting WBC images. Simulation results indicated that both PSO and hybrid K-means-PSO methods have a better accuracy compared to K-means with the highest accuracy obtained is up to 98.86%.

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INTRODUCTION

1.0   INTRODUCTION

Leukemia is known as a malignant progressive disease and also known as a cancer of the blood. The cause of leukemia is due to other-blood forming organs and the bone marrow produce more than usual the number of leukocytes or WBC which disable its function of fighting infection. There are two major types of leukemia which is Acute and Chronic. For both major type, it consists of two subtypes which is Lymphocytic and Mylogenous. The two subtypes of acute leukemia is known as Acute Lymphocytic Leukemia (ALL) and Acute Myelogenous Leukemia (AML). Meanwhile, for chronic leukemia the subtypes are known as Chronic Lymphocytic Leukemia (CLL) and Chronic Myelogenous Leukemia (CML).

In acute leukemia, the abnormal blood cells are blasts that remain very immature and cannot carry out their normal functions. With acute leukemia, the number of blasts increases rapidly, and the disease gets worse quickly. In chronic leukemia cases, some blast cells are present, but in general, these cells are more mature and can carry out some of their normal functions. Also, the number of blasts increases less rapidly than in acute leukemia. As a result, chronic leukemia gets worse gradually. Among the children ALL is the most common type of leukemia. As for adults, those whose age 65 and above are most likely to be affect by this disease. On the other hand, the occurrence of AML are more to adult than children especially men [1]. CLL most often affects adults over the age of 55. Chronic lymphocytic leukemia sometimes occurs in younger adults, but it almost never affects children. CML occurs mainly in adults. A very small number of children also develop chronic myeloid leukemia.