



ARTIFICIAL INTELLIGENCE-BASED MEDICAL DECISION SUPPORT SYSTEM FOR HAEMATOLOGIC DISEASES

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Abstract

Malaria and Thalassaemia are the life threatening diseases and an enormous global health problem. The visual analysis of blood cells is the powerful diagnostic tool for the detection of them. But it is a labour intensive repetitive task with time consuming. An accurate diagnosis in its early stage is critical to its cure. Intelligent computerized systems can provide a useful assistance to physicians to take rapid and accurate judgments for the above situation in real time. The aim of this study is to develop an automated blood image analysis system for the rapid and accurate determination of malaria, possible thalassaemia, and other abnormal red cell disorders.

In this study, Artificial Neural Network (ANN) has been employed together with image analysis techniques to automate the assessment of these blood disorders. Two back propagation ANN models (3 layers and 4 layers) have been used to evaluate the accuracy of the classification in the recognition of medical image patterns associated with morphological features of erythrocytes, in the blood. Prior to training, the first necessary step is to preprocess the giemsa stained blood sample images acquired from the light microscope. Both ANN architectures comprise 25,600 ($160 * 160$) input neurons in input layer and four output neurons in output layer. The ANN has been trained using 600 blood sample images and the trained ANN has been tested against 260 blood sample images. The efficacy of the 2 ANN architectures has been compared by comparing their error and correct recognition rate. The three layers ANN architecture has the best performance, with an error of 0.00027619 and 86.54% correct recognition rate. The trained three layer ANN acts as a final detection classifier to determine the hematologic diseases.

A medical consultation system has been jointly used with this system to provide consultation power. A questioning and answering dialog on the basis of patient history, physical examination and routine diagnostic test has been conducted in the medical consultation system with image analyzing result made by the trained ANN.



*Keywords: Malaria, Hematology, Thalassaemia, Artificial Neural Network,
Backpropagation*