

Detection of Malaria in Erythrocyte Using Artificial Neural Network

R. Abisha ¹, Dr. R. Kavitha Jaba Malar ²M.Phil Scholar, Department of Computer Science, Nanjil Catholic College, Kaliyakkavilai, India¹Associate Professor, Department of Computer Science, Nanjil Catholic College, Kaliyakkavilai, India²

ABSTRACT: Malaria is a serious disease caused by a blood parasite named Plasmodium spp. The World Health Organization estimates 300-500 million malaria cases and more than 1 million deaths per year. Malaria is one of the most common diseases caused by mosquitoes and is a great public health problem worldwide. The aim of the work is to detect malaria in erythrocyte using Artificial Neural Network. Currently, for malaria diagnosis the standard technique is microscopic examination of a stained blood film. We propose a method of Artificial Neural Networks for the diagnosis of the malarial disease in the red blood cell. For this purpose features parameters are computed from the data obtained by the digital holographic images of the blood cells and is given as input to ANN which classifies the cell as the infected one or otherwise.

KEYWORDS: ANN, Blood ,Erythrocyte, Malaria.

I. INTRODUCTION

Malaria is an ancient disease present majorly in the tropical countries having a huge social, economic, and health burden. In recent times, as a result of climatic changes due to global warming, it is predicted to have unexpected effects on Malaria. Both increase and fluctuation in temperature affects the vector and parasite life cycle. An efficient diagnostics is essential for the proper medication and cure. Erythrocytes is the essential cells in our body that travel in the blood they are involve in a gas replace that is important to human life. Red blood cells are their most general name, but they are also called erythrocytes. In medical terminology erythro means red, cyte means cell. Erythrocytes consist of a protein called haemoglobin, which contains red iron. So our blood is red in colour. Erythrocytes are round shape. When these cells are normal, they can look like doughnuts with the gap in the centre. Then erythrocytes are like rubber and smooth and simply bend. Red blood cells have an abnormal structure compared to other cells in the human body. It has lacks a nucleus, mitochondria or endoplasmic reticulum. The most important part of a red blood cell is haemoglobin. Major clinical diagnostics to identify erythrocytes affected by malaria is based on microscopic inspection of blood smears, treated with reagents, which stains the malaria parasite. A technician visually inspects these smears to identify malaria infected erythrocyte. In developing countries, visual identification of malarial erythrocyte may become inefficient due to lack of sufficiently trained technicians and poor-quality microscopes and regents. During such hematologic disorder the changes occur in the structure and elastic properties of individual erythrocytes. So studying their physical properties can thus contribute greatly to the understanding and possible discovery of new treatments for such diseases. Thus, new advanced mathematical computing techniques are valuable for determining and distinguishing between the healthy and diseased erythrocytes. An artificial neural network is called as neural network. It is a mathematical model or computational model based on biological neural networks. It is an emulation of biological neural system. It consists of an interrelated group of artificial neurons and processes information using a connectionist approach to computation.

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 4, April 2017

II. RELATED WORK

A technique was proposed (Silvia Halim et al., 2006) for estimating parasitemia from blood smear images by extracting healthy and parasite infected red blood cells. Illumination correction is performed by taking a background image using a blank slide or portion of a slide. Based on pattern matching with parameter optimization and cross-validation against the expected biological characteristics, red blood cells are determined. Using unsupervised and colour co-occurrence based technique red blood cells are classified. Red blood cells detection resulted in precision and recall rates of 80.88% and 92.98%, respectively. (Gloria Diaz et al., 2009) proposed visual quantification of parasitemia in stained thin blood films infected with Plasmodium Falciparum. Images captured with proper adjustment of microscope with 1000× magnification. Luminance correction process applied to RGB image using YCbCr transform Low Pass Filter and then smoothening of matrix done. Using color space, K-NN, and normalized RGB pixels are classified as erythrocyte or background. Using color histogram, saturation histogram, gray scale, tamura texture, and sobel histogram used for feature extraction. Only infected cells are forwarded for infection stage classification using trained SVM classifier. Automatic identification of infected erythrocytes showed a specificity of 99.7% and a sensitivity of 94%. The infection stage was determined with an average sensitivity of 78.8% and average specificity of 91.2%.

III. PROPOSED WORK

ANN networks are used for the database having information about the infected and non infected individual, but it does not consider the analysis of blood images of individual. The proposed work of malaria detection and classification is based on the image processing of thin blood smear which is used to train and test ANN. The first part of the work involves the image processing. Malaria images are collected from pathology and these images are preprocessed.

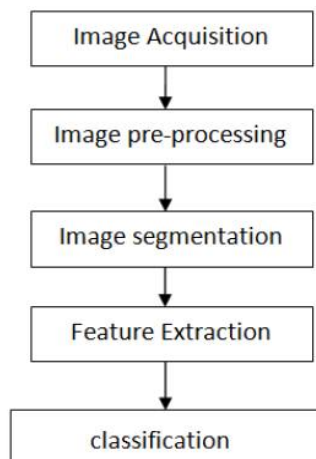


Fig.1: System Architecture

Images of stained thin blood were selected from public health image library. Blood samples are captured from the microscope. Image pre-processing step includes noise reduction and image transformation. These preprocessed images are taken for testing and classification of plasmodium. Feature extracted images are fed to the network. Feed forward network with one input layer consisting of three neurons, one hidden layer and two output neuron. ANN is a supervised learning technique used to classify patterns into different classes based on a training set. Training an ANN involves supplying the network with input features and their corresponding targets (desired outputs). The network then tries to adjust its input coefficients (commonly referred as the weights and biases) until a point where its output matches the corresponding target for a given input feature. When this happens the network is said to have learnt to classify different classes of input features. A trained ANN is capable of correctly classifying features which it has not been trained with. This is known as network generalization. MATLAB has a toolbox for creating artificial neural networks. This toolbox

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 4, April 2017

divides input features into three groups. The first group is made of 60% of the total training set. It is used in training the network (adjusting the weights and the biases). The second and the third groups each consist of 20% of the training set. One group is that the network is generalizing and it stops training before over-fitting. The other group is used as an independent test of the network generalization.

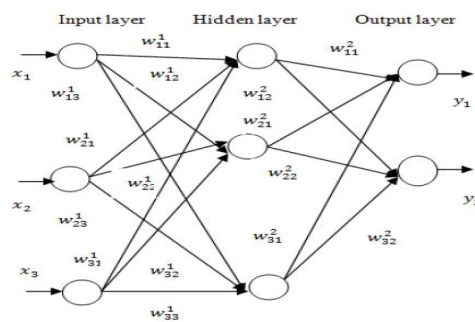


Fig.2: Layered Perception network

In this method, a multilayer back propagation neural network was trained to partition the image into two regions; erythrocytes region and the image background. Two sets of feature vector were used to train two artificial neural networks. One network was trained with RGB pixel values and the other one with both RGB and HSI image pixel values. The features were divided into two classes; erythrocytes and the background pixel values. A total of 540 feature vectors were used to train the neural network, with 340 feature vectors belonging to the erythrocytes class and 192 feature vectors belonging to the background class. The simulation results for the trained as well as testing inputs are given below. The 98% results for the testing inputs are encouraging and justify the use of ANN for detection of the disease.

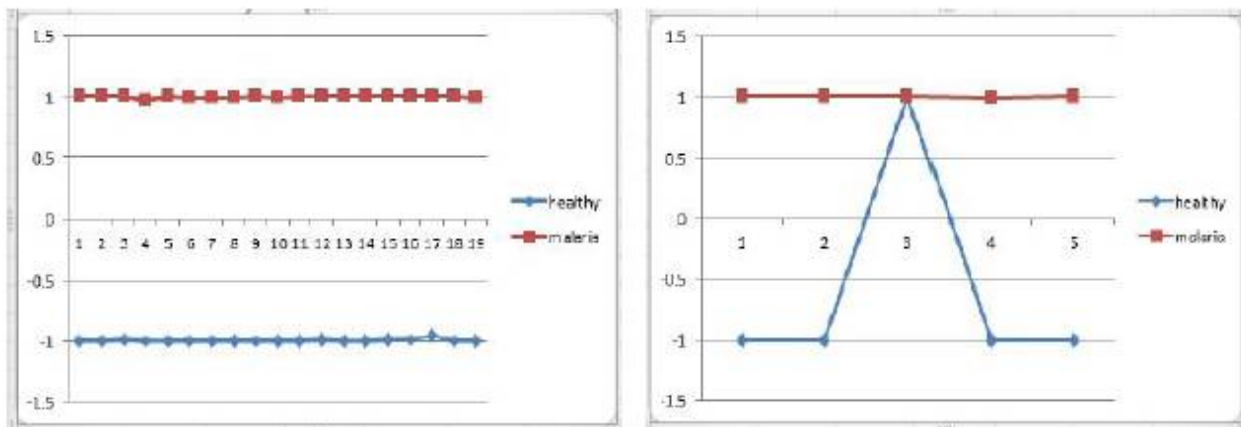


Fig.3: Classification of training and testing patterns

IV. CONCLUSION

We have determined various parameters by processing the images of healthy as well as infected RBCs. We have used Artificial Neural Network (ANN) for the detection of malaria infected RBCs. In the proposed techniques, the detection of malaria infected erythrocytes are done using ANN gives results 98%. These results can be refined more by increasing the number of parameters and also the sample size of the data provided.



ISSN(Online) : 2319-8753
ISSN (Print) : 2347-6710

International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Website: www.ijirset.com

Vol. 6, Issue 4, April 2017

REFERENCES

- [1]. A.Anand, V.K.Chhaniwal, N.R.Patel, B.Javidi, "Automatic identification of malaria infected RBC with Digital Holographic Microscope Using correlation algorithm, IEEE photonic journal", vol 4, no. 5, 1456-1464, 2012.
- [2]. G. Cybenko, "Approximation by superposition of sigmoidal functions, Mathematics of control signals and systems", vol 2 no. 4, 303-314, 1989.
- [4]. S. Hornik, H. White, "Multi-layer feed-forward networks are universal approximates, Neural Networks", vol 2, 359-366, 1989.
- [6]. U. Schnars, Werner P. O. Juptner, "Digital Recording and Numerical Reconstruction of Holograms", Bremer Institute of Angewandte Strahltechnik (BIAS), Germany, 2002.
- [5]. J. M. Zurada, "Introduction to Artificial Neural system", Jaico publishing house, 2004.