

AUTOMATIC CLASSIFICATION OF PLASMODIUM PARASITES USING STAINED RGB IMAGES

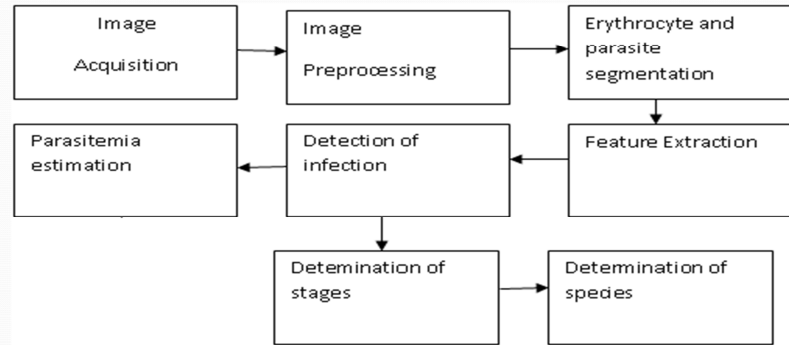


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Abstract

In this work, an accurate, speedy and affordable model of malaria diagnosis using stained thin blood smear images as developed. The method makes use of the morphological, colour and texture features of plasmodium parasites and erythrocytes. Images of infected erythrocytes were acquired, pre-processed and relevant features extracted from them. Image pre-processing entailed reducing the size of the acquired images to speed up processing and median filtering to remove salt and paper noise. Neural network classifiers were then trained and used to detect and determine the life stages and species of plasmodium parasites. Template matching technique was used to approximate the number of erythrocytes in the images and hence estimate the degree of infection (parasitemia).

Algorithm Development



Objectives

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1. The aim of this research was to develop a system that would offer speedy and accurate malaria diagnostics in human blood media based on the colour and morphological features of plasmodium parasites and infected erythrocytes. The specific objectives were as follows:
2. Acquire images of stained malarial blood samples (films of thin blood smears treated with Giemsa).
3. Develop a suitable model for detecting plasmodium parasites, classifying the parasites into their respective species and life stages and estimating parasitemia.
4. Determine the classification accuracy of the developed model in plasmodium parasites stages differentiation.
5. Determine the classification accuracy of the developed model in plasmodium parasites species differentiation.
6. Determine the classification accuracy of the developed model in parasitemia estimation.

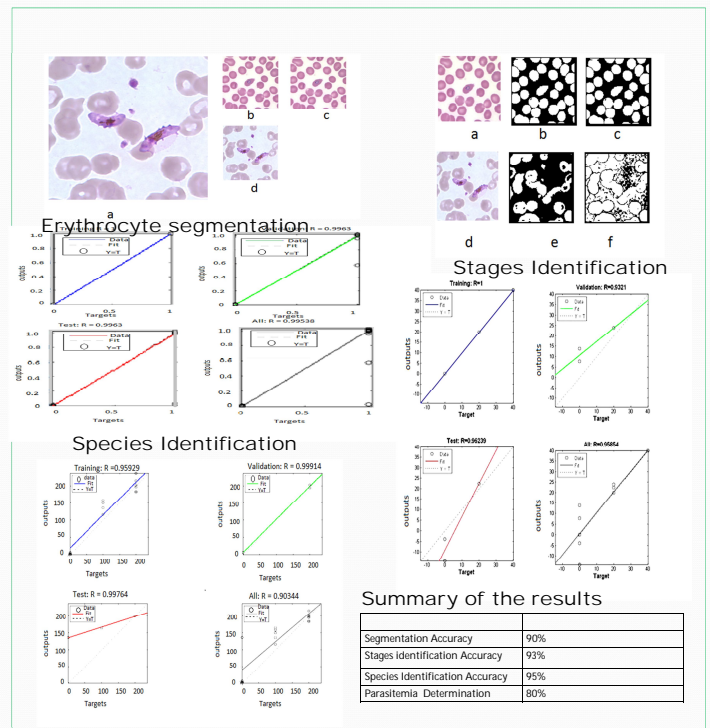
METHODOLOGY

The goal of this work was to develop a suitable model for diagnosing malaria using microscopic images of stained blood samples. This being image recognition and classification task, a systematic sequence of events was followed to achieve the objective. Generally, the procedure followed in solving such a problems is as follows. First an image is acquired and pre-processed, it is then segmented into different regions and appropriate features extracted. Next, a suitable classifier is used to categorize the features into their different classes. Finally, a decision is made about the information conveyed by the image based on the classes of features found by the classifier.

A similar criterion was used in this study to develop an algorithm for detection, classification and quantification of plasmodium parasites. Images were acquired from two sources; Kenya Medical Research Institute (KEMRI), and Centre for disease control (CDC) website. The images were pre-processed, erythrocytes and plasmodium parasites segmented, then suitable features were extracted from the images and finally, detection and classification of plasmodium parasites into their respective species and stages using ANN as well as determination of parasitemia was made.

In this work, a model of diagnosis was first developed using sampled images and then the model was tested using the entire sample of thin blood smear images from KEMRI and CDC website.

Results & Discussion



Conclusion

1. ANN can be used for segmentation of Erythrocytes and plasmodium parasites
2. RGB pixel values form effective features for image segmentation (Erythrocyte and plasmodium parasite segmentation)
3. For stages classification, colour, morphological and texture features should be used

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