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Overview on Detection of Malarial Parasites in blood Using Morphological Operations

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Abstract - *Malaria is an infectious disease caused by microorganism and it poses major threat to global health zone. The objective of the project is to develop a fully automated image classification system to positively identify malarial parasites present in thin blood smears, and differentiate the species. The implementation will be helpful to the professionals where the experts in microscopic analysis are lacking. This project aims to introducing fast and near accurate method based on image processing for malarial-parasite identification. The system describes the method of image analysis includes three main phases: 1] preprocessing using multilayer, feed forward, back propagation and KNN to highlight the stained object from the smear; 2] Morphological operations are performed on the image processed in phase 1 to highlight the identified shapes and restructure the element of specific shape and size on input image; 3] RBC count. Identified infected cells are analyzed based on their intensity profiles. The obtained result is validated by comparing with the predefined threshold. This approach is useful in rural areas where expert professionals are rarely available and the delayed diagnosis may lead to complications in patient health.*

Key Words: **Malaria diagnosis, Microscopic image, gray scale image, RBC count, Edge detection algorithm.**

1. INTRODUCTION

Malaria is a serious disease cause by mosquitoes in organisms and humans by plasmodium parasites. The diagnosis of such an infectious disease is performed by manual method. According to World Health Organization several deaths are caused due to malaria and over 250 million people are infected by plasmodium Falciparum parasite. Although the advancement in science and technology still the microscopy method is followed in many places over the world. The drawback of manual lab microscopic method is that it requires extremely trained pathologist for performing microscopic testing of malaria detection. In certain places such as villages and rural areas it's a very difficult task to provide trained pathologists and humans who are expert in performing the detection. The disadvantage of manual method can be overcome by following algorithms based on image analysis and processing methods for diagnosis. This method of malaria detection would help in ensuring that only those patients infected by malaria are provided treatment and the result is consistent and accurate in identifying the disease.

2. PROPOSED SYSTEM ARCHITECTURE

This paper describes an algorithm which works on RBCs to find out whether the human is infected by malaria or is unaffected by the parasite causing the malaria disease. The system works by creating a database using MySql of blood smear microscopic images of patients. The images implemented in C# .net framework are further applied processing techniques and finally the RBCs are counted to obtain the infected and unaffected RBCs. In order to gain results which are accurate the artificial intelligence techniques such as neural network and SVM(support vector machine) is used. This system will only not be helpful in overcoming the demerits of the manual lab method but will also contribute in the rural places and areas where there is not trained and less human expert or practitioners.

2.1 METHODOLOGY

The algorithm for processing is implemented in Microsoft Visual studio 10 using C# .net framework which identify whether the cells in the blood smear image are infected by the Falciparum parasite responsible for causing malaria. The methodology starts by creating database which stores microscopic blood smear images that are obtained by using digital microscope that would provide high accuracy in capturing the blood images for better processing. The main focus of processing is on RBCs which are responsible for the determining the presence of malaria parasite .The blood smear images further undergo various steps of processing:

1. Image collection

Image collection is a process in which microscopic blood smear image is taken as a input. Different blood smear images are collected and are stored in our database for further processing.

2. Gray Scale

A Grayscale image includes a process in which single sample is collected of each pixel's value. Thus it includes information related to intensity. This type of images are also known as black and white and are composed of shades of gray color which varies from weakest intensity of black to the strongest intensity of white. Thus the image which is collected in first step undergoes through gray scale algorithm and gets converted into g ray scale image.

3. Median Filter

Median filter is a method which is non-linear and it is used to remove noise from images. As it removes the noise from the image it also preserves the edges. The working of median filter is done by moving through the blood smear image pixel by pixel by replacing each value of pixel with the median value. The median values which is used is of neighbouring pixels.

4. Canny Edge Detection

The Canny edge is an edge detection algorithm. It includes multi-stage algorithm. These multi-stage algorithms are used to detect a wide range of edges in images. It includes following process:

a. Smoothing of image is done by using with a Gaussian filter.

b. Computation of Gradient magnitude using partial derivatives

c. Thin the edges by using non-maxima suppression

d. By using double thresholding edges are detected

5. Blob

Blob detection includes detection of the region in the image which are having different properties such as color or brightness as compared to its surrounding regions. Thus, a blob is a section of a blood smear image which consist of some constant properties. All the points in a blob are considered to be similar to each other. There are two classes of blob:

- Differential methods
- Methods based on local extrema.

6. RBCs Count

RBC count is the total count of RBC in the blood smear image. The total area which is occupied by the cell is calculated in terms of pixel. Total numbers of blood cells are calculated by dividing area of all cells in an image to the area of one cell in an image.

7. Result Verification Methods.

Result verification method includes two processes which are SVM and Neural network.

SVM:

SVM is used for classification and regression analysis. SVM constructs multiple hyper-planes which are N-dimensional and are used for classification of pixels in an image. SVM is used in categorization of text and hypertext. Training to polynomial is given by SVM using kernel function. Here an attribute called as predicate variable and feature called as transformed variable is used for hyper-planes.

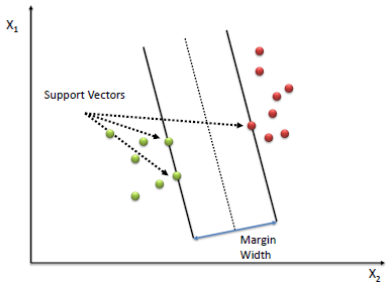

Figure 1: SVM concept

Neural network:

Neural network is most commonly used machine learning algorithm. Different algorithms are used to train the neural network.

The Architecture is as follows:

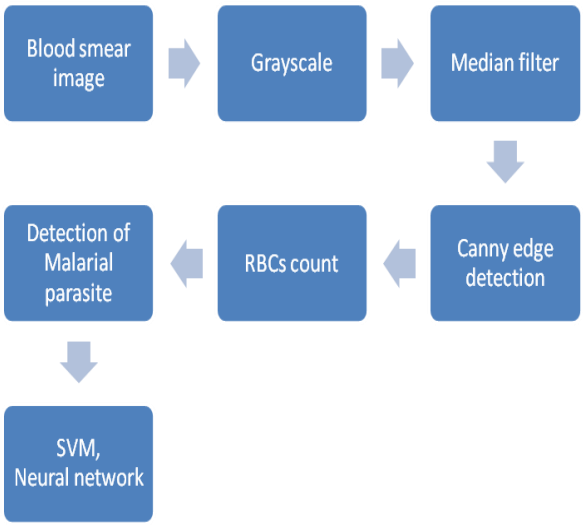

Figure 2: Architecture of system

3. TECHNICAL REQUIREMENTS

The software requirements for the proposed system are Microsoft visual studio 10 as platform for implementation and C# .net as language for development. The database creation is done by MySql which functions as the back end. The hardware requirement for system is digital microscope which will be used for capturing blood smear images.

4. CONCLUSION

This paper provides an approach towards detecting the presence of malaria parasite in microscopic blood smear images. The manual lab method testing is prone to human errors while detecting the infected RBCs. The system is an efficient way which involves computational techniques along with classification methods which help in getting accurate results. The project involves various steps of processing on the microscopic image and thus the result obtained is consistent and accurate. The system is useful to overcome the lack of pathologists and trained human expert. The system can be used to meet the real time requirements of the application for detecting the malaria.

5. FUTURE SCOPE

Currently the system is for detection of malaria but scope is that it can be used for detection of other diseases which involves not only RBC count but WBCs as well. Diseases such as typhoid, dengue can be detected.

6. REFERENCES

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