Comparative Analysis of Malaria Red Blood Cell Image Segmentation

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Abstract **-- Malaria in humans can be caused by a number of different parasites – the most dangerous, and the one which is responsible for over 90% of the worldwide deaths from malaria, is Plasmodium falciparum. This Paper presents a method to Infected Malaria Parasites in Red Blood Cell (RBC). The Blood Test used to evaluate the overall health and diagnose a wide range of disorders. Our goal is to identify the Malaria Infected Red Blood Cells to use the Microscope Images for research. This study has proposed an unsupervised gray Image Segmentation of Malaria disease using Moving K-Means Cluster algorithm, FCM algorithm and Watershed Algorithm. It has been using on blood sample Microscopy Images of both types of Malaria Red Blood Cells and Normal Blood Sample Images with the aim of obtaining fully segmented abnormal and normal Red Blood Cell. The Improvement need to be done for both segmentation and overlapped cell handling to obtained better result in the future.**

Keywords--Red Blood Cells, K-Means, Watershed, Fuzzy c means and Image Segmentation

I.INTRODUCTION

Most of the diseases are caused due to the blood. Malaria is one of the dangerous diseases. The detection of the malaria Blood cells are generally analyzed manually with the help of Microscope. The analysis of blood cells Images by using the different Image Processing Techniques. This paper also presents the approach for detection of the Infected Red Blood Cell in the available blood cell Image for the Evaluation of Malaria disease[8]. The Image segmentation technique is very useful for the analysis of the Infected Blood Cells Image.We present an approach to automatically detect malaria parasites in unstained blood droplets. Majority of automated image analysis algorithms are designed to detect parasites in stained cells [7]. Related image processing algorithms for the automated detection of malaria cells are applied on stained cells [5].

II.STEPS FOR PROPOSED METHODOLOGY

In this paper, the proposed method is focused on image Processing Procedure to obtain the segmented Red Blood Cell of affected Images.

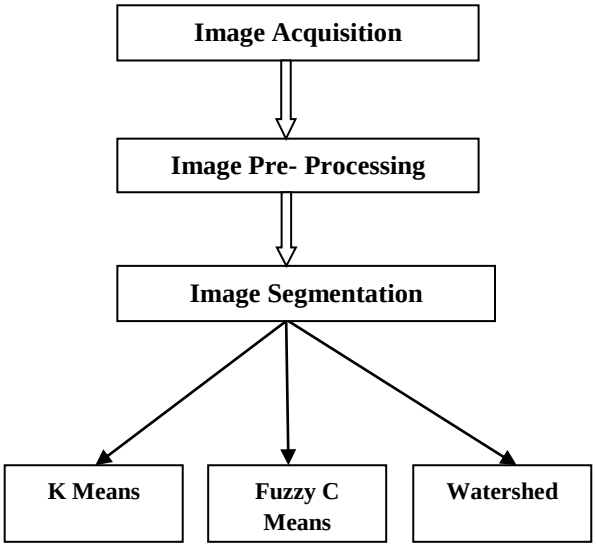

Fig1. Segmentation Methods

III.FLOW DIAGRAM

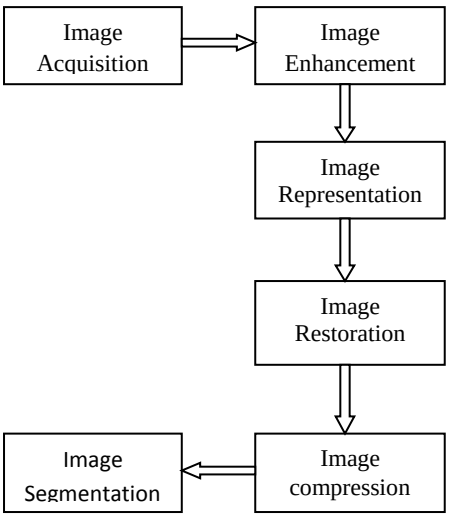

Fig2. Image Preprocessing

A. Image acquisition:

For detecting Malaria, microscopic images are acquired. These images are taken from net. This stage includes image pre processing.

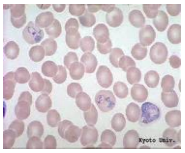

Fig3. Original Image

B. Image pre processing:

This is a pre-process of an Image Sequence before feeding into the segmentation process. There are various types of noise in Image processing. We have used salt and pepper noise. And after to using Median filter [3]. In digital Image processing, removing the noise is one of the preprocessing techniques.

C. Image segmentation:

The next stage deals with Image segmentation. Partitions an Input Image into foreground and background region. There are various approaches for segmentation. We have used three types of algorithms.

1. K-Means 2.Fuzzy C Means 3. Watershed

i. K- Mean Algorithm

K clusters are formed by partitioning the dataset and the data points are randomly assigned to the Clusters resulting in clusters that have roughly the Same number of data points.

- For all data point the distance from the data point to each cluster is calculated.
- Leave the data point where it is only if it closes to its own cluster. If the data point is not close to its own cluster, shift it into the closest cluster.
- Repeat the above step until a complete pass through all the data points'results in no data point moving from one cluster to another cluster. On this point the clusters are stable and the clustering process ends.

ii. Fuzzy C Means Algorithm

1. First the initial fuzzy partition matrix is generated and the initial fuzzy cluster centers are calculated.
2. In each step of iteration the cluster center and the membership grade point are updated and the objective function is minimized to find the best location for the cluster.
3. Improved FCM is proposed cluster technique. It is used to solve the minimal distance.
4. The process stops when the maximum number of iteration is reached or when the objective function improvement between two consecutive iteration is less than the minimum amount of data specified.[8]

iii. Watershed Algorithm

The Watershed Transform is a unique technique for Segmenting digital images that uses a type of region Growing method based on an image gradient. The concept of Watershed Transform is based on visualizing an image in three dimensions: two spatial coordinates versus gray levels. In such a "topographic" interpretation, we consider three types of points:

- Points belonging to a regional minimum.
- Points at which a drop of water , if placed at the location of any of those points, would fall with certainty to a single minimum.
- Points at which water would be equally likely to fall to more than one such minimum.

For a particular regional minimum, the set of points Satisfying condition (B) is called the *catchment basin* or *watershed* of that minimum. The points satisfying condition (C) form crest lines on the topographic surface and are termed *divide lines* or *watershed lines*. The principal objective of segmentation algorithms based on these concepts is to find the watershed lines.

IV.EVALUATION PARAMETERS

Having segmentation evaluation measures is an efficient way to analyze the performance of existing and future algorithms. Segmentation evaluation metrics can be divided into boundary –based and region –based methods. Before one gets to know the performance of an algorithm, knowing comprehensively the definitions of these metrics is Inevitable. Various performance parameters used for Evaluations of image segmentation are as follows [10].

Table 1. Evaluation Measurements Formula

S.No	Type	Description
1.	RMSE	$RMSE = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \hat{x}_i)^2}$
2.	SNR	$SNR(dB) = 20log\left(\frac{V_{RMS(Signal)}}{V_{RMS(Noise)}}\right)$
3.	PSNR	$PSNR = 10log_{10}\frac{L^2}{MSE}$
4	MAE	$MAE = \frac{1}{MN}\sum_{i=1}^{M}\sum_{j=1}^{N}\lvert X(i,j) - Y(i,j)\rvert$

IV.RESULT AND DISCUSSION

The Proposed technique is applied to 22 Images of blood Cell. Images are taken from the Google. The Images are in JPG format then Image is used for contrast enhancement then the Image is segmented by K-Means, Fuzzy c Means and Watershed are compared. The result shows that the adaptive watershed algorithm gives better segmentation result as compared to k means and FCM. To obtain the RMSE, SNR, PSNR and MAE values in the paper.

Table 2. Accuracy of Measurements

Algorithm	RMSE	SNR	PSNR	MAE
k-mean	143.623	-18.5465	4.91367	104.5448
FCM	107.52	-11.966	7.581749	82.8674
Watershed	19.90772	-0.99487	22.62104	0.983849

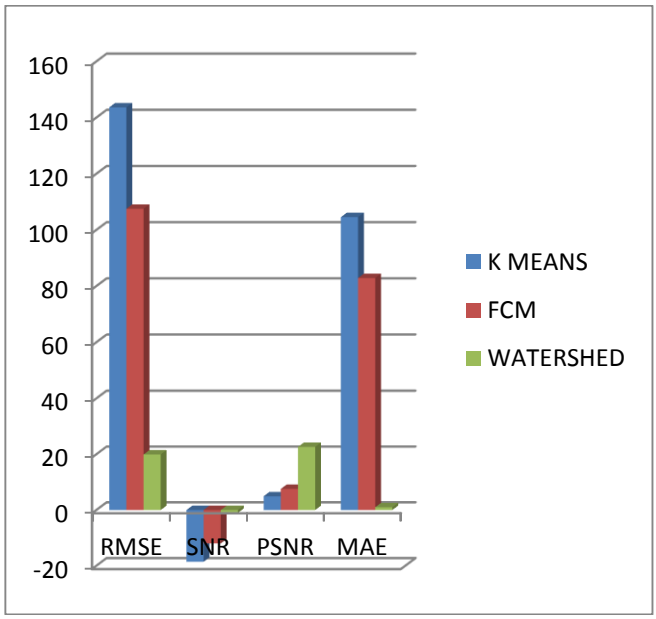

Fig.4 Accuracy of Measurements

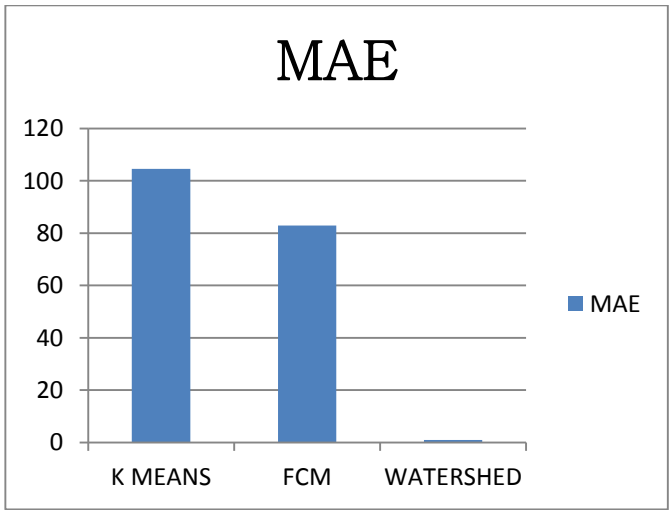

Fig 5. Accuracy of Mean square Error

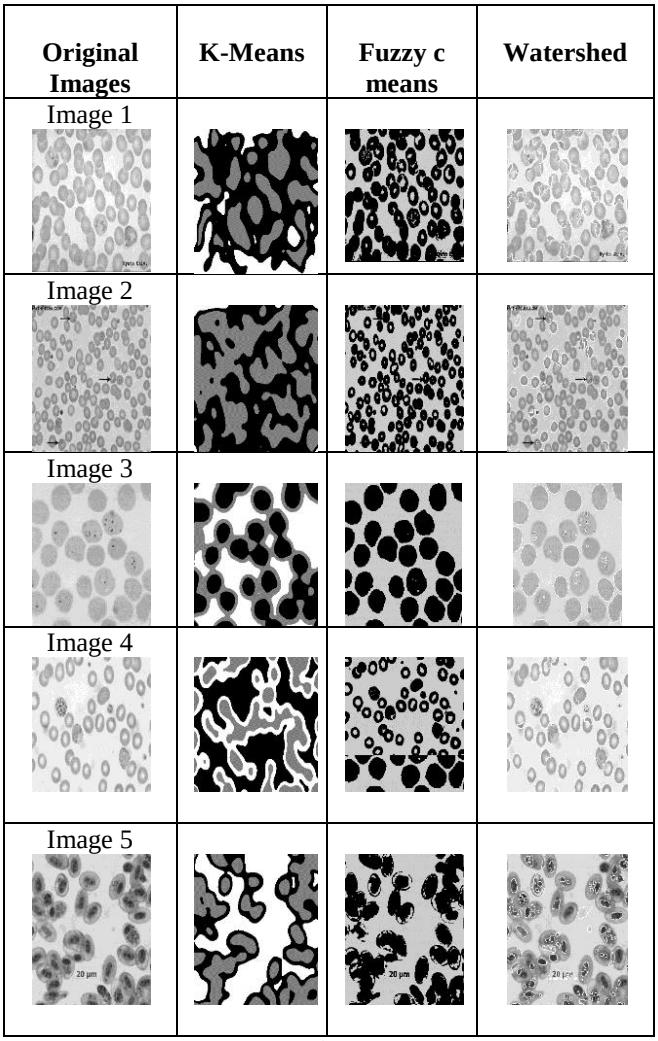

Fig 6. Sample Output for Red Blood Cells

V.CONCLUSION

In our Research we have identified affected RBC from blood cell. Image processing techniques are implemented in order to get more accurate results. Using this (RMSE,PSNR,SNR and MAE) four Evaluation Measurement, we found that Watershed Algorithm is the best segment to identify the Malaria affected Red Blood Cell.

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