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A Study on Image Processing in Medical Field

Gopika M

M Tech Scholar, Rajagiri School of Engineering and technology

Abstract: ***In medical field, through the identification of blood disorders from microscopic images, can lead to classification of certain diseases related to blood. This paper includes the study of image processing on medical field.In many of the methodologies used, various image processing and segmentation techniques are used for the detection of blood disorders through microscopic cell images. Quality of images plays vital role in the correction prediction and classification of cells.From these captured good images, morphological as well as volumetricalfeaturescan beextracted. There are various methods are tried to discriminate cell categories. Various feature extraction techniques are used for the classification of cells.For the optimization of these methods in use, needs a continuos testing and evaluation. Finding optimization areas in these methods is a tedious task. While optimizing, it is needed to ensure repeatability in result generation in various environmental conditions.***

Keywords: MSCN, BRISQ, Hyper chromic cells, Circle detection algorithm, FTIR

1. Introduction

Millions of people in each year are affected by blood disorders. It includes anemia, hemophilia, and other bleeding disorders. All these diseases affects white blood cells, red blood cells and platelets. These can leads blood cells to function abnormaly, which may leads to any disease condition or affects our health. There are mainly two research responsibility for blood test. One is to ensure safety in blood supply. Second is to detect and finding solution for various blood disorders.Some disorders cause the number of blood cells to decrease and some other cause it to decrease. Some blood disorders affects blood proteins within the blood cells or blood plasma.

Blood cells are produced in bone marrow. Red blood cells contain hemoglobin, which carries oxygen. White blood cells are protecting part in the blood. It fights all infections and cancers. Platelets with the help of various clotting factors make bleeding stop or prevent from occurring. The presence of blood disorder is first discovered by a blood test such as complete blood count (CBC).

Recent developments in medical microscopy, introduces concept of detecting blood disorders from microscopic images. .Integration of digital imaging with basic cell counter results could lead to a fasterdetection for the detection of hematological malignancies. Several algorithm is able to automatically capture images. And by variousmorphological and volumetric operations, it is able to generate a complete blood picture in the generated report.

Various studies proposed uses different image processing and segmentation techniques for the detection of disorders. All these together with the use of machine learning method, It is able to propose a fast and efficient method for identifying disorders. Many research studies include the detection of different blood categories and to identify the presence of disease causing pathogens in blood. There are various methodologies can be used for the detection of malarial parasites, identification malignant cells, detection of anemic blood conditions. Red blood cells can be classified into many categories based on its size, shape, texture of its cell and pallor. The abnormality in its size, shape, texture indicate the occurrence of anemia. Based on cell size it can be normal, macrocytic or microcytic cells. Cell pallor's also classified as hypochromic, normochromic and hyper chromic. Based on shape, it can be fragmented, spiked, helmet, elliptical, oval or circular. Blood cells can be a combination of these features. Separate methods are needed to classify these many cells. In case of malaria, it is a tedious task to detect and identify the presence of plasmodium parasites as it occurs in many forms in different categories. In some of research methods uses extracted features of blood cells for the identification blood cancer. This paper aims on a case study on the methodologies used for the detection and classification of blood disorders through various image processing techniques from microscopic images captured. And also studies about the optimization techniques for increasing accuracy percentage of various algorithms in use.

2. Literature Survey

Pooja Patil, Ganesh Sable explains a preliminary study of detection and classification of blood cells, such as RBC &WBC using microscopic blood sample images. After image preprocessing and segmentation, the RBC and WBC cells counted during classification, which is based on features extracted. Feature extraction is performed by examining changes on texture, geometry, colors.

Yazan M. Alomari introduces a iterative structured circle detection algorithm for the detection and quantification of RBC and WBC. For separating RBC and WBC, various thresholding and preprocessing steps were employed for each cell type. Based on modified circle detection algorithm counting was performed for each image using proposed method.

Ricardo ocampo, explains a method for image quality assessment. It uses Referenceless method called BRISQ for checking quality of image. It detects unfocussed, blur, empty, darker images using the concept of MSCN (mean subtracted contrast normalized. It is patented algorithm.

Vincenzo Piuri, Fabio Scotti have classified the WBCs and the count of white blood cells in microscopy images is done which allows the vivo assessment of a wide range of

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important hematic pathologies (i.e., from presence of infections to leukemia). Here they have used the morphological cell classification which is typically made by experienced operators.

WhileMs. Minal D. Joshi have proposed a software base solution related health industry which will assist the medical laboratory technician (MLT) to detect and find a blood cell count and produce an accurate cell count report. This will be very helpful to a physician in identifying the cause of his patient's diseases. To count the blood cells in a clinical laboratory different two methods and techniques are used. One is the old conventional method of cell counting under the microscope and the other is to produce cell counting report by latest but very expensive hematology analyzer.

And in Abdul Nasir, A. S, Mustafa, N., Mohd Nasir have presented a rapid, novel, minimally invasive approach for cancer detection based on Fourier transform infrared (FTIR) micro spectroscopic (MSP) analysis of peripheral blood plasma coupled with advanced computational methods. They have developed an automatic, computerized classification method that alerts for any signs of cancer presence, even in the early stages, regardless of the location of the solid tumor and without the need to search for a specific type of cancer.

Gaganjit Singh, Swarnalatha P., Tripathy B.K., Swetha Kakani, have proposed automatic Otsu's threshold blood cell segmentation method along with image enhancement and arithmetic for WBC segmentation. The Knearest neighbor (KNN) classifier has been utilized to classify blast cells from normal lymphocyte cells. The system is applied for 108 images available in public image dataset for the study of leukemia. This method gives 93% accuracy.

J. Poomcokrak And C. Neatpisarnvanit have proposed an image processing technique for counting the number of blood cells. The number of counted blood cells will then be used to calculate the ratio of blood cells for leukemia detection. For this purpose, few preprocessing and post-processing techniques have been implemented on blood cells image in order to provide a much clearer and cleaner image for blood cells ratio calculation. The results show that the ratio of blood cells which have been calculated using the proposed image processing techniques are able to differentiate between normal and abnormal blood cell image for leukemia detection. They have applied this method on 91 different images.

Hemant Tulsani introduces a method for counting blood cell using morphological watershed transformation. Morphological operations are used for masking and watershed transformations are used for segmentation of cells. It states that this method is unsuccessful for more overlapped cells.

Esti suryani, Wiharto uses fuzzy rule based method to formalize the human capacity of imprecise reasoning. In fuzzy logic, all truths are partial or approximate. This method is used to create a regulation of the input variable to the output variable. The extracted features such as WBC area, Nucleus ratio and granule ratio etc are taken as input variables. And the output variables are weighted average, percentage of sickness of blood in image sample.

Owen Yang, david Cuccia uses laser speckle imaging technique for capturing RBC cells. Image-processing algorithms can be applied to produce speckle flow index (SFI) maps of relative blood flow. They introduces a novel algorithm that employs the NVIDIA Compute Unified Device Architecture (CUDA) platform to perform laser speckle image processing on the graphics processing unit.

Lokman Faivdullah introduces a method to detect leukemia from blood smear images. After feature extraction using the techniques of flow cytometry, machine learning base coding and classification performed. To lower the complexity coding process is carried out on the DSIFT descriptor.

Jameela Ali introduces a image processing technique for classifying cells based on geometrical features such as Aspect ratio, fourier descriptors and moments. It calculates those features after image pre-processing and segmentation and classify the cells based on the threshold given for each type.

Pooja R Patil, introduces a fast and cost effective production of blood cell count reports. In this method RBSC and WBC are counted using gray-thresholding algorithm computing with manual methods. Here number WBC and RBC are counted from five blood images. After counting the number of WBC and RBC from these five images, these counts are applied to a formula to count the normalized count. Image processing helps in improving image quality thereby increasing the accuracy.

Ningning Guo uses multispectral imaging technique and uses a method for WBC segmentation. For image segmentation, Support Vector Machine (SVM) was applied directly to the spectrum of each pixel, and using sequential minimal optimization (SMO) algorithm for feature selection to reduce the time of training SVM classifier. Mass of experiments showed that the method is robust, effective and insensitive to smear staining and illumination condition.

In Lalit B Damahe introduces a method to count RBCs as well as to detect parasites from blood cell images. They used S and V component of HSV color model and segmented using Zack's thresholding technique, sequential edge linking algorithm and Euclidian distance based clustering. And also author gives a summarised view of techniques used for RBC classification as well as for Malaria parasite detection.

3. Conclusion

This research involves a study on image processing methods used in medical image processing for the detection of blood disorders. Optimization of blood cell identification and clinical metrics have high importance in medical field. Severalalgorithm currently using having a maximum accuracy of 90.5%. For the optimization of blood algorithm, it is needed to identify the issues and provide necessary solutions to route causes. From the case study, quality of image plays a vital role in the performance of the system. For the blood cell classification, several methods are in use to discriminate cell categories. Continuous analysis and

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testing is needed to find the optimization areas associated with the algorithm.

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