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Detection of Sickle Cell Anemiafromblood Smeared Images Using CNN Algorithmin Image Processing

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Abstract- Human blood consists of 3 kinds of major cells: Red blood cells, White blood cells and blood platelets. Erythrocyte malady could be a cluster of disorders that affects hemoglobin, the molecules in red blood cells that delivers element to cells throughout the body.This is known as sickle cell anemia.In sickle cell anemia, the blood contains unusual hemoglobin molecules referred to as hemoglobin S, which misshapes red blood cells into a reaping hook, or crescent shape.Sickle cell anemia is a hereditary form of anemia in which mutated hemoglobin distorts the red blood cell into sickle shaped cells due to low oxygen levels. Signs and symptoms of erythrocyte malady i.e., sickle cell disease typically begin in infancy.Detection of sickle cell anemia emphasizes the analysis for accurate disease diagnosis. It is being done using CNN algorithm in image processing.To perform the segmentation of the images, techniques such as Plane Extraction, Arithmetic operations, Linear distinction Stretching, bar graph feat and world Thresholding and Gray Level Co-occurrence Matrix employed for classification.

Keywords- Sickle cell anemia, CNN algorithm, Plane Extraction, Linear distinction stretching, World Thresholding, Gray Level Co-occurrence Matrix

I. INTRODUCTION

Pathology is the field of investigation of samples collected from the individual to produce proof for diagnosing within the medical field. It involves the detection of pathogens or harmful foreign particles present within the sample for providing necessary proof for any treatment of the diseases. A specialist collects the samples and processes it for exploitation using the laboratory instrumentation to come up with a report based mostly upon the results.The instrumentation presently accessible with the specialist is haemocytometer or the haematology analyser.

This instrumentation is large and extremely priceyand they supply cheap accuracy. Theobject of this workt is to outline a system that answers the hurdles gift within the field of pathology. The system created ought to manage the price of the presently accessible systems that is refraining the pathologists from approaching these areas and to improve the services. Medical laboratories give confirmation of clinical diagnoses, facilitate improved management of diseases, generate essential public health data and with adequate government funding.

Quick and cost-efficient production of vegetative cell count is extremely necessary to form higher and cheap diagnosing. It's a vital task to extract morphological data concerning blood cells of a person. In all, the foremost difficult task is to increase ancient approaches to segmentation and object classification.

In comparison with the manual method,the automatic analyzer provide quick and reliable results relating to the quantity, average size, and variation in size of blood cells, they can't dependably count the abnormal cells, overlapped cells and don't observe cell shapes.

Sickle cells are crescent shaped cells also named after sickle tool in carpentry, found in red blood cells due to mutation in the gene that reduces haemoglobin at low oxygen levels. Sickle cell anaemia is caused due to presence of large number of abnormal cells in erythrocytes.

Sickle cells are discovered in 1910 in United States of an African young man named Walter Clement Noel from Grenada. In 1927, American scientists Hahn and Gillespie discovered that sickle cells are the cause of removal of oxygen from red blood cells in human body.

In India, sickle cell trait is found to be occurring and present among the tribal people in central India and in south India with frequency as high as 40%. The sickle cell disease is found to be inherited from parent genes. There are two types of sickle cell disease known as sickle cell anaemia and sickle cell trait.

Person with sickle trait were heterozygouscarriers for the gene (AS). People with the sickle cell anemia were homozygous i.e., they have a double dose of the gene (SS).

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In this project, sickle cell anemia is detected using convolution neural network by using blood smear images in image processing.

Because of pathology, acute chest syndrome is widely used in sickle cell anemia disease which includes components from infection, fat embolism and pulmonary sequestration. Other symptoms of sickle cell anemia include fatigue, pain crisis, dactylitis, leg ulcers etc.

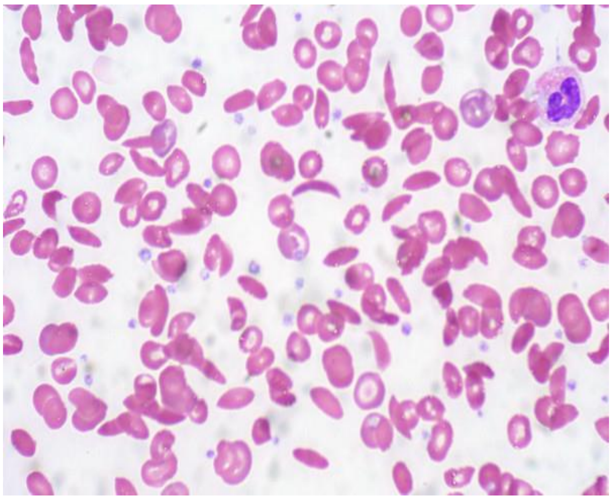

Fig 1. Sample Image.

Fig 1. is the sample image for sickle cells which are shaped in crescent form.The sickle cell anemia treatment can be done by blood transfusions and medications. In children, the sickle cell anemia can be cured at early stages by stem cell transplant.

II. LITERATURE SURVEY

In [1] Prof A. Arputha Regina proposed a theory which makes a necessity to discover and classify the AML mechanically. Premature work is completed by color conversion of the image from RGB to CIELAB color house to perform the segmentation technique well. The widely used segmentation technique is K-means formula.

K-means is associate degree unattended learning formula supported by bunch of comparable behavior of the objects. Feature extraction technique includes the Hausdorff dimension (HD) and native Binary Pattern. Support Vector Machine is employed for classification. The analysis of varied result analysis parameters is analyzed to realize accuracy.

In [2] Dishant Mehta proposes an automatic technique for numeration of red blood cells mistreatment image process techniques. The normal ways of blood analysis involve the manual numeration of blood cells ascertained underneath the magnifier. This technique poses giant dependency on the abilities of the laboratory technician and may cause errors.

The machine-driven medical specialtyanalyzers, on the opposite hand, turn out correct results. However, this equipment area unit is terribly pricy and troublesome to maneuver once put in.

They need trained consultants to control this instrumentation. The proposed technique provides an occasional price and movable answer for getting the red somatic cell count employing a image process.

In [3] Renuka V Tali The paper gives away majority of the methods of the segmentation and classification of blood cells in microscopic blood smear images. Selectinga suitable segmentation technique is a challenging task, as the classification technique depends on success of the segmentation. We mainly focus on methods used in segmenting White blood cells and its major types from its RBCs, Platelets and background.

III. EXISTING SYSTEM

The existing method for segmentation, classification and counting of cells is based on the size of red blood cells.Classifications of cell were done using multi-layer perceptron (MLP).

In this project color k-means algorithm is used to segment RBCs from blood smear images. A set of texture, geometrical and statistical features are taken out from segmented region.

IV. PROPOSED SYSTEM

The projected image process system consists of following steps

- Filtering
- improvement and
- Detection.

1. Filtering:
Filters the pictures bysquaremeasure corrupted by noise like salt and pepper noise, impulse noise and Gaussian noise. As there's a trade-off between edge strength and noise reduction, filtering is completed.

2. Enhancement:
It emphasizes pixels wherever there's a major modification in native intensity values and is typically performed by computing the gradient magnitude.

3. Detection:
In a picture, various points have a nonzero price for the gradient, and all these points have square-measure edges for a specific application. Thresholding is employed for the detection of edge points. This project in the main deals with the sting Detection of reap hook cells gift in RBCs.

V. BLOCK DIAGRAM

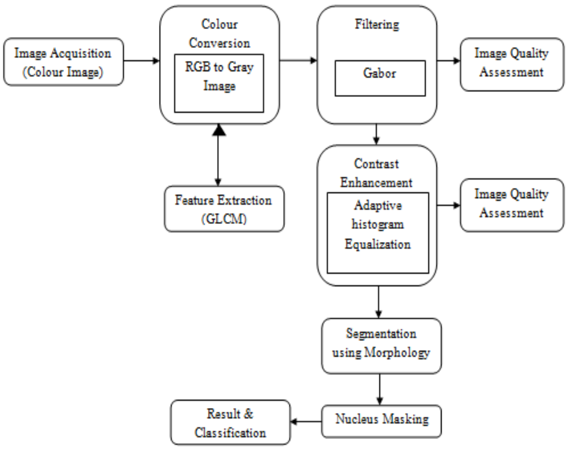

Fig 2. Matlab Unit.

VI. MODULE DESCRIPTION

1. Input Image:
RGB is different color model where dissimilar individual devices ascertains or create given RGB value differently, since the color and their reaction to the individual red, green and blue color levels differs from user to user. Red, green and blue value does not define the same color across devices without some kind of color management.

Three different light beams (one red, one green, and one blue) should be layered in order to form a color with red, green and blue. Individually these three beams is called a product of that color, and each of them have better intensity from fully off to fully on.

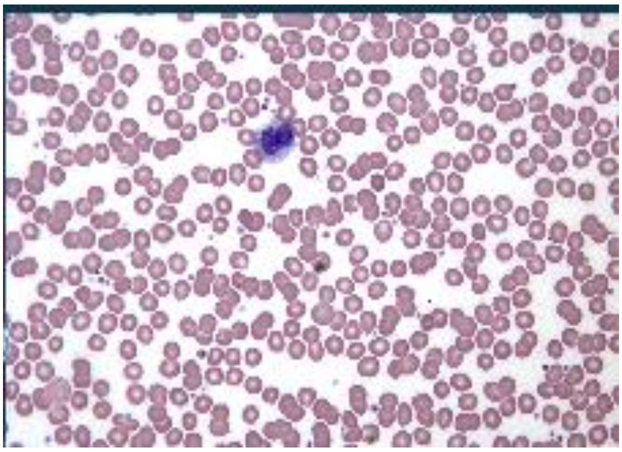

Fig 3. Input Image.

2. Gray Image:
In photography and computing technology, a grayscale or greyscale digital image is an image conversion types in which the value of each pixel is a single sample that is, it carries only intensity values information. Images of this sort, also known as black and white, are combined exclusively of shades of gray, varying from black at the lowest intensity to white at the strongest.

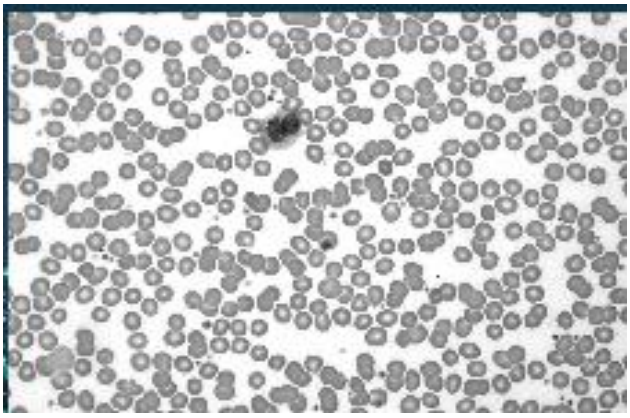

Fig 4. Gray Image.

3. Filtering:
In signal processing, a filter is a device or process or technique that reduces unnecessary components or features from a signal. Filtering is a signal, image or frames processing, the defining feature of active or passive filters being the complete suppression or partial of some aspect of the signal. It is a one of the non-linear digital filtering techniques, often used to remove noise and unwanted distortion from an image or signal. Such noise reduction is a typical processing step to improve the results of edge detection like sobel, canny etc.

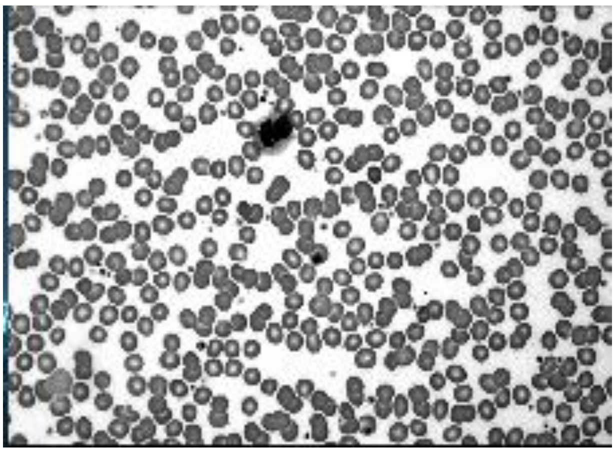

Fig 5. Median Filter.

Median filtering is used in digital image processing analysis to remove noise in original 2D image. It prevents edges while removing noise, also having wide applications in signal and image processing. The filter is used to run through the signal step by step, replacing each entry within the median of neighboring entries.

4. Contrast Enhancement:
In image processing, Contrast Enhancement is a technique or approach of contrast modification using the image's

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histogram. Histogram equalization does this by improving the spread out of mostintensity values to clear blur.

Adaptive histogram equalization (AHE) is a computer image processing methodand machine vision technique used to improve contrast in images or signals. It differentiates from other histogram equalization. This method computes several histograms and uses them to spread the non-darkness values of the image. In adjust method adjusts intensity values.

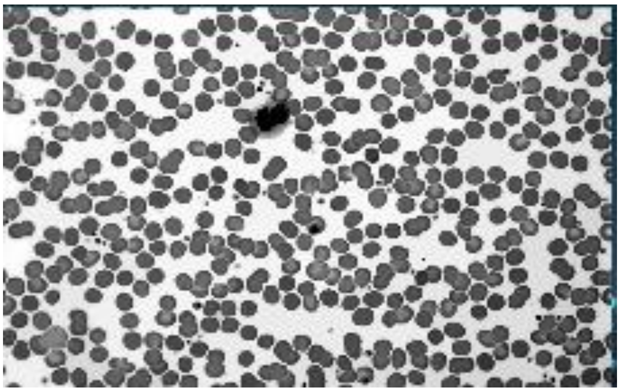

Fig 6. Adaptive Histogram Equalization.

5. GLCM:

GLCM also known as gray level spatial dependence matrix is a statistical method of examining texture that considers the spatial relationship of pixels.In deep learning, recognitionmethod or algorithm and in image processing, extraction method begins from starting set of measured data creates feature extracted value intended to be informative. Feature extraction is related to dimensionality reduction based quantitative analysis.

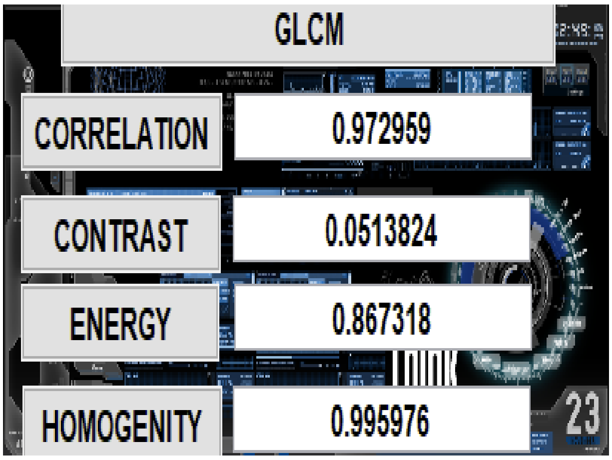

Fig 7. Feature Extraction using GLCM.

VII. RESULT AND DISCUSSION

This project collects the blood smear images from blood and passes the images through the device for detection. The CNN algorithm is used for detection of sickle cell disease as it has high accuracy and high efficiency. The input image is based on RGB colour model.

It segments the image and contrasts the image using image enhancement. Then the image is transformed into gray image and filtered. The filtered separates the sickle cells and number the count. This helps to diagnose the sickle cell anaemia.

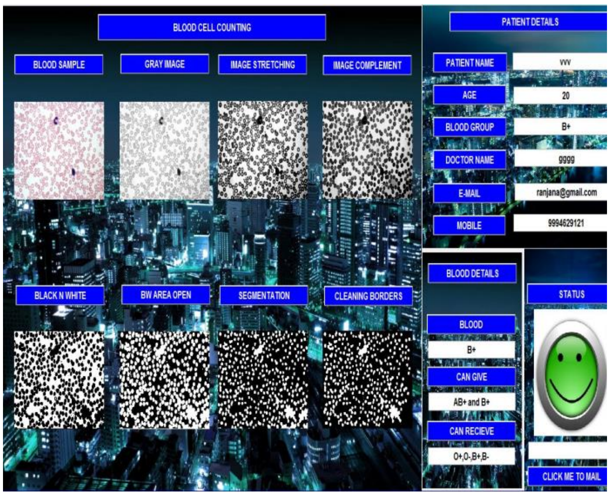

Fig 8. MATLAB unit.

Fig 9. Result.

The sickle cell anemia is divided into five types mainly. They are sickle betaplus-thalassemia, sickle beta zero-thalassemia, sickle hemoglobin-C disease, sickle hemoglobin-D disease, sickle cell hemoglobin SS. These types differed based on the number of cun of sickle cells present in the blood.

These sickle cells are counted accurately and the number distinguishes whether the sickle cell disease is present or not present in the person. The project uses green plane extraction, image enhancement, gray level co-occurrence matrix for segmentation technique.

VIII. CONCLUSION

This paper describes an automated system for fetal and maternal red blood cells reading in clinical KB test. The system uses a custom-motorized image capturing platform to automatically center a KB slide, collect 120 images

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(over 60,000 cells), and count/distinguish fetal and maternal RBC's.
Spatial-color classification with spectral clustering is proposed to effectively count overlapping cells.

Multiple features including cell color, size, and shape and contrast variations are used in supervised learning for distinguishing fetal RBCs and maternal ones. Testing patient KB slides in the automated system quantitatively demonstrated high accuracy in counting and strong correlation with benchmark flow cytometry.

Compared to manual technologist reading, the automated system is significantly more efficient and accurate.

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