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Detection of Sickle Cell Anemia Disease using Image Processing

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ABSTRACT: Anemia is a blood disorder which results from the abnormalities of red blood cells. Anemia is characterized by the presence of abnormal cells like sickle cell, ovalocyte. A healthy RBC is usually round. But sometimes it changes its shape to form a sickle cell structure; this is called as sickling of RBC. Majority of the sickle cells (whose shape is like crescent moon) found are due to low hemoglobin content. An image processing algorithm to automate the diagnosis of sickle-cells present in thin blood smears is developed. Image features based on color, texture and the geometry of the cells are generated, as well as features that make use of a prior knowledge of the classification problem and mimic features used by human technicians. The proposed image processing-based identification of sickle-cells in anemic patient will be very helpful for automatic, sleek and effective diagnosis of the disease.

KEYWORDS: Anaemia, Sickle-cells, blood smears, filtering, histogram stretching, image processing.

I. INTRODUCTION

Red blood cell (RBC) has a significant role in the gaseous interchange of external environment and the living tissue. Haemoglobin is the protein in RBC that works as a carrier of oxygen. Usually hemoglobin A dominates throughout the life after six weeks of age. It contains two alphas and two beta chains. Sickle cell disease (SCD) is found when a person receives two abnormal copies of haemoglobin genes, one from each parent. That means healthy hemoglobin (HbA) is replaced by sickle haemoglobin (HbS). Medical image segmentation becomes more challenging in the presence of non-uniform intensity, noise and diversified signal intensity of lesion cells. The efficiency of the segmentation depends on various characteristics : location, shape, size, area, form factor, elongation, circularity, texture of cell and elasticity.

II. RELATED WORK

Image processing is a set of computational techniques for analysing, enhancing, reconstructing images.[1]Ahmad Sabry Mohamad, Nur Syahirah Abdul Halim 2019, have designed Image processing technique has been used to produce automated detection of Sickle Cell Anemia. A Laplacian of Gaussian (LoG) edge detection algorithm computed to detect sickle cells diseases at the early stage in diagnosing patient.[2]Mohammed AbduraheemFadhel, AmjadJalilHumaidi 2017, have proposed a Red Blood Corpuscles (RBC) constitutes the main cellular element of human blood. They are gaseous exchangers between living cell and external environment. In normal physiological state, RBC has circular shape in front view and biconcave shape in side view. In [3]Chihwen Cheng 2013, have proposed a Sickle cell disease (SCD) is the most common inherited disease, and SCD symptoms impact functioning and wellbeing.. Morphological technique is used to extract text from the images presented in [4]This research work proposes an image processing technique to separate the Red blood cell from other components of blood. It aims to examine and process the blood smear image, in order to support the classification of Red blood cells into 11 categories. K-Medoids algorithm which is robust to external noise is used to extract the WBCs from the image. In [5]Tajkia Saima Chy, Mohammad AnisurRahama2018,have proposed one of the important parts of the human body is red blood cells (RBCs). Disk shape is the ordinary red blood cell's shape

III. METHODOLOGY

The microscopic image is a colour image which has all the three RGB components. It needs to be converted to grey scale images. In order to process a blood cell image, conversion of the colour image into the grey value is required



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because of converting three intensities level to single intensity level. The edges of the cells in the image need to be enhanced for detection of the change the intensity of the grey levels inside and outside the cell and the background of the image. The high pass filtered image is passed through the canny edge detection algorithm which detects the edges of the cells. It includes many sub functions involving double thresholding, differentiation of the image based on the change in the intensity and avoiding the false edges. The secondary edges in the image are obtained by using connected components methodology. The cells are calculated whether they are valid, invalid, anemia affected. The report window is generated which shows whether the person is anemia affected or safe.

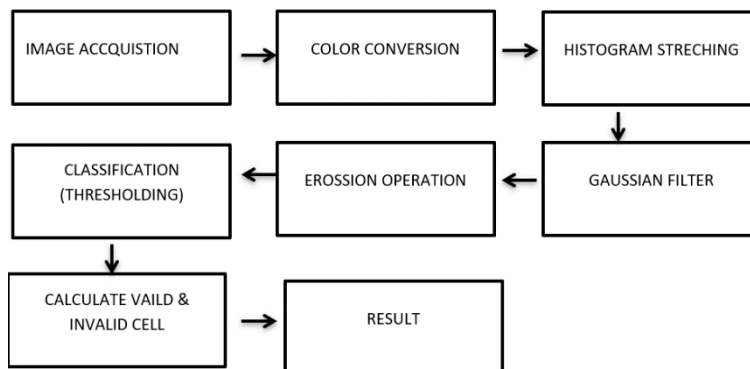


Fig 1.Architectural Diagram

IV. EXPERIMENTALRESULTS

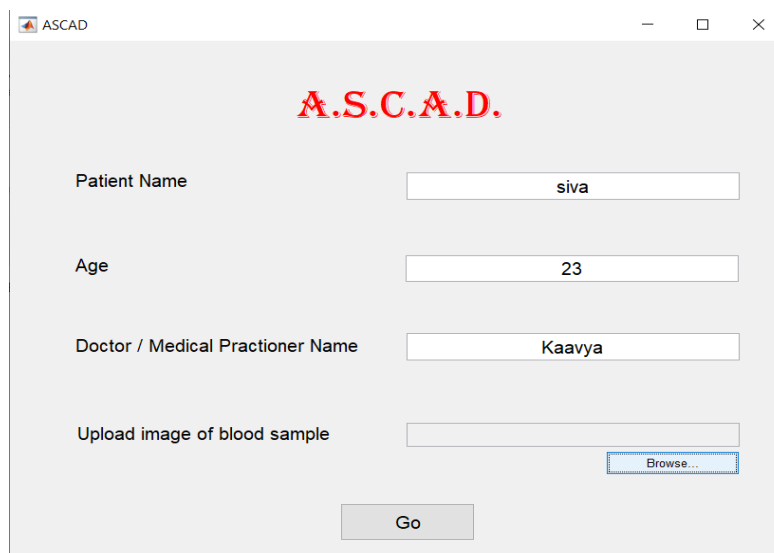


Fig 2.Takes input from the user.

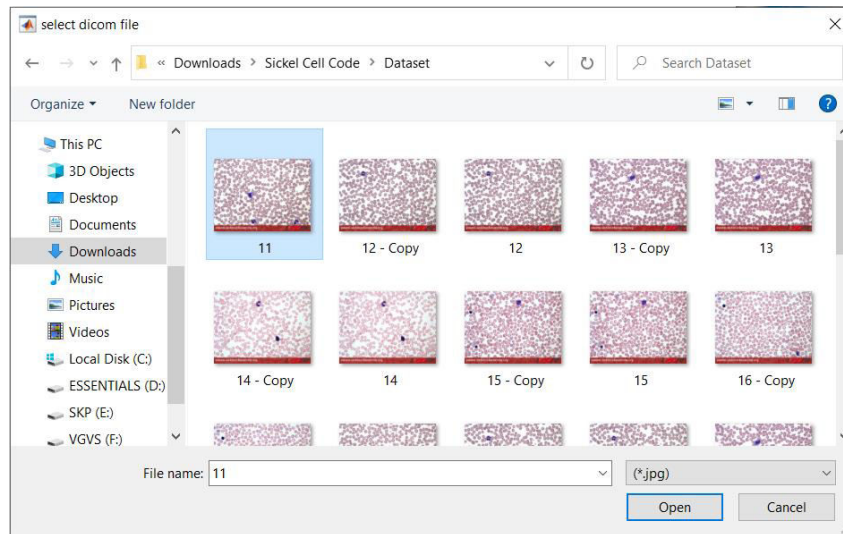


Fig 3. Feeding Microscopic image.

Fig 2, Fig 3 shows the input that should be given. It takes the inputs such as Name, Age, Medical practitioner, Uploading image of blood sample.

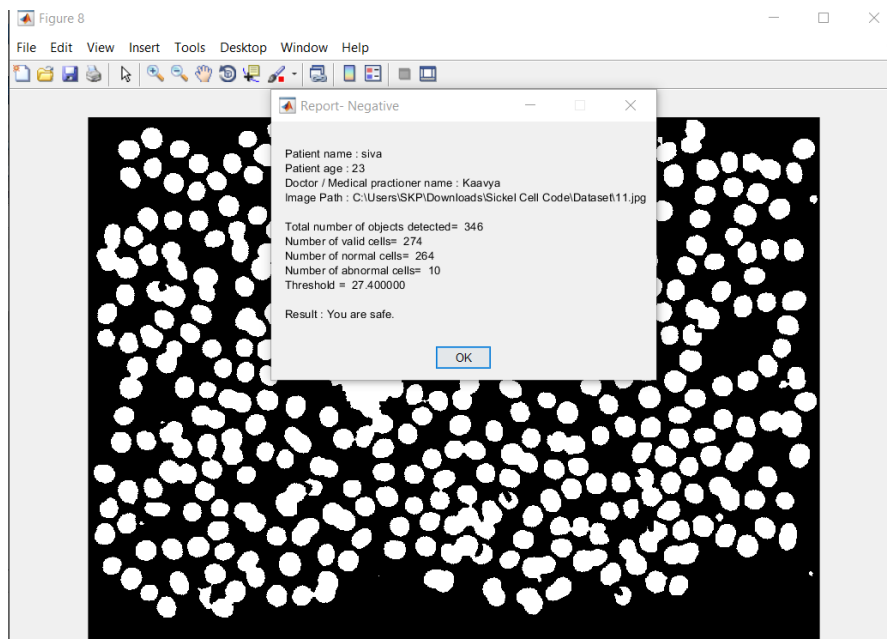


Fig 4. Negative Report.

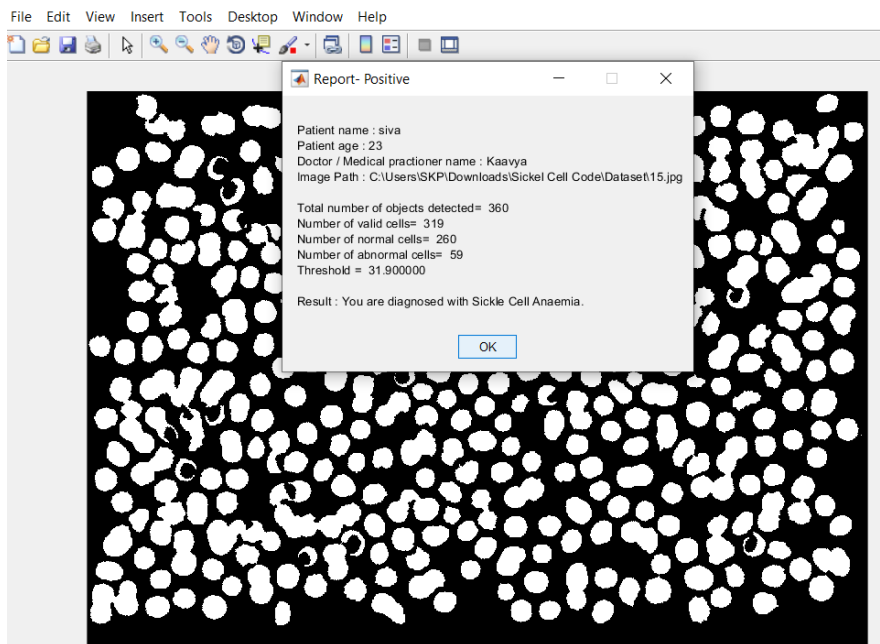


Fig 5.Positive Report.

V. CONCLUSION

Sickle cell anemia is a recessive hereditary malady in which abnormal erythrocytes are developed. Life expectancy is diminished by it. Detection of sickle cells from RBC within a shortest time correctly is the most challenging task. In this paper, an automated system has been developed which can be used for detection and classification of sickle cell anemia. The efficiency of algorithm is upgraded by threshold segmentation. Morphological operations are used to remove the imperfection cells from red blood cells. By analyzing the parameters, the features are extracted successfully. For classification there has used support vector machine (SVM). It has given very much satisfactory results. It is hoped that this system would prove helpful in medical sectors and save lives of people with high accuracy and high sensitivity.

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