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REVIEW ON RED BLOOD CELLS IDENTIFICATION TECHNIQUE USING IMAGE PROCESSING

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ABSTRACT

Sickle Cell anemia is a blood disorder which results form the abnormalities in red blood cells and shortens the life expectancy to 42 and 48 years for males and females respectively. It also causes pain, jaundice, shortness of breath, etc. The Presence of abnormal cells like sickle cell, ovalocyte, anisopoikilocyte are the parts of Sickle Cell Anemia. Sickle cell disease usually presenting in childs, occurs more commonly in people form parts of tropical and subtropical regions where malaria was very common. A healthy RBC. Due to low hemoglobin content majority of the sickle cells whose shape will look like crescent moon. An image processing algorithm is to automate the diagnosis of sickle cells present in thin blood smears is developed. Images are acquired employing a charge coupled device camera connected to a light-weight microscope. Clustering based segmentation techniques are wont to identify erythrocytes (red blood cells) and Sickle-cells present on microscopic slides. Image features supported texture. colour and therefore the geometry of the cells are generated, also as features that make use of a priori knowledge of the classification problem and mimic features employed by human technicians. The red blood corpuscle smears were obtained form. IG Hospital, Rourkela. This proposed image processing technique based identification of sickle-cells in anemic patient are going to be very helpful for automatic, sleek and effective diagnosis of the disease.

KEYWORDS: Anemia, Sickle cell anemia, Image Segmentation, Gray-Level Co-Occurrence Matrices (GLCM), K-means clustering

I. INTRODUCTION

Automated Sickle Cell Anaemia Detector is a Matlab application that will diagnose 'Sickle Cell Anaemia' (drepanocytosis) from microscopic images of the patient's blood smear. It uses advanced image processing techniques to analyze the shape of 'Red Blood Cells' which are primary indicators of the disease. Our ultimate goal however, lies in automation of the pathological examinations, thereby expediting the process of differential diagnosis. A red blood cell in normal physiological condition, is circular in front view and bi-concave in side view. Sickle cell anaemia is a hereditary blood disorder which primarily presents itself with high propensity for red blood cells to assume a cresentic or sickle-like shape. When the patient provides microscopic image of his/her blood sample to Automated Sickle Cell Anaemia Detector, it uses edge detection algorithms to scan for the presence of abnormally shaped red blood cells in it. The Automated Sickle Cell Anaemia Detector then proceeds to compare the ratio of normal RBC count to sickle shaped RBC count. A decision considering a threshold is then made to arrive at the conclusion to whether the patient is anaemic or not. The application also provides a detailed report of its result for further diagnostic purposes if required. It also provides appropriate recommendations based on it.

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(a) ANEMIA

Several different cell types are present in the cellular part of blood molecule. Red blood cells are one of the most important and the most numerous cell type. The white blood cells and platelets are the types of cell. The most common disorder of the blood is anemia. The "Anemia",word is Inspire from the ancient Greek word anaimia. which means "Lack of Blood". Red Blood Cells (RBCs) or resulting in lesser than possible because of reduction in normal quantity of haemoglobin in the blood. The Capicity of haemoglobin molecule can be decrease due to deformity or lack in numerical development and therefore the capicity oxygen decrease. Anemia is actually a sign of a disease process rather than being a disease itself. It can be either classified as acute or chronic. The symptoms of chronic anemia, begin slowly and progress gradually; whereas in acute anemia, symptoms can be abrupt and more distressing. Among many factors, nutritional (like vitamins and mineral deficiencies) and non-nutritional (like infection and haemoglobinopathies), that contribute to the onset of anemia; Iron Insuffiency and malaria plays a significant role. For men, anemia is typically defined as hemoglobin level of less than 13.5 g/dl and in women as hemoglobin of less than 12.0 g/dl.

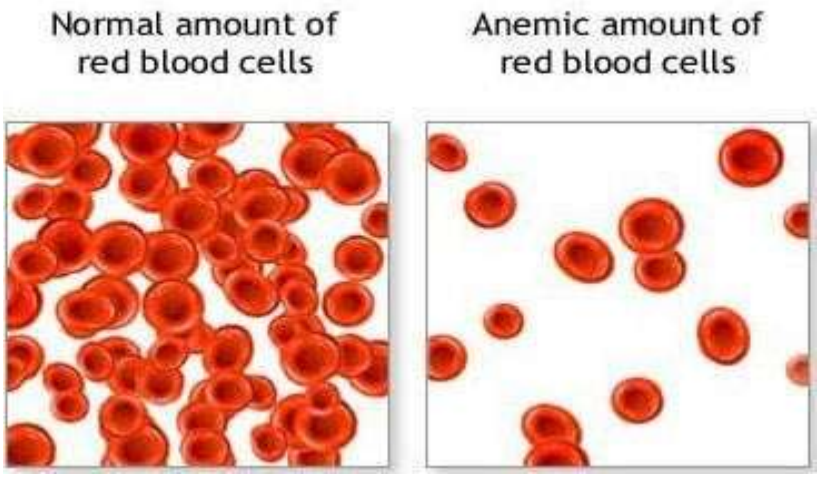

Fig-1: (a) Normal Blood Cell Image (b) Anemic Blood Cell

- **Anemia Causes:**

Many medical conditions cause anemia. Common causes are:

(i) **Anemia from active bleeding:** Loss of blood through heavy menstrual bleeding or wounds can cause anemia. Due to gastrointestinal ulcers or cancers such as cancer of the colon may slowly ooze blood and can also cause anemia.

(ii) **Iron Deficiency anemia:** The bone marrow needs iron to make red blood cells. In structure of the hemoglobin molecule Iron (Fe) plays an important role. Due to deficiency of food , if intake of iron less or incomplete the weakness can be cause such as anemia. This is called iron deficiency anemia. It can be cause when there are stomach ulcers or other sources of slow, chronic bleeding (colon cancer, uterine cancer, intestinal polyps, hemorrhoids, etc). In these situation chronic slow blood loss, iron is also lost from the body (as a part of blood) at a higher rate than normal and can result in iron-deficiency anemia.

(iii) **Anemia of chronic disease:** Any long-term medical conditions can results to anemia. The exact mechanism of this procedure in mysterious, but any long-standing and continuing medical condition such as a chronic infection or a cancer may cause this kind of anemia.

(iv) **Anemia related to kidney disease:** The kidneys release a hormone called the erythropoietin that helps the bone marrow make red blood cells. In people with long standing kidney disease, the production of this hormone is diminished, and this, in turn, shrinks the production of red blood cells, causing anemia.

(v) **Anemia related to pregnancy:** Deficiency of the relative concentration of red blood cells is lower, therefore Water weight and fluid gain during pregnancy dilutes the blood, which may be reflected as anemia since.

(vi) **Anemia related to poor nutrition:** Vitamins and minerals are required to make red blood cells. In addition to iron, vitamin B12 and folate (or folic acid) is required for the proper production of hemoglobin (Hgb). Scarcity in any of these may cause anemia because of insufficient creation of red blood cells. Due to low folate and low vitamin B12 levels Poor dietary intake is an important cause. Strict vegetarians who do not take sufficient vitamins are at risk to develop vitamin B12 insufficiency.

(vii) **Pernicious anemia:** There also may be a problem in the stomach or the intestines leading to poor absorption of vitamin B12. This may lead to anemia because of vitamin B12 insufficiency known as pernicious anemia.

(viii) **Sickle cell anemia:** In some individuals, the problem may be related to production of abnormal hemoglobin molecules. The hemoglobin problem is qualitative, or functional in this condition. Due to Abnormal hemoglobin molecules may cause problems in the integrity of the red blood cell structure and they may become crescent-shaped (sickle cells). There are different types of sickle cell anemia with different severity levels. It is Genetic and is more common in those of In African, Middle Eastern, and Mediterranean ancestry. In childhood people with sickle cell anemia can be diagnosed depending on the severity and symptoms of their disease.

(ix) **Other Causes**: Thalassemia, Alcoholism, Hemolysis and others related to edications.

(b) Sickle-Cell

- **Sickle-Cell Overview**

Sickle-cell disease (SCD), or sickle-cell anemia (SCA) or drepanocytosis, is an autosomal recessive genetic blood diseases with excess dominance, differentiation by red blood cells that as they anabnormal, stiff, sickle shape. Due to the change of haemoglobin gene the sickling cause, when a person inherits two abnormal genes (one from each parent) then there shape of RBC can be change, which is like crescent moon as shown in figure.

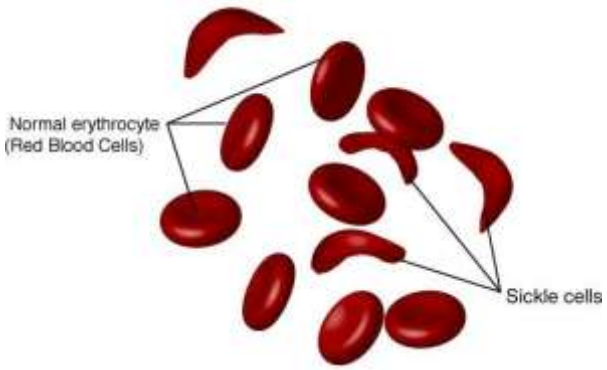

Fig-2: Sickle Cells and Normal Red Blood Cells

- **Causes of Sickle-Cell Disease :** Sickle cell Anemia is caused by an abnormal type of heamoglobin called Haemoglobins.
- The shape of red blood cells will be changed by hemoglobin S. The red blood cells shaped as crescents or sickles.
- The less oxygen will provided to the body's tissues from sickle-shaped cells.
- In small blood vessels they can also get stuck more easily and break into pieces that can interrupt healthy blood flow. Due to such problems less amount of oxygen flowing to the body even more.

From a microscopic blood smear image, one can filter out all the components in the human blood other than the RBCs and determine a relative numeric value for each RBC that will help us in estimating its shape and decide whether it is normal or not. Thus, the software can be used to diagnose sickle cell anemia from a microscopic image with high accuracy. Automated Sickle Cell Anemia Detector is such diagnostic software.

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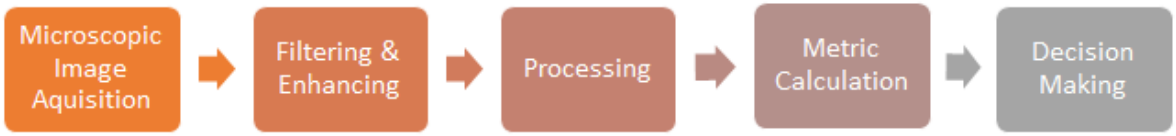

Fig-3: Image Processing Block diagram

Automated Sickle Cell Anemia Detector provides a solution that is not just fast and inexpensive, but also can be easily incorporated into routine blood-work performed at birth. It also expedites the diagnosis of sickle cell anemia in adult patients, by circumventing the lengthy manual blood examinations. Additionally, it resolves the possibility of human-induced error that may occur during manual testing.

II. LITERATURE REVIEW

Sickle cell anaemia is a well understood medical condition. There is no widely available standard cure. However there are certain treatments to prevent the symptoms and thus avoid complications resulting from it. These treatments require early detection as mentioned above. However there isn't any automated test for sickle cell anaemia. This presumably stems from insufficiency of literature or studies involving automation of diagnostic process. Correspondingly, literature involving automated detection of sickle celled disease remains considerably scarce.

One of such recherché studies published on Science Direct is 'Detection of Abnormal Findings in Human RBC in Diagnosing Sickle Cell Anemia Using Image Processing' authored by Pranati Rakshita and Kriti Bhowmikb [3]. This study treads along parallel ideologies as our project. The proposed methodology in it involves preprocessing, edge detection and region selection.

Preprocessing requires initially converting the blood smear image into a binary form. Then an adaptive filtering method is used to eliminate unwanted noise present in it. The filter of choice used in this paper was Weiner's filer. The next step is edge detection which demarcates boundaries for the red blood cells. The study approves the use of any of the following edge detectors: Sobel Operator, Robert's Operator, Canny Operator, LoG Operator, Zerocross Operator and Prewitt Operator [4]. The third step is region selection, wherein we measure properties of connection image components which satisfy certain predefined conditions. It is used to compute the shape measurements like the centroid, area, bounding box convexHull, convexArea, perimeter etc. An extensive use of properties area and perimeter is done. Area is a scalar value which represents the actual number of pixels in the region and perimeter is used to calculate the distance around the boundary of the region. In MATLAB, these measurements can be computed using the inbuilt function 'RegionProps'.

Using the measurements obtained, the study proposes a metric to determine the circularity of objects (which are the RBCs) in the image. This metric is defined as: (4*pi*area)/perimeter^2 [1]. The metric ranges from values of 0 to 1; 1 for a perfectly 2D circle, 0.785 for a 2D square and so on goes decreasing as the shape resembles less of a circle. So a typical RBC would have a metric higher than 0.82 whereas a sickle shaped RBC would have a much lower metric of about 0.4 – 0.5. This we obtain a clear distinction between different shapes of RBCs present.

Another approach suggested here is the use of Fuzzy C-means clustering. It is one of the commonly used methods for image segmentation and its success is mainly due to the introduction of fuzziness for the belongingness of each image pixels.

III. CONCLUSION

India is a country with a population of over 1.27 billion people. It is estimated that out of this, 200 million suffer from some kind of disease at any given point of time. On top of the world second largest sick population, a poor health-care funding and lack of R&D in medicine paints a deplorable picture of the prevalent health-care standard in our country. In such a scenario, our solution to sickle-celled disease is what we believe, an initiative in the right direction. By expediting the diagnostic processes, we not only seek to improve the health

individually but also curtail unnecessary industry-wide expenditure involved in long & manual laboratorial work. Furthermore, Automated Sickle Cell Anemia Detector, if successful as a consumer product, has the potential to open up a gateway to private research and development investment into automation in health-care sector. Such solutions that target the root causes are indispensable in improving the health-care standard in our country. All the main points of the research work are written in this section. Ensure that abstract and conclusion should not same. Graph and tables should not use in conclusion.

IV. REFERENCES

[1] D.J Weatherall, J.B Clegg, "Inherited haemoglobin disorders: an increasing global health problem" Bull. World Health Organ. 79: 704–12, 2001

[2] N Awasthy, K. C. Aggarwal, P. C. Goyal,M.S Prasad, M. Sharma, "Sickle cell disease: Experience of a tertiary care center in a nonendemic area" Ann Trop Med Public Health, 2008.

[3] P. Rakshita, K. Bhowmikb, "Detection of Abnormal Findings in Human RBC in Diagnosing Sickle Cell Anaemia Using Image Processing", International Conference on Computational Intelligence: Modeling, Techniques and Applications, Elsevier, 2013

[4] N. S. Aruna, S. Hariharan, "Edge Detection of Sickle Cells in Red Blood Cells", International Journal of Computer Science and Information Technologies, Vol. 5 (3) 4140-4144, 2014.

[5] S. S. Barpanda, "Use of Image Processing Techniques to Automatically Diagnose Sickle-Cell Anemia Present in Red Blood Cells Smear", NIIT Rourkela, 2013.

[6] NCMH Background Papers—Burden of Disease in India (New Delhi, India), September 2005, Ministry of Health & Family Welfare, Nirman Bhawan, Maulana Azad Road, New Delhi 110011, India.