

Determination and Classification of Blood Groups Using Image Processing Technique

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Abstract - It is exceptionally significant to decide human blood types in a crisis circumstance. Be that as it may, as per the present framework the discovery of blood gather is moderate and furthermore not exact. At present, human blood groups are resolved physically through slide test. It comprises of gathering of blood tests and blending with particular reagents keeping in mind the end goal to decide the agglutination. Also, these can be recognized by the lab experts in the research center, when the test handles with the huge examples physically it might prompt human blunders. Assurance of fitting blood classification inside short interim of time assumes fundamental part in blood transfusion, donation, accident and other crisis circumstances. The point of this framework is to give the outcome inside the briefest conceivable time without the human mistakes utilizing image processing procedures.

Keywords: Antigen, Agglutination, Blood Samples, Thresholding, Standard deviation

1. INTRODUCTION

Blood is a body liquid in people and different creatures that conveys fundamental substances, for example, supplements and oxygen to the cells and transports metabolic waste items from those same cells. Blood gather distinguishing proof is important to guarantee the blood transfusion securely. On account of crisis blood transfusion, quick recognizable proof is basic, straightforwardly identified with the survival of the patient. In the current years, with the quick improvement of picture handling innovation, the innovative work of programmed assurance framework in light of machine vision innovation has turned into a critical need in the field of blood aggregate distinguishing proof. A blood classification (likewise called a blood gathering) is an arrangement of blood in view of the nearness and nonattendance of antibodies and furthermore in light of the nearness or nonappearance of acquired antigenic substances on the surface of red platelets (RBCs). These antigens might be proteins, sugars, glycoproteins, or glycolipids, contingent upon the blood bunch framework. A portion of these antigens are additionally present on the surface of different kinds of cells of different tissues. In human blood there are two antigens and antibodies. The two antigens are antigen An and antigen B. The two

antibodies are immunizer An and neutralizer B. The antigens are available on the red platelets and the antibodies in the serum. Concerning antigen property of the blood every single person can be characterized into 4 gatherings, those with antigen An (assemble A), those with antigen B (amass B), those with both antigen An and B (aggregate AB) and those with neither one of the antigens (bunch O). The Rh framework (Rh meaning Rhesus) is the second most critical blood-assemble framework in human-blood transfusion.

Patients ought to in a perfect world get their own particular blood or sort particular blood items to limit the shot of a transfusion response. Dangers can be additionally lessened by cross-coordinating blood, however this might be skipped when blood is required for a crisis. Cross-coordinating includes blending an example of the beneficiary's serum with an example of the benefactor's red platelets and checking if the blend agglutinates, or frames bunches. In the event that agglutination isn't clear by coordinate vision, blood donation center specialists normally check for agglutination with a magnifying instrument. On the off chance that agglutination happens, that specific contributor's blood can't be transfused to that specific beneficiary.

2. EXISTING BLOOD GROUP TEST

To work out blood group of a person, red cells of that person are mixed with different antibody solutions. If, for example, the solution contains anti-A antibodies and the person has A antigens on cells, it will clump together. If the blood react to both anti-A and anti-B antibodies, it is blood group AB. If the blood does not react to any of the anti-A or anti-B antibodies, it is blood group O. A series of tests with different types of antibody can be used to determine blood group. In existing framework, blood gather is resolved physically. In this framework, including arrangements, for example, hostile to Antigen-A, Antigen-B, Antigen-D to the three examples of blood occurred. After some time, agglutination might possibly happen. Contingent on the agglutination, blood gathering can be controlled by the individual physically. Inconveniences of this framework are more odds of human blunders are conceivable. No one but specialists can tell the blood classification by observing at the agglutination procedure.

3. PROPOSED SYSTEM

In the proposed system, reagents are mixed with the three samples of the blood taken on the slide. After some time, agglutination may or may not occur. After the formation of agglutination, the slide is captured as an image and is allowed to process under MATLAB image processing. By using this system human errors can be reduced. Image processing techniques used for determination of the blood types are

- Pre-processing techniques
- Thresholding
- Morphological operations
- HSL Luminance plane
- Quantification

In this proposed work different pre-handling systems, for example, shading plane extraction, dim and parallel changes were utilized. The captured pictures should have same intensity and they are preprocessed to a similar size for handling. The point of pre-preparing is a change of the picture information that smothers unwilling mutilations or upgrades some picture highlights imperative for additionally handling, albeit geometric changes of pictures (e.g. turn, scaling, interpretation). Filtering contains various picture channels for some applications, smoothing, sharpening, evacuating clamor, and edge discovery. Some notable filtering techniques for honing and obscuring might be utilized at the pre-handling stage.

3.1 Types of Thresholding

Thresholding is the simplest method of image segmentation. From a grayscale image, thresholding can be used to create binary images.

Local and Global thresholding

Thresholding may be viewed as an operation that involves tests against a function T of the form:

$$T = T[x, y, p(x, y), f(x, y)]$$

Where $f(x, y)$ is the gray level, and $p(x, y)$ is some local property.

Simple thresholding schemes compare each pixels gray level with a single global threshold. This is mentioned as Global Thresholding.

If T rely on both $f(x, y)$ and $p(x, y)$ then this is referred to a Local Thresholding.

Basic Global Thresholding includes:

- 1) Select an underlying evaluation for T

- 2) Segment the picture utilizing T. This will create two gatherings of pixels. G1 comprising of all pixels with dark level values $>T$ and G2 comprising of pixels with values $\leq T$.

- 3) Compute the normal dark level qualities mean1 and mean2 for the pixels in areas G1 and G2.

- 4) Compute another limit esteem

$$T = (1/2) (\text{mean1} + \text{mean2})$$

- 5) Repeat stages 2 through 4 until distinction in T in progressive cycles is littler than a predefined parameter T.

Variable or local thresholding

Global thresholding strategies commonly fall flat when the foundation brightening is exceedingly nonuniform. One answer for this issue is to endeavor to assess the shading capacity, utilize it to adjust for the nonuniform force example, and after that limit the picture utilizing any worldwide thresholding techniques. Another approach is utilized to make up for abnormalities in enlightenment, or in situations where there is in excess of one overwhelming item force, is to utilize variable thresholding. This approach processes an edge an incentive at each point (x,y) in the picture, in view of at least one determined properties of the pixels in an area of (x,y) .

3.2 MORPHOLOGICAL OPERATIONS

Morphological activities are easy to utilize and works on the premise of set hypothesis. The target of utilizing morphological activities is to evacuate the flaws in the structure of picture. The vast majority of the tasks utilized here are mix of two procedures, dilation and Erosion. The task utilizes a little framework structure called as organizing component. The shape and size of the organizing component has noteworthy effect on the last outcome.

3.2.1 Dilation

Dilation is the procedure that develops or thickens the items in a picture and is known as organizing component. Graphically, organizing components can be spoken to either by a matrix of 0s and 1s or as an arrangement of frontal area pixels. Widening adds pixels to the limits of articles in a picture, while erosion evacuates pixels on question limits. The number of pixels added or removed from the objects in an image depends on the size and shape of the structuring element used to process the image.

3.2.2 Erosion

Erosion shrivels or diminishes protests in twofold picture. It expels pixels on question limits. In the morphological

widening and disintegration tasks, the condition of any given pixel in the yield picture is dictated by applying a manage to the relating pixel and its neighbors in the info picture. The rule used to process the pixels characterizes the activity as an dilation or erosion.

3.3 HSL plane

HSL abbreviates to Hue, Saturation and Luminance. Hue is the degree on the color wheel, their precise measurement, beginning at the red essential at 0°, going through the green essential at 120° and the blue essential at 240°, and after that wrapping back to red at 360°. Saturation is the rate esteem where 100% is the full shading. Lightness is additionally a rate esteem where 0% is dull (dark), 100% is light (white) and 50% is the normal. RGB gadgets has remarkable HSL and HSV spaces.

3.4 Quantification

Quantification is the measure of quantity. The calculation of an agglutination area based on the white pixel density, mean and standard deviation. Based on the area calculated for the image captured after slide test the blood group can be identified.

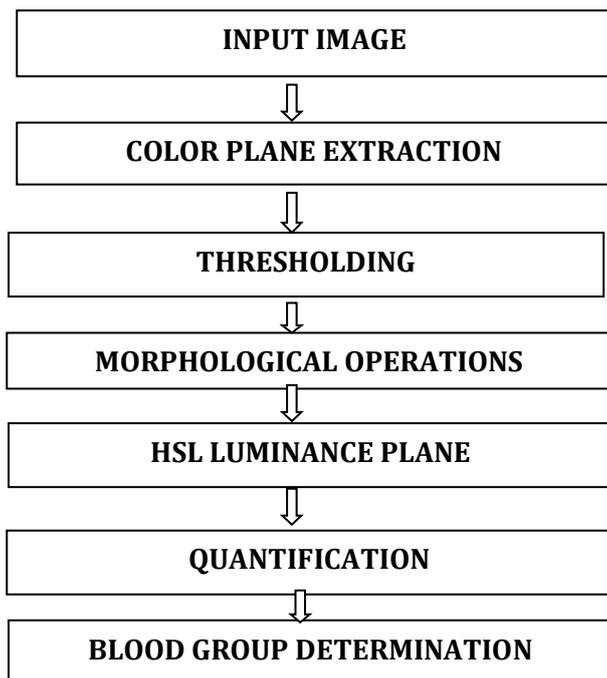


Fig 1: Steps for determining blood types

4. METHODOLOGY AND ANALYSIS

The image for analysis is collected from the laboratory which is captured after the slide test stored in JPEG format. These images are pre-processed using color plane extraction. The original slide test image is shown in figure.



Fig 2: Input image

4.1 COLOR PLANE EXTRACTION

The color plane contains the color information in images. The foreground and background color of each image has different values. In this work just gray shading segment is separated on the grounds that it contains the most extreme incentive in the RGB shading plane. The green plane extraction is appeared in figure.

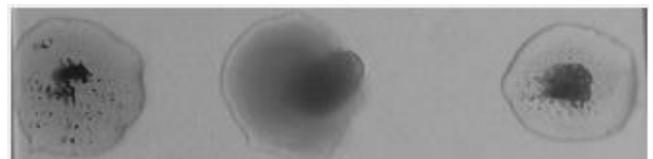


Fig 3: Color plane extraction

4.2 Thresholding

Image thresholding is a straightforward, yet successful, method for parceling a picture into a foreground and background. This picture investigation system is a sort of picture division that isolates objects by changing over grayscale pictures into binary pictures.



Fig 4: Thresholding

4.3 Quadratic Integral Ratio (QIR)

Integral Ratio method is a first stage in a multi stage thresholding approach. In the principal organize, the picture is isolated into three subimages (rather than two): foreground, background, and a fuzzy subimage where it is difficult to decide if a pixel really has a place with the foreground or the background. Figure 4 demonstrates the three subimages inside the intensity histogram. Two imperative parameters that differentiate the subimages are A, which isolates the foreground view and the fuzzy subimage, and C, which isolate the fuzzy and the background subimage.

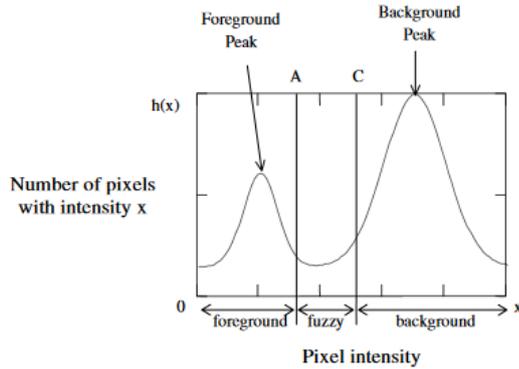


Fig 5: Quadratic Integral Ratio

If a pixel's intensity is less than or equal to A, the pixel belongs to the foreground and if a pixel's intensity is greater than or equal to C, the pixel belongs to the background. If, however, a pixel has an intensity greater than A but less than C, it belongs to the fuzzy subimage and more information from the image is needed to decide whether it actually belongs to the foreground or the background.

4.4 MORPHOLOGY

It incorporates pre or post handling activities, for example, dilation, erosion, morphological separating and granulometry. The major activities are dilation and erosion. The erosion activity consistently lessens the extent of the items in connection to their experience and dilation extends the span of the articles. By utilizing enlargement and disintegration, auxiliary tasks like opening and filling should be possible. The fundamental impact of an opening is to some degree like disintegration in that it tends to evacuate a portion of the closer view (brilliant) pixels from the edges of locales of frontal area pixels. Be that as it may it is less damaging than disintegration when all is said in done. Likewise with other morphological administrators, the correct activity is dictated by an organizing component. Shutting task is utilized to fill the openings and holes. It is the procedure of enlargement which is trailed by disintegration. It can be watched that the divided picture is filled utilizing task is appeared in Figure.



Fig 6: Filling Holes

The morphological open operation is an erosion followed by dilation, using the same structuring element for both operations. Opening operation is used to smoothens the contours of cells and parasites. It can be

noticed that it smoothens the contours of cells by removing small objects is shown in Figure



Fig 7: Removing small objects

4.5 HSL Luminance plane

HSL Stands for hue, saturation and lightness. In this cylindrical coordinate representation of points in RGB color plane is used. The result of HSL plane is shown in figure

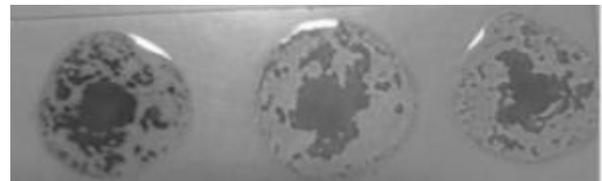


Fig 8: HSL Luminance plane

4.6 Quantification

Quantify function is defined as a expression or measure of quantity. It measures area, mean, standard deviation, minimum and maximum values of pixel intensity. Based on the pixel density in the calculated area the blood group can be identified. The result of quantification is shown in figure.



Fig 9: Quantification

5. CONCLUSION

In this proposed work different pre-handling systems, for example, shading plane extraction, dim and twofold transformations were utilized. The caught pictures ought to have same power and they are preprocessed to a similar size for handling. The point of pre-handling is a change of the picture information that smothers unwilling twists or improves some picture highlights critical for additionally preparing, albeit geometric changes of pictures (e.g. revolution, scaling, interpretation). Sifting contains various picture channels for some, applications, smoothing,

honing, evacuating commotion, and edge location. Some notable separating strategies for honing and obscuring might be utilized at the pre-handling stage.

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