Identifying the blood group using Image Processing

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Abstract - *Identifying blood group is very important in emergency cases. The method based on image processing technology at present is very quick and it has wide uses in biotechnological field. In this paper, we are proposing the accurate and fast identification of blood group based on image processing technology. Sometimes the human eye may give us an inaccurate result, but if we detect the blood group using image processing technology then the small error in the results which are calculated and given by human is reduced. Using image processing technology, we can give the best result as this technology is growing faster and faster. This method can quickly and accurately classify the blood group.*

***Key Words*: ABO blood group, Threshold Segmentation, HSV, Histogram, Binary image, Clusters, Patch.**

1. INTRODUCTION

Blood group identification is the key step to ensure blood transfusion safety. In the case of emergency blood transfusion, rapid identification of the type of blood is essential, directly related to the survival of the patient. The ABO blood group system is found and identified as the first human blood group system by Austria Rand Steiner in early nineteenth Century. Blood groups are divided into four types i.e. A, B, AB and O. ABO blood group detection follows the agglutination method and then it goes for a machine recognition. The agglutination reaction means that occurred reaction between the antibody and the antigen, indicating the presence of the antigen.

1.1 Literature Survey

Mehedi Talukder ,Md Rabiul Islam etc. all in year October 2015 on "Improvement of accuracy of human blood groups." He has suggested that, the blood group can be detected by using image processing using plate method. This method gives the accurate result.

Pravin manikandan, Ravindra G, etc. all in year February 2017 on "Determination and classification of blood type using image processing techniques." He has suggested that, the type of blood group can be detected by using image processing with method such as thresholding, morphological processing, quantification, etc. It is effective and efficient method to detect the agglutination and determines the blood type of the patient accurately.

Yue fang dong, etc. all in year 2017 on "ABO blood group determination based on image processing technology." He has suggested that, The blood group can be detected by using image processing with method such as measurement of linear primitives and circular primitives, color information extraction, object segmentation based on niblack, feature extraction, etc. A fast, accurate and robust blood group judgment method is proposed for the rapid and accurate identification of blood type in the case of emergency transfusion.

1.2 Comparative Analysis

Table-1: Analysis of previous papers

Title	Year Published	Techniq-ue's Used	Algor-ithm	Demerits
Improve-ment of accuracy of human blood groups.	Oct 2015	Name plate	Thre-sholding	Requires 30 minutes which is excessive especially in emergency situation
Determi-nation and classifi-cation of blood types	Feb 2017	Morpholo-gical process-ing	Quantifi-cation	More chances of human error are possible only experts can tell the blood type by seeing at the agglutina-tion process.
ABO blood group detection based on image process-ing techno-logy	Feb 2017	Feature extraction	Niblack segment-ation, Otsu algori-thm	Gives accurate result but time consuming.

2. EXISTING SYSTEM

In today's world, the blood group is identified on the basis of microscope vision. It may gives wrong result as the human may be incorrect due to the deficiency in human beings, but we can reduce this errors by doing the same process on the basis of image processing at the fast speed without any wrong interpretation.

3. PROBLEM DEFINITION

1) Improvement of accuracy of human blood group

In this system, it has disadvantage of requiring 30 minutes, which is excessive especially in emergency situation.

2) Determination and classification of blood type using image processing

Disadvantage of this system are more chances of human errors are possible, only experts can tell the blood type by seeing at the agglutination process.

3) ABO blood group detection based on image processing technology

In this Paper, method gives accurate result but it takes more time to generate the result i.e. finding the blood type on the basis of image processing techniques used in this project.

We are using some special techniques of image processing like detection of background and cluster detection. The final blood group can be detected on the basis of number of clusters and feature detection of the image. Due to this, we get the accurate result without any expert by avoiding human errors within short period of time. The techniques used in our projects are morphological processing, finding the biggest cluster using cluster detection, and background color detection using HSV luminance method and after this, we are going to take a decision of cluster or patch to find the blood group of the image. We also plot the histogram just to verify the distribution of colors in the image.

4. PROPOSED SYSTEM

The digital images of blood samples are obtained from the hospital/laboratory consisting of a color image composed of three samples of blood. These images are processed using image processing techniques namely feature extraction, clustering, HSV luminance, etc.

Fig -1: Sample image for further processing

4.1 Resize the Image

In this process, we will resize the image and enhance the quality of image by converting image into bitmap image. Bitmap image is the type of memory organization or image file format used to store digital image.

4.2 HSV Luminance

HSV (Hue, Saturation, and Value) are two alternative representations of the RGB color model, designed in the 1970s by computer graphics researchers to more closely align with the way human vision perceives color-making attributes. In these models, colors of each hue are arranged in a radial slice, around a central axis of neutral colors which ranges from black at the bottom to white at the top. The HSV representation models the way paints of different colors mix together, with the saturation dimension resembling various shades of brightly colored paint, and the value dimension resembling the mixture of those paints with varying amounts of black or white paint.

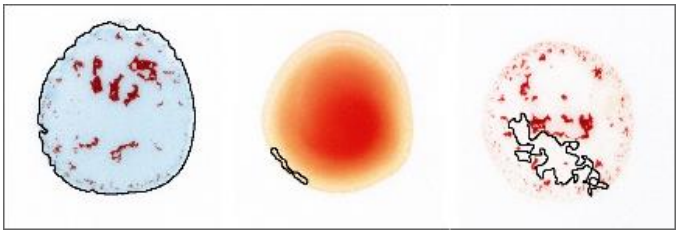

Fig -2: Background color detection

4.3 Morphological Operation

Morphology is a tool of extracting image components that are useful in the representation and description of region shape, such as boundaries, skeletons, and the convex hull. In morphological operation, there are two fundamental operations such as dilation and erosion, in terms of the union of an image with translated shape called a structuring element. This is a fundamental step in extracting objects from an image for subsequent analysis. The fundamental operations in morphological operations can be listed as

4.3.1 Erosion

Erosion is one of the two basic operators in the area of mathematical morphology. It is typically applied to binary images, but there are versions that work on grayscale images. The basic effect of the operator on a binary image is to erode away the boundaries of regions of foreground pixels (*i.e.* white pixels, typically). Thus areas of foreground pixels shrink in size, and holes within those areas become larger.

4.3.2 Dilation

Dilation is the process that grows or thickens the objects in an image and is known as structuring element. Graphically, structuring elements can be represented either by a matrix of 0s and 1s or as a set of foreground pixels.

4.3.3 Smooth Gaussian

The Gaussian smoothing operator is a 2-D convolution operator that is used to `blur' images and remove detail and noise. In this sense it is similar to the mean filter, but it uses a different kernel that represents the shape of a Gaussian (`bell-shaped') hump.

4.3.4 Threshold Binary

The simplest thresholding methods replace each pixel in an image with a black pixel if the image intensity $I_{i,j}$ is less than some fixed constant T ($I_{i,j}$<T), or a white pixel if the image

intensity is greater than that constant. In the example image on the right, this results in the dark tree becoming completely black, and the white snow becoming completely white.

4.3.5 Blob Detection

4.3.5.1 Finding a counter

In this method, the blob in the image is detected using blob detection methods like Counter detection in image processing.

4.3.5.2 Classification between Cluster and Patch

In this method, we classify the cluster and patch to identify the blood group by determining the area of a cluster.

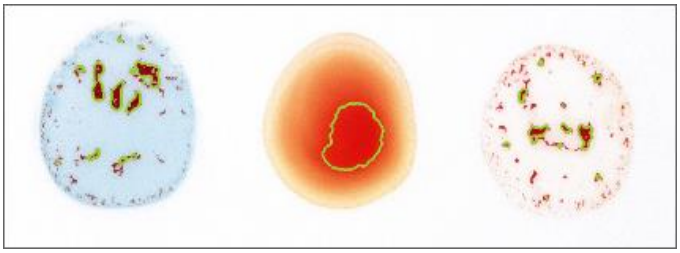

Fig -3: Detection of Cluster OR Patch

4.4 Histogram

Histogram is a graph of number of pixels versus the Quantity of pixels. The color histogram can be built for any kind of color space, although the term is more often used for three-dimensional spaces like RGB or HSV. For monochromatic images, the term intensity histogram may be used instead. For multi-spectral images, where each pixel is represented by an arbitrary number of measurements (for example, beyond the three measurements in RGB), the color histogram is N-dimensional, with N being the number of measurements taken. Each measurement has its own wavelength range of the light spectrum, some of which may be outside the visible spectrum.

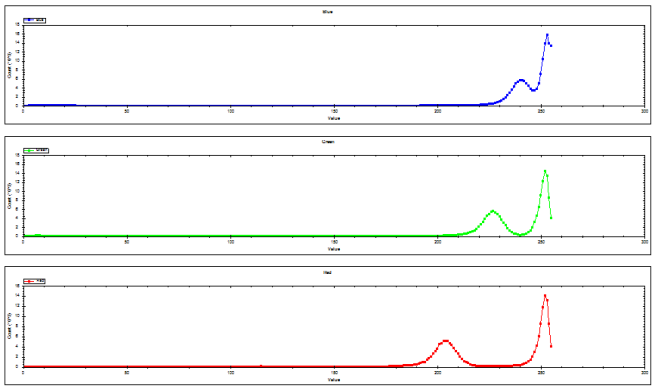

fig -4: Histogram

5. IMPLEMENTATION DETAILS

The system is developed in Visual studio using the techniques of image processing and opencv methods. The user interface is developed using opencv and the implementation of identification of the blood group is processed using image processing techniques.

6. RESULT ANALYSIS

We first detect the background color using Image processing technique like HSV luminance plane to detect background color. Range to detect cluster or patch on the basis of area of the agglutination of the blood. Range to detect cluster or patch is between 0 to 255 of HSV Luminance plane method and it should be as follows:

Table-2: To detect Cluster or patch

0	255
50	255
0	230

The final result is calculated on the basis of combination of cluster and patch of the given three images which is as follows:

Table-3: Identification of blood group on the basis of combination of cluster and patch of three images

Combination of cluster and patch			Result as a blood group
C	P	C	A
P	C	C	B
C	C	C	AB
P	P	P	O

7. CONCLUSIONS

A fast, accurate and robust blood group judgment method is proposed for the rapid and accurate identification of blood types in the case of emergency transfusion.

A large number of experiments show that this method can quickly and accurately identify whether the serum and antibody agglutination reaction, and then get blood type determination, to meet the needs of automated rapid blood type analyser.

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