Software Requirements Specification

for

Project

DETREMINATION OF BLOOD GROUP USING IMAGE PROCESSING WITHOUT TEST WORKING SOLUTION

Table of Contents

Table of Contents ii

Revision History ii

1. Introduction 1

1.1 Purpose 1

1.2 Document Conventions 1

1.3 Intended Audience and Reading Suggestions 1

1.4 Product Scope 1

1.5 References 1

2. Overall Description 2

2.1 Product Perspective 2

2.2 Product Functions 2

2.3 User Classes and Characteristics 2

2.4 Operating Environment 2

2.5 Design and Implementation Constraints 2

2.6 User Documentation 2

2.7 Assumptions and Dependencies 3

3. External Interface Requirements 3

3.1 User Interfaces 3

3.2 Hardware Interfaces 3

3.3 Software Interfaces 3

3.4 Communications Interfaces 3

4. System Features 4

4.1 System Feature 1 4

4.2 System Feature 2 (and so on) 4

5. Other Nonfunctional Requirements 4

5.1 Performance Requirements 4

5.2 Safety Requirements 5

5.3 Security Requirements 5

5.4 Software Quality Attributes 5

5.5 Business Rules 5

6. Other Requirements 5

Appendix A: Glossary 5

Appendix B: Analysis Models 5

Appendix C: To Be Determined List 6

Revision History

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| **Name** | **Date** | **Reason For Changes** | **Version** |
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## Abstract

## Blood group determination is done before a blood transfusion in emergency situations or while checking blood group of a person for donation. It is a fast and easy way to ensure that you receive the right kind of blood during surgery or after an injury. If you are given incompatible blood, it can be fatal resulting in agglutination. Hence, before the blood transfusion it becomes necessary to perform certain tests. Determining blood group is one of the tests before transfusing the blood during emergency situations. Microscopy has intermittently proved inefficient since it is time consuming and also the results are difficult to reproduce. Also, experts are needed. Due to these reasons, automation of evaluation process is of high importance.Based on the processing of digital images acquired during the slide test, a software is developed in image processing to determine the blood group during emergency situations without any error. The images obtained are then processed, occurrence of blood clumping is checked and accordingly the blood group is determined. Thus, using image processing techniques, this developed automated method will be useful in determining the blood groupDocument Conventions

## PROBLEMSTATEMENT:

## Blood typing is a method to tell what type of blood you have. Blood typing is done so you can safely donate your blood or receive a blood transfusion. It is also done to see if you have a substance called Rh factor on the surface of your red blood cells .Your blood type is based on whether or not certain proteins are on your red blood cells. These proteins are called antigens. Your blood type (or blood group) depends on what types your parents passed down to you. Blood is often grouped according to the ABO blood typing system.

## The 4 major blood types are:

TYPE A

TYPE B

TYPE AB

TYPE OPRODUCT FUNCTIONS

## OBJECTIVES:

## The objective of blood typing is to determine a person's specific blood type, which is based on the presence or absence of certain antigens (proteins) on the surface of their red blood cells. This information is essential for medical purposes, including safe blood transfusions and organ transplants, to ensure compatibility and prevent adverse reactions between donors and recipients. Blood typing also helps identify the presence or absence of the Rh factor (Rhesus factor) on red blood cells, further refining blood compatibility assessments. Ultimately, the objective is to improve patient safety and the effectiveness of medical procedures involving the transfer of blood and blood-related products.Operating Environment

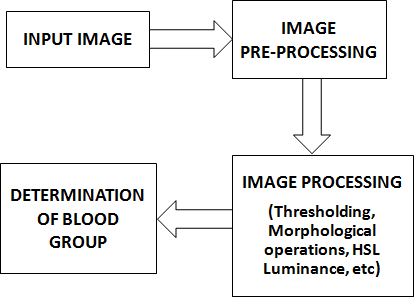
**PROPOSED SYSTEM**

Firstly, three samples of blood are mixed with three different reagents namely anti-A, anti-B and anti-D are taken on a slide. After sometime, agglutination may or may not occur. After the occurence of agglutination, the slide containing three samples of blood mixed with three different reagents is captured as an image and allowed to process in MATLAB image processing toolbox. This system reduces the chances of false detection of a blood group.

**Image processing techniques used for blood group detection :**

* 1. Pre-processing techniques
  2. Thresholding
  3. Morphological operations
  4. HSL plane
  5. Quantification

Figure clearly explains the block diagram of the system



## Data collection

Three samples of blood are taken on a slide, each mixed with reagent anti-A, anti-B, anti-D respectively and images of slide are taken. These images are digital images stored in JPEG format and they are pre-processed using colour plane extraction.

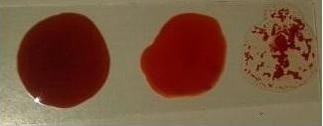
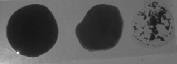
The original slide test image used as input is as shown in figure .

Fig.Input image

## Colour plane extraction

The colour plane contains colour information in images. ‘Comparing’ sections in an image is the concept used in image processing. Comparison in Gray scale involves simple scalar algebraic operators. In colour plane extraction, we first convert the RGB image in to a gray image and then filter the obtained result using median filtering.

Figure shows the result of pre-processed image obtained in colour plane extraction.



## Thresholding

Thresholding operation in image processing is used to create binary images. The gray scale samples are clustered into two parts as background and object.

In this case, multilevel thresholding is performed using Otsu’s method. More than one threshold are determined for a given image and segmentation is done creating certain regions. One background with many objects is the result of this multilevel thresholding. It is a clustering-based image thresholding.

Figure shows the result of multilevel thresholding using Otsu’s method

**Morphological Operations**

Morphology is a tool of extracting image components that are useful in the representation. 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. Here, closing operation is performed where dilation is followed by erosion. Also, edge detection using Canny edge detection technique is performed. Morphological operations are used to eliminate noise spikes and ragged edges.

Figure shows the result of closing operation (segmented image).

.Segmented image



Edge detection

## HSL plane

HSL plane stands for Hue, Saturation and Luminance. It is the representation of RGB colour model. Hue is expressed in a degree around a colour wheel, while saturation and brightness are set as a percentage. Figure 8 shows the result of HSL plane



HSL plane

**Sample Source Code:**

import org.opencv.core.Core;  
import org.opencv.core.CvType;  
import org.opencv.core.Mat;  
import org.opencv.core.MatOfFloat;  
import org.opencv.core.MatOfInt;  
import org.opencv.core.Scalar;  
import org.opencv.core.Size;  
import org.opencv.core.CvType;  
import org.opencv.core.CvType.CV\_8U;  
import org.opencv.imgcodecs.Imgcodecs;  
import org.opencv.imgproc.Imgproc;  
  
public class BloodGroupDetection {  
  
    static {  
        System.loadLibrary(Core.NATIVE\_LIBRARY\_NAME);  
    }  
  
    public static void main(String[] args) {  
        // Load the image  
        String imagePath = "path/to/your/image.jpg";  
        Mat image = Imgcodecs.imread(imagePath);  
  
        // Convert the image to HSV color space  
        Mat hsvImage = new Mat();  
        Imgproc.cvtColor(image, hsvImage, Imgproc.COLOR\_BGR2HSV);  
  
        // Define the range of red color in HSV  
        Scalar lowerRed = new Scalar(0, 100, 100);  
        Scalar upperRed = new Scalar(10, 255, 255);  
  
        // Create a mask for red color  
        Mat mask = new Mat();  
        Core.inRange(hsvImage, lowerRed, upperRed, mask);  
  
        // Apply morphological operations to remove noise  
        Mat kernel = Imgproc.getStructuringElement(Imgproc.MORPH\_RECT, new Size(5, 5));  
        Imgproc.morphologyEx(mask, mask, Imgproc.MORPH\_OPEN, kernel);  
        Imgproc.morphologyEx(mask, mask, Imgproc.MORPH\_CLOSE, kernel);  
  
        // Find contours in the mask  
        Mat contoursImage = image.clone();  
        Imgproc.findContours(mask, contours, new Mat(), Imgproc.RETR\_EXTERNAL, Imgproc.CHAIN\_APPROX\_SIMPLE);  
  
        // Loop through the contours and determine blood group based on the characteristics  
        for (int i = 0; i < contours.size(); i++) {  
            MatOfPoint contour = contours.get(i);  
            double area = Imgproc.contourArea(contour);  
  
            // Add your logic to determine blood group based on contour area or other features  
            // You may need more sophisticated techniques depending on your specific case  
            // For simplicity, this example just prints the area of each contour  
            System.out.println("Contour " + i + " Area: " + area);  
        }  
    }  
}

**Reference Objected And Figures BY:**

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