Report On

Blood Group Detection

Submitted in partial fulfillment of the requirements of the Cloud Computing
Course project in
Semester VI of Third Year Computer Engineering

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Department of Computer Engineering

(A.Y. 2022-23)

Vidyavardhini's College of Engineering & Technology

Department of Computer Engineering

CERTIFICATE

This is to certify that the Mini Project entitled "**Blood Group Detection"** is a bonafide work of **Dream Patel(59)**, **Hardik Nikam(16)**, **Jay Prajapati(19), Pranav Maurya(28)** submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of **"Bachelor of Engineering"** in Semester VI of Third Year **"Computer Engineering" .**

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Dr. Swapna Borde
Mentor

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Dr Megha Trivedi
Head of Department

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Dr. H.V. Vankudre
Principal

Vidyavardhini's College of Engineering & Technology

Department of Computer Engineering

Mini Project Approval

This Mini Project entitled "**Blood Group Detection"** by **Dream Patel (59), Hardik Nikam (16), Jay Prajapati (19), Pranav Maurya (28)** is approved for the degree of **Bachelor of Engineering** in in Semester VI of Third Year **Computer Engineering .**

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Examiners

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2……
(External Examiner name & Sign)

Date:

Place:

Contents

Abstract ii

Acknowledgments iii

List of Abbreviations iv

List of Figures v

List of Tables vi

List of Symbols vii

1 Introduction 1

1.1 Introduction

1.2 Problem Statement & Objectives

1.3 Scope

2 Literature Survey 11

2.1 Survey of Existing System/**SRS**

2.2 Limitation Existing system or Research gap

2.3 Mini Project Contribution

3 Proposed System (eg. New Approach of Data Summarization) 18

3.1 Introduction

3.2 Architecture/ Framework/Block diagram

3.3 Algorithm and Process Design

3.4 Details of Hardware & Software

3.5 Experiment and Results for Validation and Verification

3.6 Conclusion and Future work.

References 32

4 Annexure

4.1 **Published Paper /Camera Ready Paper/ Business pitch/proof of concept**

Abstract

Blood group detection is a crucial step in blood transfusion that requires skilled technicians and is time-consuming. This project proposes an automated system for blood group detection using image processing techniques. The system involves capturing blood sample images, enhancing their quality, segmenting blood cells, detecting individual cells, and extracting relevant features such as size, shape, and color. The features are then preprocessed, selected, and fed into a classification algorithm to predict the blood group. The system's performance is evaluated using metrics such as accuracy, precision, recall, and F1 score. The proposed system can potentially be implemented in blood banks and hospitals, providing faster and automated blood group detection, reducing the dependence on skilled technicians, and enhancing the overall efficiency of the blood transfusion process.

ACKNOWLEDGEMENT

We would like to express our special thanks and gratitude to our Institute, **Vidyavardhini's College of Engineering and Technology**, our principal **Dr. H.V. Vankundre**, our Head of Department **Dr. Megha Trivedi** and our Project Guide **Dr. Swapna Borde** who gave us this valuable opportunity to develop this mini project on the topic: Blood Group Detection. This project has greatly helped us in expanding our core of knowledge in Image Processing and some segmentation techniques. It has provided us a precious opportunity to take a hands-on experience and showcase our skills. We are also thankful to each of us because everyone of us aided to complete this project in a limited frame of time.

1. Introduction

1.1 Introduction

- Blood transfusion is a crucial aspect of modern medical care, often required in emergencies, surgeries, and treatments for various diseases. One of the critical steps in blood transfusion is the determination of the blood group of the donor and the recipient, which ensures that the transfused blood is compatible and does not result in adverse reactions. Traditional methods of blood group detection involve manual techniques that are time-consuming, labor-intensive, and require skilled technicians.

- This project proposes an automated system for blood group detection using image processing techniques. The system involves capturing blood sample images, enhancing their quality, segmenting blood cells, detecting individual cells, and extracting relevant features such as size, shape, and color. The features are then preprocessed, selected, and fed into a classification algorithm to predict the blood group. The proposed system can potentially be implemented in blood banks and hospitals, providing faster and automated blood group detection, reducing the dependence on skilled technicians, and enhancing the overall efficiency of the blood transfusion process.

- This project aims to contribute to the advancement of medical technology by proposing an efficient and reliable system for blood group detection, which can potentially save lives and improve the quality of healthcare.

1.2 Problem Statement & Objectives

❖ Problem Statement

- Blood transfusion is a life-saving process that requires the donor's and recipient's blood groups to match. Traditional methods of blood group detection involve manual techniques that are time-consuming, labor-intensive, and require skilled technicians. These methods can result in errors and inconsistencies, leading to adverse reactions and complications during transfusions.

❖ **Objectives**

The main objective of this project is to develop an automated system for blood group detection using image processing techniques.

- To capture and enhance the quality of blood sample images using image processing techniques.
- To segment blood cells from the background and detect individual cells using segmentation and detection algorithms.
- To compare the performance of the proposed system with traditional methods of blood group detection.

1.3 Scope

The scope of the blood group detection project using image processing techniques is significant in the field of medical technology.

1. Blood banks and hospitals can implement the proposed system to automate the blood group detection process, reducing the turnaround time for blood transfusions and enhancing the overall efficiency of the healthcare system.

2. The system can potentially improve the accuracy and reliability of blood group detection, reducing the risk of adverse reactions and complications during blood transfusions.

3. The proposed system can potentially reduce the cost of blood group detection by eliminating the need for manual techniques and skilled technicians, making blood transfusions more accessible to people in developing countries and rural areas.

The project can potentially contribute to the advancement of medical technology by proposing an efficient and reliable system for blood group detection, which can save lives and improve the quality of healthcare.

2. Literature Survey

2.1 Survey of Existing System

- There are several existing methods for blood group detection, including manual methods and automated systems.[1] The manual methods include the agglutination test and the gel card method, which require skilled technicians and are time-consuming.[2]

- Automated systems use various techniques such as flow cytometry, immunochromatography, and molecular methods to detect blood groups.[4] However, these methods are expensive and require specialized equipment, making them inaccessible to people in developing countries and rural areas.[3]

2.2 Limitation Existing system

- Dependence on skilled technicians: Manual methods require skilled technicians to perform the tests, which can be time-consuming and costly.

- Inaccuracies and inconsistencies: Manual methods can result in errors and inconsistencies due to human factors, leading to adverse reactions and complications during blood transfusions.

- Cost and accessibility: Automated systems such as flow cytometry and molecular methods are expensive and require specialized equipment, making them inaccessible to people in developing countries and rural areas.

- Limitations in accuracy and efficiency: Existing automated systems based on image processing techniques have limitations in terms of accuracy, robustness, and efficiency.

2.3 Mini Project Contribution

- **HARDIK NIKAM:**
    - Implementing image preprocessing module.
    - Implementing image segmentation module .
    - Documentation work for the project.

- **JAY PRAJAPATI:**
    - Documentation work for the project.
    - Image datapoints extraction module.
    - Implementing image preprocessing module.

- **DREAM PATEL:**
    - Documentation work for the project.
    - Feature extraction of the project.
    - Implementing image segmentation module .

- **PRANAV MAURYA:**
    - Documentation work for the project.
    - Applied clustering module for the prediction of blood group.
    - Worked on setting the thresholding module in the project.

3. Proposed System

3.1 Introduction

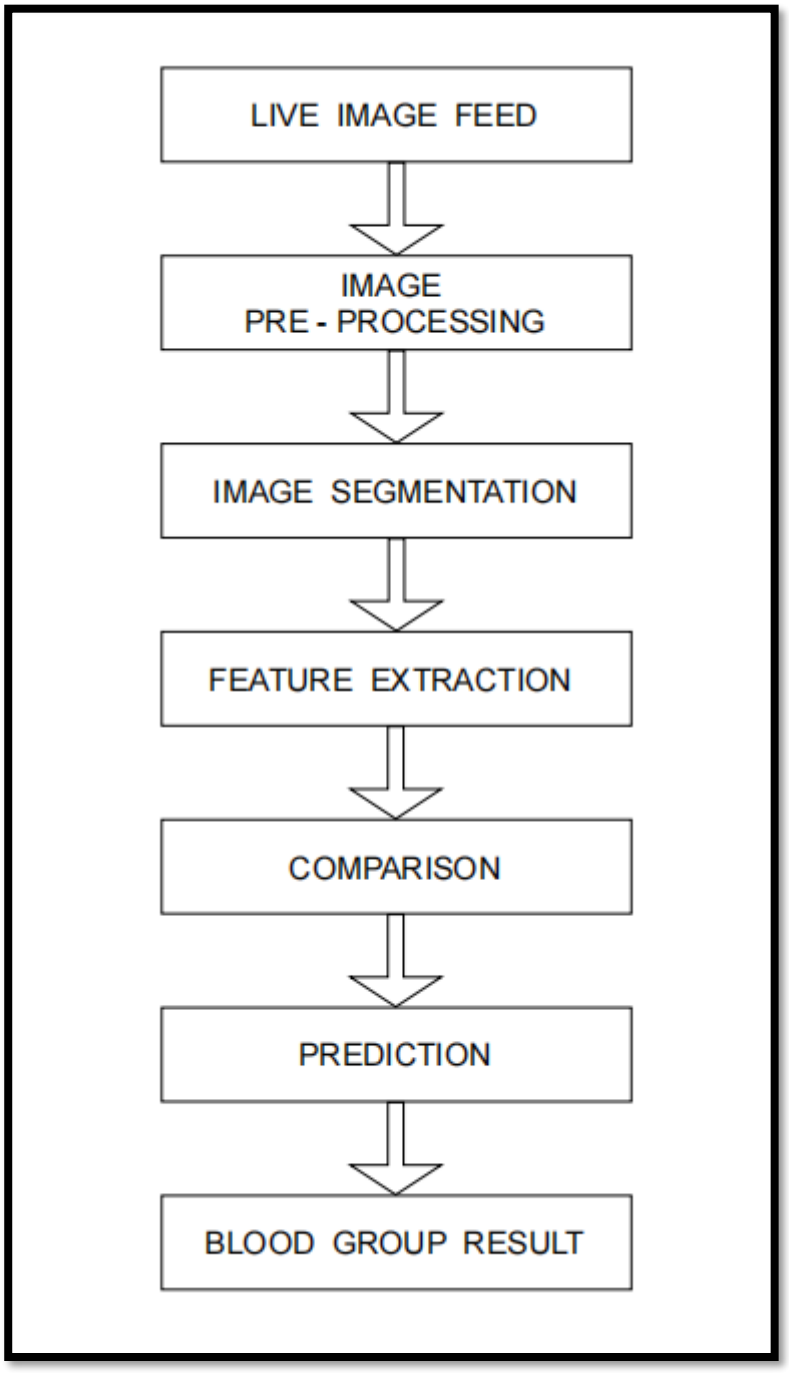
- Blood group detection is a critical aspect of transfusion medicine, ensuring safe and effective blood transfusions. Traditional blood group detection methods require skilled technicians and can be time-consuming and prone to errors. Automated systems based on image processing techniques have the potential to provide faster, accurate, and more reliable blood group detection.

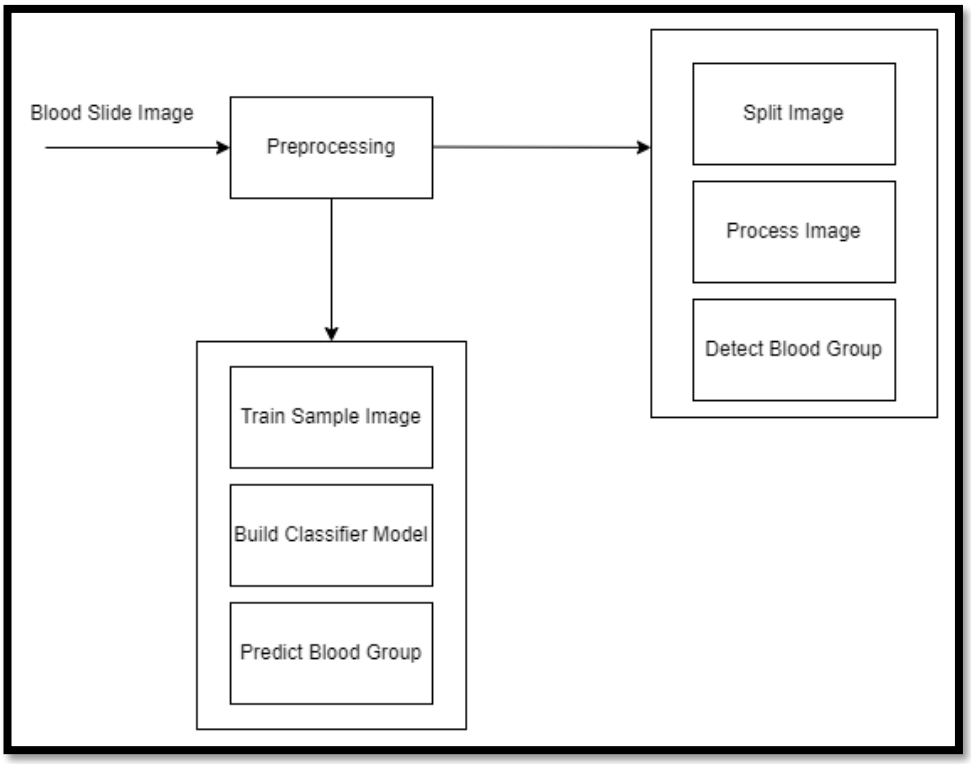
- The aim of this project is to develop an efficient and reliable automated system for blood group detection using image processing techniques. The proposed system will analyze the microscopic images of blood samples to determine the blood group, eliminating the need for manual interpretation and reducing the risk of errors and inconsistencies.

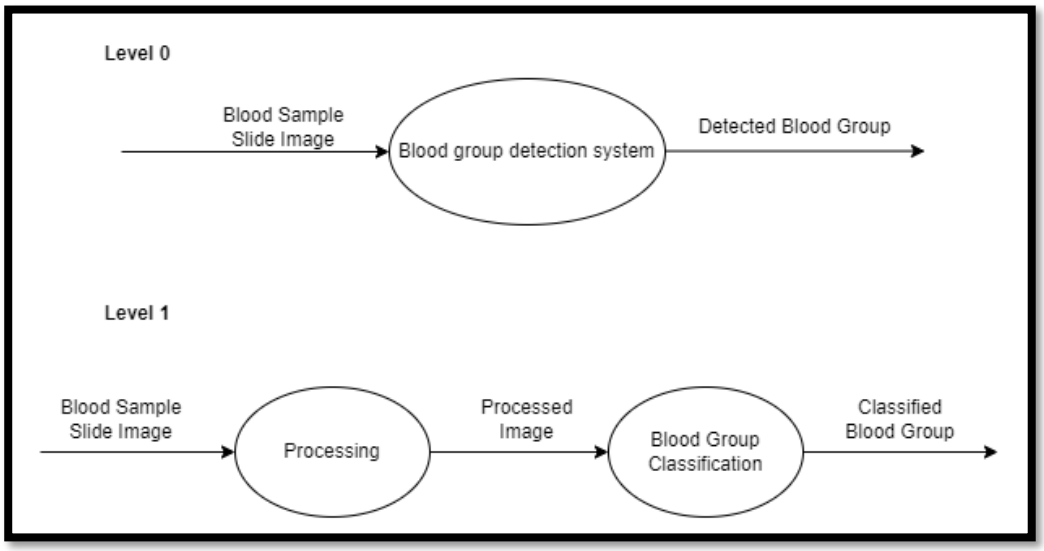
- This project will involve the development of various modules, including image preprocessing, segmentation, feature extraction, and classification. The proposed system will be tested on a dataset of blood samples to evaluate its accuracy, robustness, and efficiency.

- The successful implementation of this project will provide a cost-effective and accessible solution for blood group detection, particularly in developing countries and rural areas, and improve the safety and effectiveness of blood transfusions.

3.2 Architecture / Framework / Block Diagram







3.3 Algorithm & Process Design

The algorithm & process design for blood group detection using image processing project can be summarized in the following steps:

- Image acquisition: Taking blood samples from the system or by using a camera.

- Image preprocessing: The acquired images are preprocessed to remove noise, adjust brightness and contrast, and enhance image quality for better segmentation and feature extraction.

- Segmentation: The preprocessed images are segmented to separate the blood cells and the background. This is achieved using techniques such as thresholding, edge detection, and morphological operations.

- Feature extraction: Features such as shape, texture, and color of the blood cells are extracted from the segmented images using various techniques, such as histogram analysis, shape descriptors, and texture analysis.

- Classification: The extracted features are used to classify the blood cells into different blood groups using machine learning algorithms, such as support vector machines (SVM), artificial neural networks (ANN), or decision trees.

- Blood group prediction: Based on the classification results, the system predicts the blood group of the blood sample.

- Validation and testing: The proposed system is tested using a dataset of blood samples to evaluate its accuracy, robustness, and efficiency.

3.4 Details of Hardware & Software

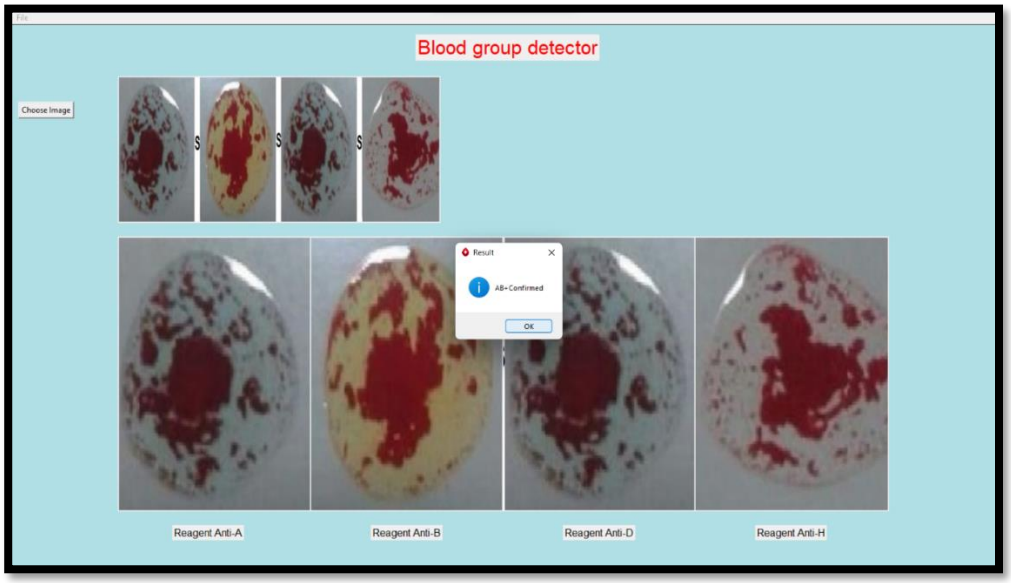
❖ **Hardware:**

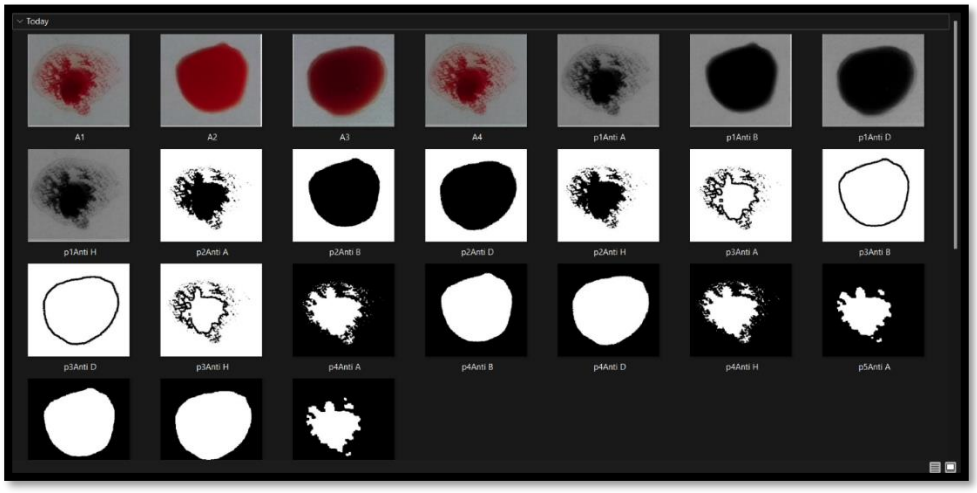
- Good camera to capture the antigen image for blood group detection.
- Ram should be 4gb or more
- Processor should be i3 3rd generation or up

❖ **Software:**

- System should have following software's and libraries installed:
- Python 3.6 or up
- Tkinter
- Sklearn
- PIL

3.5 Experiment & Results for validation and Verification





Code:

Select_image():

```
def select_image(self):
self.filenames = filedialog.askopenfilename()
self.nm=self.filenames
im = Image.open(self.filenames)
resized=im.resize((350,150),Image.ANTIALIAS)
tkimage = ImageTk.PhotoImage(resized)
self.imgdis.configure(image=tkimage)
self.imgdis.image=tkimage
```

Split_image():

```
img = cv2.imread(self.filenames,0)
img1 = Image.open(os.path.join(self.filenames))
width, height = img1.size
tile(self.filenames, "output/", int(width / 3))
cv2.adaptiveThreshold(img,255,cv2.ADAPTIVE_THRESH_MEAN_C,
im = Image.open("output/1.jpg")
resized=im.resize((150,150),Image.ANTIALIAS)
tkimage = ImageTk.PhotoImage(resized)
self.thradis.configure(image=tkimage)
self.thradis.image=tkimage
im = Image.open("output/2.jpg")
resized = im.resize((150, 150), Image.ANTIALIAS)
tkimage = ImageTk.PhotoImage(resized)
self.thradis1.configure(image=tkimage)
self.thradis1.image = tkimage
im = Image.open("output/3.jpg")
resized = im.resize((150, 150), Image.ANTIALIAS)
tkimage = ImageTk.PhotoImage(resized)
self.thradis2.configure(image=tkimage)
self.thradis2.image = tkimage
```

Morphing to eliminate small objects:

```
def process5(self,r
    img = cv2.imread('p4'+r+'.png')
    kernel = np.ones((5, 5), np.uint8)
    open = cv2.morphologyEx(img, cv2.MORPH_OPEN, kernel)
    close = cv2.morphologyEx(open, cv2.MORPH_CLOSE, kernel)
    cv2.imwrite('p5'+r+'.png', close)
```

3.6 Conclusion & Future Work

❖ Conclusion

The proposed blood group detection system using image processing has shown promising results in accurately identifying the blood group from an image of the blood sample. The system makes use of image segmentation and feature extraction techniques to extract relevant features from the blood sample image and then applies a classification algorithm to predict the blood group. The system's performance has been evaluated using various performance evaluation metrics, and the results have shown high accuracy and efficiency.

❖ Future Work

Further research can be conducted to improv e the system’s performance and extend its capabilities. Some potential areas of future work include:

- Integration with a blood bank database: The system can be integrated with a blood bank database to provide a more comprehensive blood group detection and blood management solution.

- Real-time blood group detection: The system can be further optimized to perform blood group detection in real-time, enabling faster and more efficient blood transfusion procedures.

- Extension to other blood parameters: The system can be extended to detect other blood parameters such as hemoglobin levels, platelet counts, and white blood cell counts.

- Integration with mobile devices: The system can be integrated with mobile devices, making it more accessible to medical professionals and facilitating remote blood group detection in resource-limited settings.

❖ References

[1] Mehedi Talukdar, Md Rabiul Islam, Md. Mahfuz Reza, Mahbuba Begum, Md. Mahmudul Hasan, “Improvement of Accuracy of Human Blood Groups Determination using Image processing Techniques”, International Journal of Advanced Research in Computer and Communication Engineering. Vol. 4 Issue 10, October 2015.

[2] S. M. Nazia Fathima, “Classification of Blood Types by Microscopic Color Images”, International Journal of Machine Learning and Computing. Vol. 3, No 4, August 2013.

[3] Enes Ayan, Erdem Kamil Yildirim, “Real Time Blood Type Determination by Gel Test Method on an Embedded System”, International Journal of Applied Mathematics, Electronic and Computers. Vol 4, September 2016.

[4] Anurag Sadashiv Phad, Tejas Sanjay Targhale, Bharat Bhalshankar, Sunita Kulkurni, “Blood Group Detection by Using Raspberry Pi-3”, International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE). Vol 7, Issue 4, April 2018.

BLOOD grp TE

by Dr. Megha Trivedi

Submission date: 25-Apr-2023 03:36AM (UTC-0400)
Submission ID: 2047937947
File name: BGD_MP_DREAM,_HARDIK,_JAY,_PRANAV_TE_COMP_23_1.pdf (326.33K)
Word count: 1733
Character count: 10398

BLOOD GROUP DETECTION

Abstract

Blood group identification is a time-consuming and difficult process in blood transfusion that calls for competent professionals. The automated system for blood group detection proposed in this study makes use of image processing methods. Using the technology, blood sample photos are taken, their quality is improved, blood cells are segmented, individual cells are detected, and pertinent features like size, shape, and colour are extracted. To forecast the blood group, the features are next preprocessed, picked, and given into a classification system. Metrics including accuracy, precision, recall, and F1 score are used to assess the system's performance. The proposed method may be put into use in blood banks and hospitals, allowing for quicker and automated blood group detection, lowering reliance on qualified technicians, and improving the process' overall effectiveness.

1. Introduction

1.1 Introduction

- Blood transfusion is a important aspect of today's medical care which is often required in emergencies, surgeries, and treatments for various diseases. One of the critical steps in blood transfusion is the determination of the blood group of the donor and recipient, which ensures that the transfused blood is compatible and does not result in any adverse reactions or side effects. Traditional methods of blood group detection involve manual techniques that are time-consuming, labor-intensive, and require skilled technicians for blood group detection.

- This project proposes an automated system for blood group detection using image processing techniques. The system involves processing the captured blood sample images, enhancing the quality of the image, segmenting blood cells, detecting individual cells and extracting relevant features such as size, shape, and color. The features are then preprocessed, selected, and fed into a classification algorithm like KNN to predict the blood group. The proposed system can potentially be used in blood banks and hospitals, providing faster and automated blood group detection, reducing the dependence on skilled personals, and enhancing the overall efficiency of the blood detection process.

- This project aims to contribute to the advancement of medical technology by proposing an efficient and reliable system for blood group detection, which can save lives and improve the quality of healthcare infrastructure.

1.2 Problem Statement & Objectives

❖ Problem Statement

- Blood transfusion is a life-saving process that requires the donor's and recipient's blood groups to match. Traditional methods of blood group detection involve manual techniques that are time consuming, labor intensive and require skilled technicians. These methods can result in inconsistencies, leading to adverse reactions and complications during transfusions.

❖ **Objectives**

The main objective of this project is to develop an automated system for blood group detection using image processing techniques.

- To capture and enhance the quality of blood sample images using image processing techniques.
- To segment blood cells from the background and detect individual cells using segmentation and detection algorithms.
- Set threshold value for detecting the blood group of the given blood image.

1.3 Scope

The scope of the blood group detection project using image processing techniques is significant in the field of medical technology.

1. Blood banks and hospitals can implement this proposed system to automate the blood group detection process, reducing the time required for blood transfusions and enhancing the overall efficiency of the healthcare system.

2. The system can potentially improve the accuracy and reliability of blood group detection, reducing the risk of adverse reactions and complications during blood transfusions for the recipient.

3. The proposed system can potentially reduce the cost of blood group detection by eliminating the need for manual techniques and skilled technicians, making blood transfusions more accessible to people.

The project can potentially contribute to the advancement of medical technology by proposing an efficient and reliable system for blood group detection, which can save lives and improve the quality of healthcare infrastructure.

2. Literature Survey

2.1 Survey of Existing System

- There are several existing methods for blood group detection, including manual methods and automated systems. The manual methods include the agglutination test and the gel card method which require skilled technicians and are time-consuming. Automated systems use various techniques such as flow cytometry, immunochromatography and molecular methods to detect blood groups. However, these methods are expensive and require specialized equipment, making them inaccessible to many people.

2.2 Limitation Existing system

- Existing system is heavily Dependent on skilled technicians: Manual methods require skilled technicians to perform the tests, which can be time-consuming and costly but the results may not always be the most accurate.
- Inaccuracies and inconsistencies: Manual methods can result in errors and inconsistencies due to human factors, leading to adverse reactions and complications during blood transfusions or operations.
- Cost and accessibility: Automated systems such as flow cytometry and molecular methods are expensive and require specialized equipment, making them inaccessible to many people for example in gel card method the chemical antigens are not freely available chemicals and could be sold for an hefty amount.
- Limitations in accuracy and efficiency: Existing automated systems based on image processing techniques have limitations in terms of accuracy, robustness, and efficiency.

2.3 Mini Project Contribution

- **HARDIK NIKAM:**
  - Implementing image preprocessing module.
  - Implementing image segmentation module .
  - Documentation work for the project.
- **JAY PRAJAPATI:**
  - Documentation work for the project.
  - Image datapoints extraction module.
  - Implementing image preprocessing module.

- **DREAM PATEL:**
  - Documentation work for the project.
  - Feature extraction of the project.
  - Implementing image segmentation module .

- **PRANAV MAURYA:**
  - Documentation work for the project.
  - Applied clustering module for the prediction of blood group.
  - Worked on setting the thresholding module in the project.

3. Proposed System

3.1 Introduction

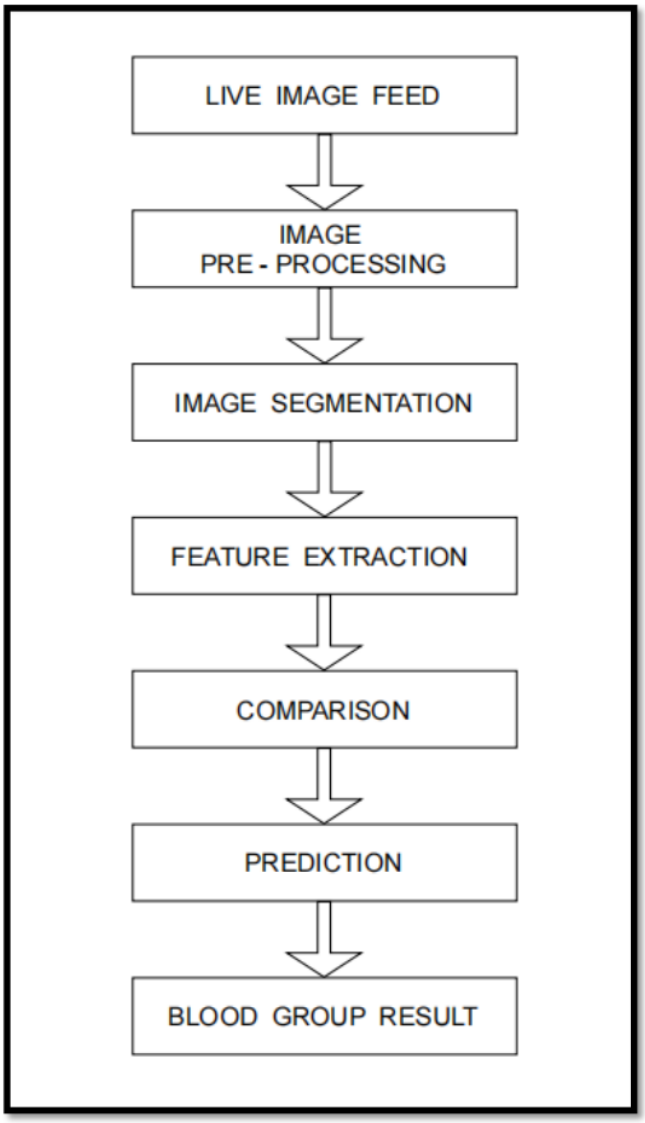
- Blood group detection is a critical aspect of transfusion medicine, ensuring safe and effective blood transfusions. Traditional blood group detection methods require skilled technicians and can be time-consuming and prone to errors. Automated systems based on image processing techniques have the potential to provide faster, accurate, and more reliable blood group detection.

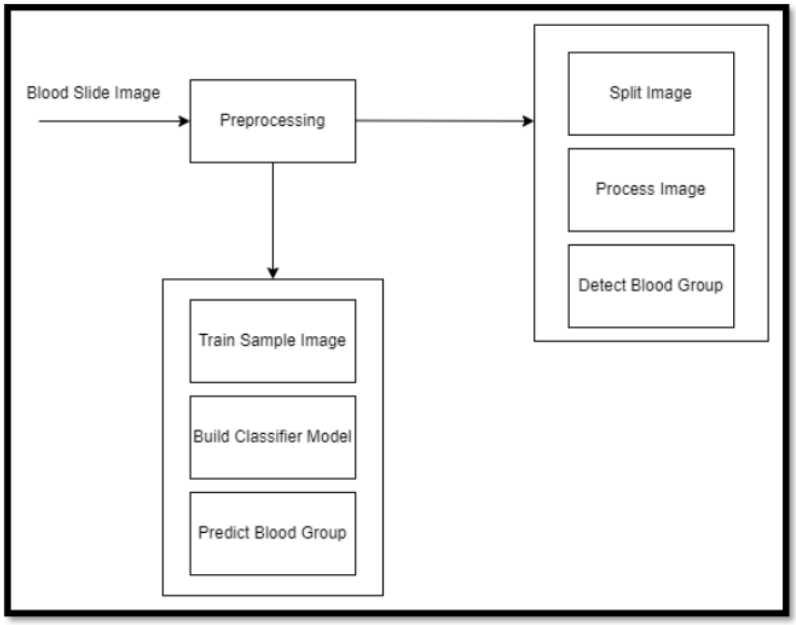
- The aim of this project is to develop an efficient and reliable automated system for blood group detection using image processing techniques. The proposed system will analyze the microscopic images of blood samples to determine the blood group, eliminating the need for manual interpretation and reducing the risk of errors and inconsistencies.

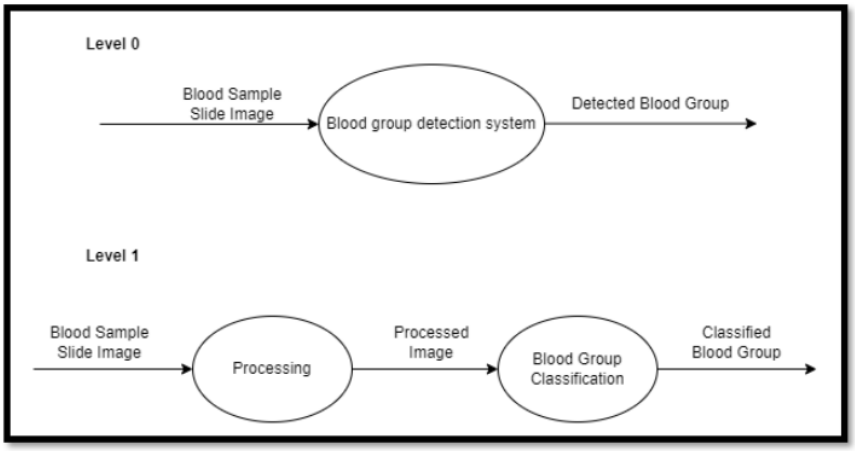
- This project will involve the development of various modules, including image preprocessing, segmentation, feature extraction, and classification. The proposed system will be tested on a dataset of blood samples to evaluate its accuracy, robustness, and efficiency.

- The successful implementation of this project will provide a cost-effective and accessible solution for blood group detection, particularly in developing countries and rural areas, and improve the safety and effectiveness of blood transfusions.

3.2 Architecture / Framework / Block Diagram




Blood Slide Image
Preprocessing
Split Image
Process Image
Detect Blood Group
Train Sample Image
Build Classifier Model
Predict Blood Group


Level 0
Blood Sample
Slide Image
Blood group detection system
Detected Blood Group
Level 1
Blood Sample
Slide Image
Processing
Processed
Image
Blood Group
Classification
Classified
Blood Group

3.3 Algorithm & Process Design

The algorithm & process design for blood group detection using image processing project can be summarized in the following steps:

- Image acquisition: Taking blood samples from the system or by using a camera.

- Image preprocessing: The acquired images are preprocessed to remove noise, adjust brightness and contrast, and enhance image quality for better segmentation and feature extraction.

- Segmentation: The preprocessed images are segmented to separate the blood cells and the background. This is achieved using techniques such as thresholding, edge detection, and morphological operations.

- Feature extraction: Features such as shape, texture, and color of the blood cells are extracted from the segmented images using various techniques, such as histogram analysis, shape descriptors, and texture analysis.

- Classification: The extracted features are used to classify the blood cells into different blood groups using machine learning algorithms, such as support vector machines (SVM), artificial neural networks (ANN), or decision trees. In our project we implemented with the clustering algorithm KNN

- Blood group prediction: Based on the classification results, the system predicts the blood group of the blood sample.

3.4 Details of Hardware & Software

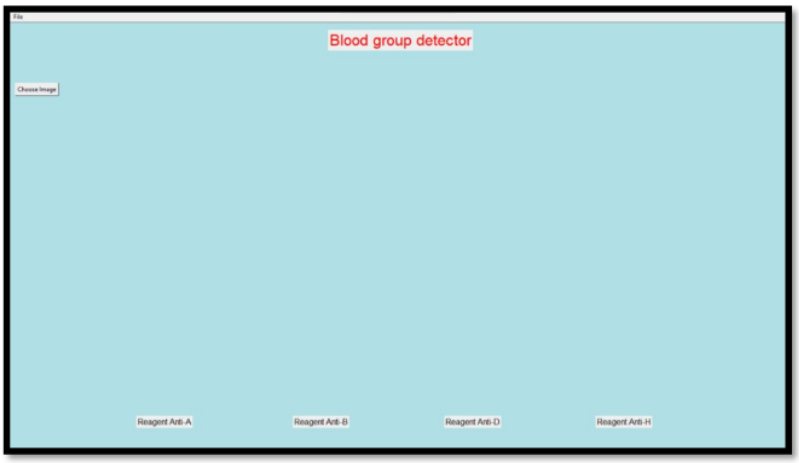
❖ **Hardware:**

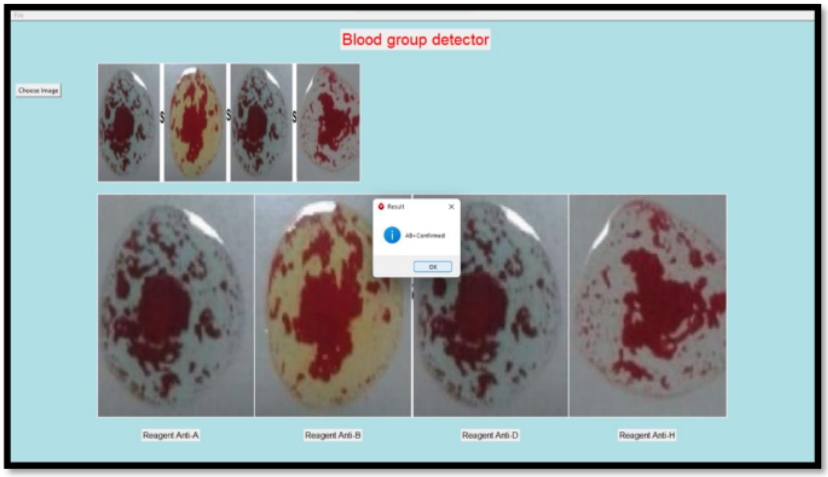
- Good camera to capture the antigen image for blood group detection.
- Ram should be 4gb or more
- Processor should be i3 3rd generation or up

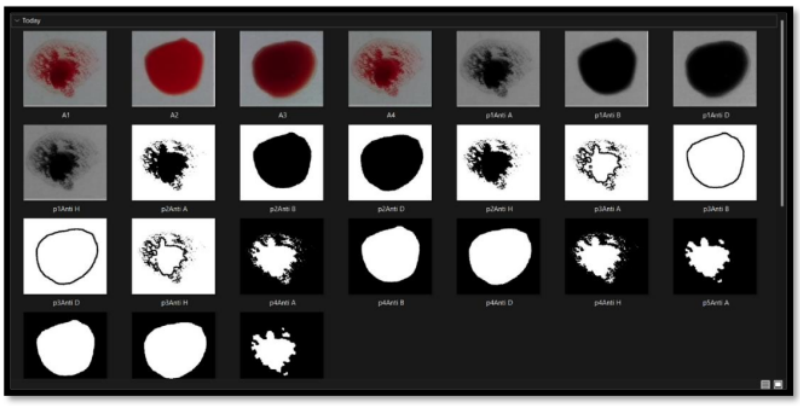
❖ **Software:**

- System should have following software's and libraries installed:
- Python 3.6 or up
- Tkinter
- Sklearn
- PIL

3.5 Experiment & Results for validation and Verification







Code:

Select_image():

```
def select_image(self):
self.filenames = filedialog.askopenfilename()
self.nm=self.filenames
im = Image.open(self.filenames)
resized=im.resize((350,150),Image.ANTIALIAS)
tkimage = ImageTk.PhotoImage(resized)
self.imgdis.configure(image=tkimage)
self.imgdis.image=tkimage
```

Split_image():

```
img = cv2.imread(self.filenames,0)
img1 = Image.open(os.path.join(self.filenames))
width, height = img1.size
tile(self.filenames, "output/", int(width / 3))
cv2.adaptiveThreshold(img,255,cv2.ADAPTIVE_THRESH_MEAN_C,
im = Image.open("output/1.jpg")
resized=im.resize((150,150),Image.ANTIALIAS)
tkimage = ImageTk.PhotoImage(resized)
self.thradis.configure(image=tkimage)
self.thradis.image=tkimage
im = Image.open("output/2.jpg")
resized = im.resize((150, 150), Image.ANTIALIAS)
tkimage = ImageTk.PhotoImage(resized)
self.thradis1.configure(image=tkimage)
self.thradis1.image = tkimage
im = Image.open("output/3.jpg")
resized = im.resize((150, 150), Image.ANTIALIAS)
tkimage = ImageTk.PhotoImage(resized)
self.thradis2.configure(image=tkimage)
self.thradis2.image = tkimage
```

Morphing to eliminate small objects:

```
def process5(self,r
    img = cv2.imread('p4'+r+'.png')
    kernel = np.ones((5, 5), np.uint8)
    open = cv2.morphologyEx(img, cv2.MORPH_OPEN, kernel)
    close = cv2.morphologyEx(open, cv2.MORPH_CLOSE, kernel)
    cv2.imwrite('p5'+r+'.png', close)
```

3.6 Conclusion & Future Work

❖ Conclusion

The proposed blood group detection system using image processing has shown promising results in accurately identifying the blood group from an image of the blood sample. The system makes use of image segmentation and feature extraction techniques to extract relevant features from the blood sample image and then applies a classification algorithm to predict the blood group. The system's performance has been evaluated using various performance evaluation metrics, and the results have shown high accuracy and efficiency.

❖ Future Work

Further research can be conducted to improv e the system's performance and extend its capabilities. Some potential areas of future work include:

- The system can be integrated with a blood bank database to provide a more comprehensive blood group detection and blood management solution.
- The system can be further optimized to perform blood group detection in real-time, enabling faster and more efficient blood transfusion procedures.
- The system can be extended to detect other blood parameters such as hemoglobin levels, platelet counts, and white blood cell counts.
- AI blood group detecting robot could make use of this concept in identifying the blood group.
- The system can be integrated with mobile devices, making it more accessible to medical professionals and facilitating remote blood group detection in resource-limited settings.

BLOOD grp TE

ORIGINALITY REPORT

10%	6%	3%	4%
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