Automatic Detection of Human Blood Group System using Deep Learning and Image Processing

Raj Bhagat[1], Snehal Marge[2], Prathamesh Deshmukh[3], Siddhesh Khanvilkar[4]

[1,2,3]Under Graduate student, Pillai HOC College of Engineering & Technology, Mumbai University, India.

[4]Assistant Professor, Pillai HOC College of Engineering & Technology, Mumbai University, India.

---***---

Abstract - *Determination of blood type is important before administering a blood transfusion in an emergency situation. Currently, these tests are performed manually by technicians in the laboratory, when the test is handled with a large number of samples, it is monotonous to do and it may lead to human errors. The proposed system aims to develop an embedded system which uses Image processing algorithm to perform blood tests based on ABO and Rh blood typing systems. The proposed system helps in reducing human intervention and perform complete test autonomously from adding antigens to final generation of the result. The proposed system aims at developing results in shortest possible duration with precision and accuracy along with storage of result for further references. Thus, the system allows us to determine the blood type of a person eliminating traditional transfusions based on the principle of the universal donor, reducing transfusion reactions risks and storage of result without human errors.*

*Key Words***:** Antigen, Blood Samples, GPU, Histogram, LBP (local binary pattern), Nearest Neighbour Classifier, Image Processing, Pattern MatchingIntroduction.

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. Blood Typing system is basically used to determine the blood group that the person possesses. Blood Detection is most important and essential activity. The differences in the blood group of individuals are due to presence or absence of certain protein molecule named as antigens or antibodies. The antigen is any foreign substance that causes an immune response either alone or it forms a complex with a large protein molecule. Antibodies are the proteins produced by the immune system to defend against the foreign substances that may cause harm to our body, therefore, they are the guards of our body. The ABO blood group system is found and identified as the first human blood group system by Austria Rand Steiner in early nineteenth Century. There are 4 major blood groups based on presence or absence of antigen on the surface of RBC (Red Blood Corpuscles) . 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. Group A has only the A Antigen on the blood cellsGroup B has only the B antigen on the blood cells. Group AB has both Antigen A and Antigen B on their blood cells. Group O has neither Antigen A nor Antigen B on their blood cells. Based on the compatibility of blood groups the blood transfusion is done. Not all the blood groups are compatible with each other. So for safe transfusion of blood determining the blood group is mandatory. Nowadays blood group detection is done manually by lab technicians but there are some drawbacks of this traditional method like this technique consumes more time. Also in some cases if appropriate blood group is not detected then it may result in the death of an individual.

2. LITERATURE SURVEY

Dr. Kiran Y. C proposed a system 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. So presented the solution for Image processing techniques used for determination of the blood types such as Preprocessing techniques, Morphological operations, Thresholding HSL Luminance plane Quantification and after using this techniques it resulted 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.

In Mrs. G. Sangeetha Lakshmi, and Ms.M.Jayashree, Automated blood group recognition system using image processing Traditional way of detecting blood group have remained analogue in this era and are therefore vulnerable to human fallibility. To develop an system which uses image processing algorithm to perform blood tests based on ABO and rh blood typing system. Here the improved results were observed and it Helps reducing human intervention and perform complete test autonomously from adding antigen to final generation of result.
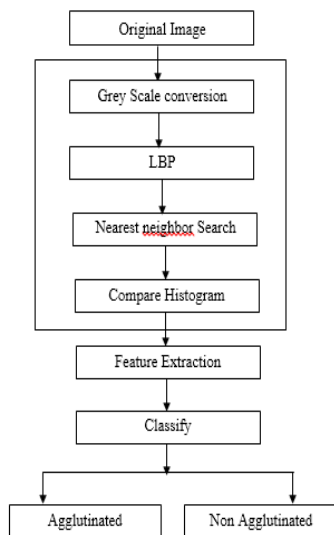
n Amol Dhande, Pragati Bhoir, Varsha Gade technique of Identifying the blood group using Image Processing the blood group is identified on the basis of microscope vision. The raw blood sample images are processed using image

processing techniques namely feature extraction, clustering, HSV luminance, etc. This method can quickly and accurately identify whether the serum and antibody agglutination reaction, and then get blood type determination

In Prof. R.A Rathod, Rubeena A Pathan paper Determination and Classification of Human Blood Types using SIFT Transform and SVM Classifier. blood types is very important during emergency situation before administering a blood transfusion. Presently, these tests are performed manually by technicians, which can lead to human errors. The image processing techniques such as thresholding and morphological operations are used This paper based on literature survey of different types of blood group determination method.

3. METHODOLOGY

This project we will develop using python and web technology. First we will collect raw blood image from various hospitals and medical labs. Then these image are preprocessed by using machine learning algorithm. We will Cleans the data for doing image processing. Then we are doing preprocessing on the dataset. The local binary pattern (LBP) is applied to these images. Using classification algorithm, we will classify the image as blood groups. Once model will generated, take the raw image from patient for blood group detecion. These all purpose we are using python as backend, MySQL is database and for frontend html, css, JavaScript.

features are extracted, the extracted feature is sample matched on matching we get prediction data upon that we can tell which type of blood group it is. The result is stored in database for further use.

4. PROPOSED WORK

Certain standardized tests are necessarily to be performed before the blood transfusion, one such standardized test is blood group detection and this is essential for the safe transfusion of the blood, so that blood type of the donor is compatible with the blood type of the receives. During emergency situations, blood transfusion is very necessary and blood group detection is manually done in laboratory which take more time. In blood group O negative which is consider universal donor there is low risk of incompatibility. Delay in time can also lead to the death of a patient secondly, the pretransfusion tests are performed manually by technician, sometimes this lead to the human error which causes fatal consequence for patent. So in order avoid such consequences, we have come up with an automated system which detects the blood group in a faster manner and also a special type of blood group known as Bombay blood group (also called HH group) can be detected. Both Bombay blood group and group O negative gives the same result when mixed with reagents antigen A, antigen B, and antigen D. this leads to confusion, so in order to avoid such situation antigen H is added to the blood sample, so that Bombay blood group could be easily identified
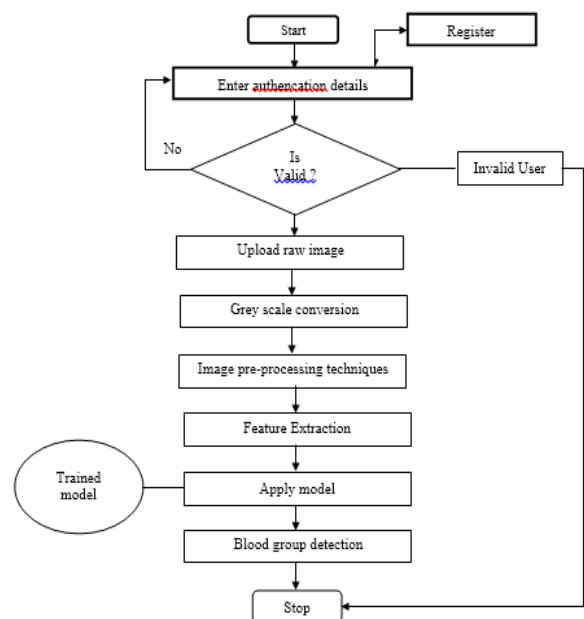
5. WORKING PROCEDURE

In this diagram, it explains that the image is uploaded directly from the camera, next it undergoes pre-processing where we machine learning methods like grey scaling, binarization and thresholding are used for processing. Once the image is preprocessed it next goes for image segmentation where we get four image parts from that

Now a days the blood group is identified on the basis of microscopic vision. It needs expert's advice but human errors do happen, instead we can reduce this error by doing the same process on the basis of image processing at the fast speed without any wrong interpretation. In the existing system, antigens are adding to three sample drops of blood. After sometime, agglutination may occur. After agglutination takes place, the slide image gets captured and allowed to further process using image processing techniques. By using this system, human errors can be reduced. Image processing techniques used for this blood type determinations are • Pre-processing • Thresholding • Morphology • HSL Luminance plane • Quantification • Classification

A. Data Flow Diagram

A data flow diagram (DFD) is a graphical representation of the flow of data through an information system. A data flow diagram can also be used for the visualization of data processing (structured design). It is common practice for a designer to draw a context level DFD first which shows the interaction between the system and outside entities. This context level DFD is then exploded to show more detail of the system being modeled

• System Logical information flow

• Finding the physical system construction requirements

• Simplicity of notation

• Set up the manual and automated systems requirements
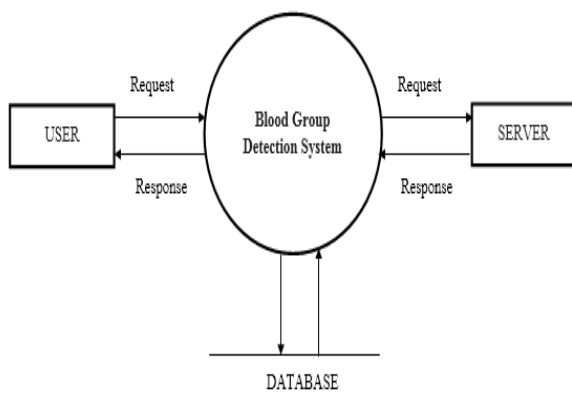
The DFD is also called bubble chart. It is used for the graphical formation of the system in terms of input data, data processing and output data that is generated. This control flow chart mainly focuses on how the image is captured, loaded in the system and copied to the workspace of the system. If in case image is not captured properly, system is triggered to capture the image again..

This control flow chart mainly focuses on how the image undergoes Preprocessing steps, here image is resized with respect to height and width according to the necessity, the next step is green panel extraction i.e. conversation of RGB image to gray scale image and then Binarization is carried

This also shows how the image undergoes segmentation and then the region of interesting feature is extracted, if not extracted process is stopped else the extracted data is generated
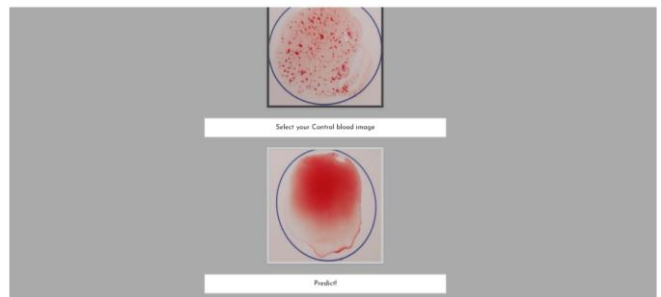
DFD level 1
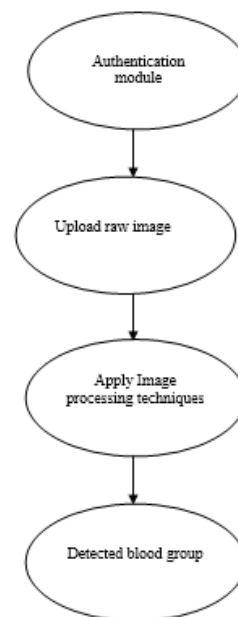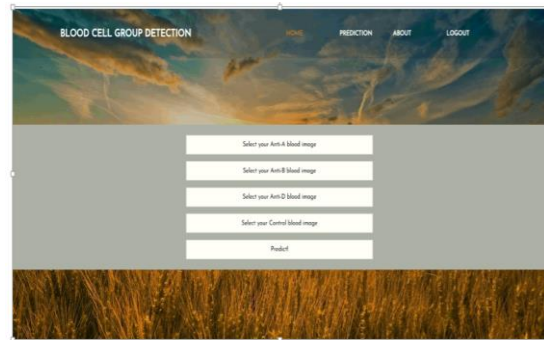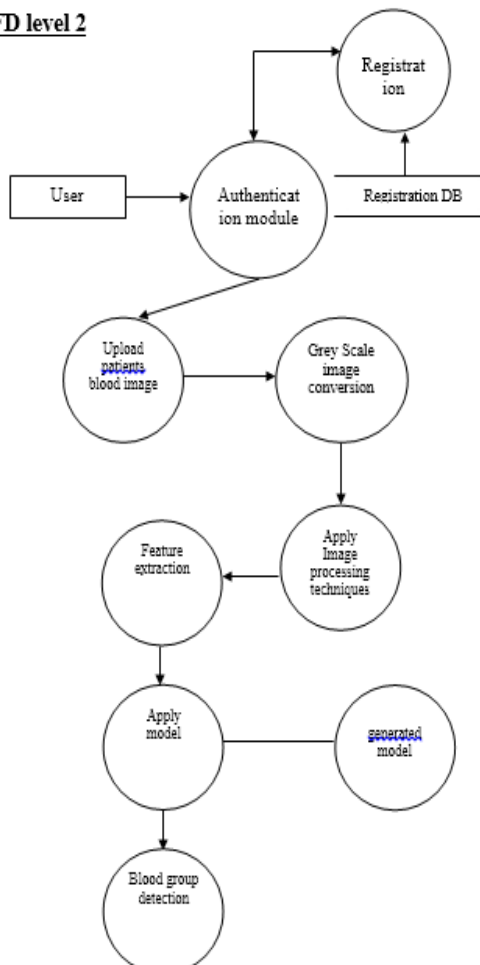
This is the GUI page which has got buttons and labels the blood type

6. RESULTS AND DISCUSSION

The method developed proves that it is effective and efficient method to detect the agglutination and determines the blood type of the patient accurately. The use of image processing techniques enables automatic detection of agglutination and determines the blood type of the patient in a short interval of time. The method is suitable and helpful in emergency situations. The proposed system aims to develop a system which uses Image processing algorithm to perform blood tests based on ABO and Rh blood typing systems. The input taken to this system is a blood sample whose images are captured and forwarded to the image processing algorithm. It uses algorithm for classification of images and pattern matching algorithms for matching of images. It makes use of GPU for faster computation of the process of blood detection.

The proposed method is a fact, exact and robust for detecting blood type, this method gives rapid and exact recognition of regular blood type along with the special type i.e. Bombay blood. From more number of experiments, this technique shows quick and accurate identification, using serum and antibody agglutination. This system can be enhanced to predict the Blood Samples without using Antigens or Anti serum. System can be enhanced to predict the alcohol detection in the blood sample. System can be enhanced to predict the infection of malaria in the blood sample.

REFERENCES

[1] G. Daniels, Human Blood Groups, 2nd ed. Blackwell Science, 2002.Available: download.bioon.com/view/upload/201106/17202758_9385.pdf

[2] Suthathira Vanitha N., Professor, Department of EEE, Knowledge Institute of Technology, Tamil Nadu, India, A novel approach in identification of blood group using laser technology, International Journal of Research in Engineering and Technology Available: esatjournals.net/ijret/2014v03/i23/IJRET20140323005.pdf [3] CallumJ.L, Kaplan.H.S, MerkleyL.L, (2001), Reporting of near miss events for transfusion medicine: improving transfusion safety Transfusion, vol. 41, pp. 12041211.Available: www.ncbi.nlm.nih.gov/pubmed/1160681 [4] Jose Fernandes, Sara Pimenta, Student Member, IEEE, Filomena O. Soares, Senior Member, IEEE and Graca Minas, Senior Member, IEEE,(2012), A Complete Blood Typing Device for Automatic Agglutination Detection Based on Absorption Spectrophotometry, IEEE Transactions On Instrumentation And Measurement

[5]. B. Jyothi, Y. M. Latha, and V. S. K. Reddy, "Medical image retrieval using multiple features," Research India Publications, vol. 3, pp. 387–396, 2010. Available: searchdl.org/public/book_series/AETS/7/546.pdf

[6] Z. Q. Song, H. Cui, and Y. A. Hu, "Research and development of support vector machine theory," Journal of Naval Aeronautical Engineering Institute, vol. 23, no. 2, pp.143-148, 2008.

[7] Nazia Fathima S.M (2013) Classification of blood type by microscopic color images, International Journal of Machine Learning and Computing. Vol. 3, No. 4 Available: www.ijmlc.org/papers/342-L472.pdf

[8] Priyadharshini, Ramya, Kalaiyarasi, Kalpana Devi., SuthathiraVanitha.

A NOVEL APPROACH IN IDENTIFICATION OF BLOOD GROUP USING LASER TECHNOLOGY.

International Journal of Research in Engineering and Technology Volume: 03 Special Issue: 11 Available: www.ijret.org

[9] Mäenpää, Topi The local binary pattern approach to texture analysis-Extension and application

Available:http://urn.fi/urn:isbn:9514270762