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Automatic Detection of Human Blood Group with Special Case in Low Resolution Using Image Processing

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Abstract: Blood group identification during emergency situation is very important. At present image processing technology will give the result very quick and it is widely used in medical field. In this paper, we are proposing blood group identification using image processing technology. This method is fast and accurate than the traditional method. Sometimes due to some human careless, detection of human blood could be inaccurate, these errors can be reduced by using image processing technology. By using image processing technology small error in the output can be calculated and human mistakes is reduced. By using This approach, we can determine the blood type quickly and accurately than the manual method.

Key Words: - ***Bombay blood group, antigens, Image Processing, Thresholding, Binary image, Histogram, Mean value.***

I. INTRODUCTION

The blood group of a person is basically determined by a blood typing system. Each individual will possess a different blood group this is because of the attentiveness or absence inattentiveness of protein molecules known as antibodies or antigens. Antigens is nothing but a foreign substance which causes immune response and antibodies are produced to defend the foreign substance thereby acting as guard for the human body.

Majorly there are 4 types of blood groups depending on attentiveness or inattentiveness of antigen. Based on the blood group compatibility, blood transfusion is done. For the safe transfusion blood group determined in compulsory.

Blood group	Antigen A	Antigen B
Group A	Present	Absent
Group B	Absent	Present
Group AB	Present	Present
Group O	Absent	Absent

There are some drawbacks in determining blood type, which is carried by lab experts manually. Because this method takes more time and also in some situations, inaccurate blood group result can be found. In order to avoid such error, automated system has been proposed to find the accurate blood type using image processing.

II. LITERATURE SURVEY

In Ana Ferraz, et.al [4] proposed a system which is able to perform the centrifugation in a simple approach. Here six slides are considered. Respective reagent drop is added to image of the sample which is taken and uploaded into the system for future process. Using image processing techniques, the presence of agglutination is determined using centrifugation classification algorithm and used for analyzing the blood group from the taken blood samples.

The image that is captured is segmented and then quantification is carried on the mixture of antigen and blood based on the standard deviation values.

Luminance planes are removed and the original images are retrieved, structure and geometry matching are used to identify the reference image. Finally, the blood type is carried by using quantify function.

In Tejaswini H V, et.al [2] proposed system, antigens are introduced with the samples of blood. Later, agglutination formation may or may not take place. Slide image is captured and MATLAB processing is done using image processing tools. This proposed work includes techniques such as HSL luminance plane, quantification, color panel extraction and gray conversion. Number of image filters are used in image optimization. Various filters are used for edge enhancement, noise suppressing, character modification and so on. Image contrast can be increased by using static or dynamic binarization and image resolution is reduced by binning.

In A. Narkis Banu, et.al [8] blood type is classified based on the microscopic color image of the blood sample. The system proposed here is partially automated and preprocessing step is

carried at first i.e. histogram equalization and color correction image. This is done to convert RGB to HIS image. Next heraldic method is used to extract the texture. Laser technology is used to identify the blood group. Using novel approach this method is the replacement of automatic machine in the laboratories of manual work.

In Prof R. A Rathod, et.al [5] digital image of blood sample is collected from the laboratories in hospitals, three samples of blood which is mixed with antigens are captured and pre-processing steps are carried. A software is developed where the result is interpreted based on the agglutination occurrence or non- occurrence and blood group is determined. The images are processed using techniques such a color panel extraction, thresholding, morphological operation, feature extraction, classification and determination of blood group.

In Vue-fang Dong, et.al [9] paper has mainly focused on the development of small and fact blood analyzer. Blood sample which is to be identified is placed on the disk, this disk has four quadrants. Centrifugation and several oscillations are carried for the proper mixture and uniform distribution of reagent and blood samples without any bubbles, and then for certain period of time reaction of blood sample with reagents is observed. Based on the reaction, the blood group is determined. Agglutination between the antigen and reagent is the principle of the blood group identification. 'Y' is for agglutination and 'N' for no-agglutination. Under the uniform light, image is obtained and given to the blood group analyzer, and these images are captured only after centrifugation and oscillation.

In K. Radhika, et.al [16] paper proposes a device which finds the blood type based on color changes with paper. The color of the paper changes to teal or brown, depending on the addition of antigens and antibodies present in the human blood. In emergency cases, this paper-based test to determine a person's blood grouping with a few drops of blood is helpful, where normal blood grouping is not possible. In This paper they used thermometer with two ends. At the left side the user places a solution that contains antibody 'A' and at the right side, a solution with antibody 'B' is placed. At center a few drops of blood are placed, followed by drop of the dye. The solution goes to the end of the paper and reaches antibody 'A' and antibody 'B'. If the blood grouping is 'A', then the solution at the left side with a mixture of antibody 'A', is antigen 'A', and the dye will change to brown, and the solution at the right with a mixture of antibody 'B', is antigen 'A', and the dye will change to teal. If the blood grouping is 'B' it will be vice versa. Blood grouping 'AB', in which antigen 'A' and antigen 'B' is found, will turn both solutions teals. Blood O grouping, where no antigens are found, will turn both solutions brown.

In **Vinay M, et.al [10]** the slides which has blood sample is taken for the test, for the determination of the blood group using image processing techniques the slides consist of mixture of blood sample and reagent, each sample is mixed with reagents i.e. antigen A, antigen B, antigen D. Based on the occurrence and non-occurrence of agglutination the result is interpreted and particular blood group is determined.

III. METHODOLOGY

A. System Architecture

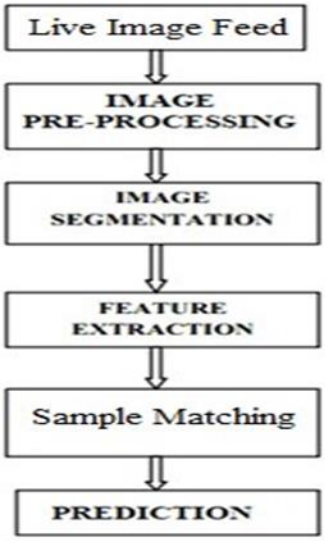

Fig.1. System Architecture

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 pre-processed it next goes for image segmentation where we get four image parts from that 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.

IV. 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

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universal donor there is low risk of incompatibility. Delay in time can also lead to the death of a patient secondly, the pre-transfusion 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.

V. WORKING PROCEDURE

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

A. Data Flow Diagram

DFD is a graphically representing of the information flow of any process or system defined symbols like rectangles, circles and arrows, along with short text labels, to show data inputs and outputs with storage points are used, the visual representation is a good communication tool for uses to interact with system designer. DFD is used for the representation of expanded hierarchy of detailed diagram. DFD is used for the following reasons:

- System Logical information flow
- Finding the physical system construction requirements
- Simplicity of notation
- Set up the manual and automated systems requirements

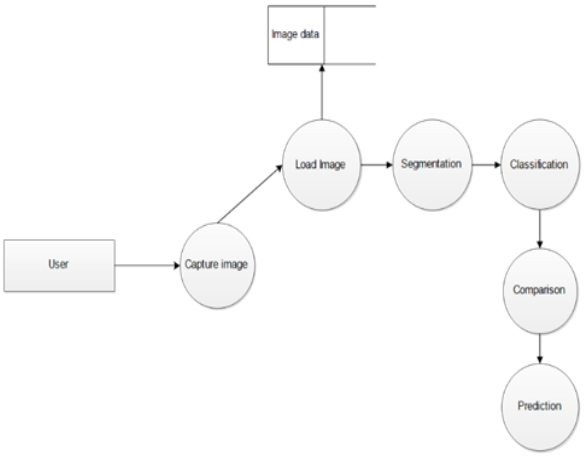

Fig.2. Data Flow Diagram

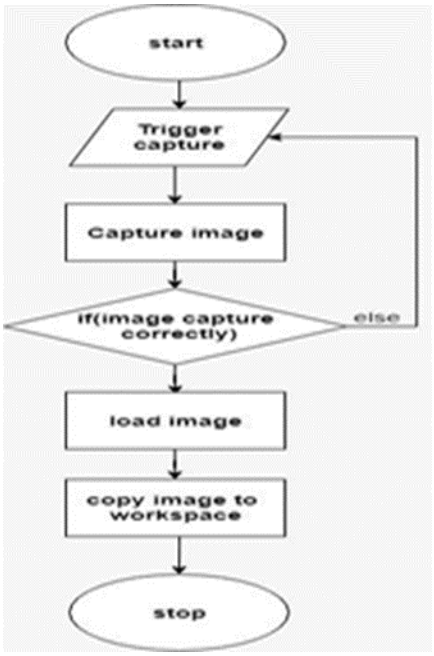

Fig.3. flow char for Data flow

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.

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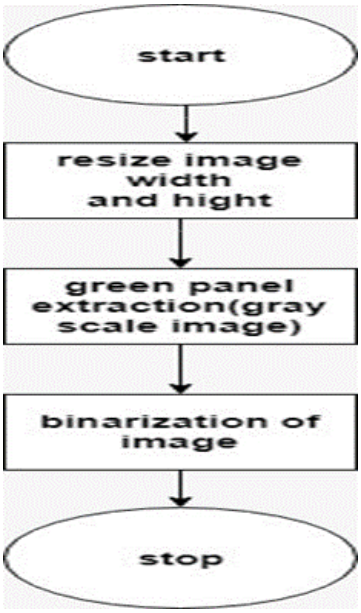

Fig.4. flow char for Pre-processing steps

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.

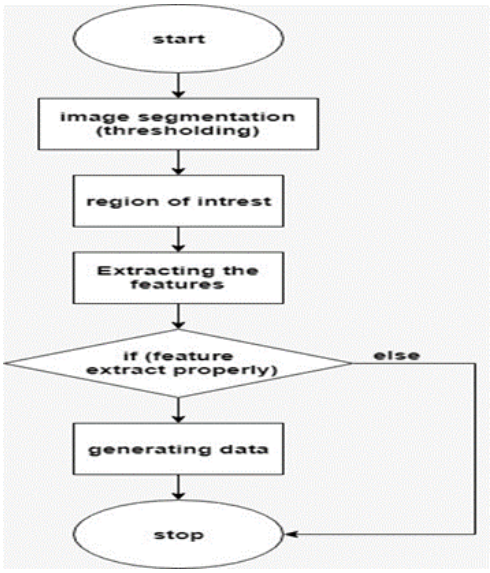

Fig.5. flow chart for Image Segmentation and Feature Extraction

This control flow chart mainly focuses on 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.

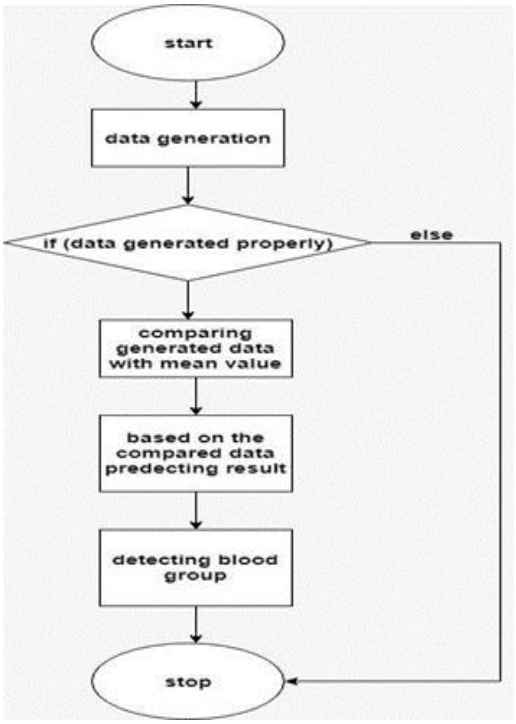

Fig.6. flow chart for sample matching and result prediction

This control flow chart mainly focuses on how the generated data is compared with the mean value and based on the comparison the result is predicted and displayed.

VI. Results And Discussion

This is the GUI page which has got buttons and labels.

Fig.7. screenshot of user interface looks

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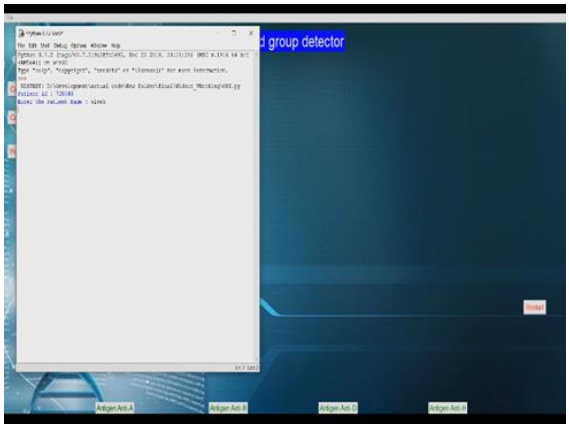

Fig.8. Entering Patient details

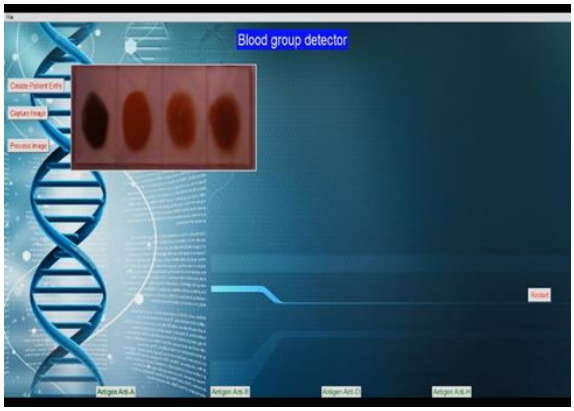

Fig.9. Displaying captured image

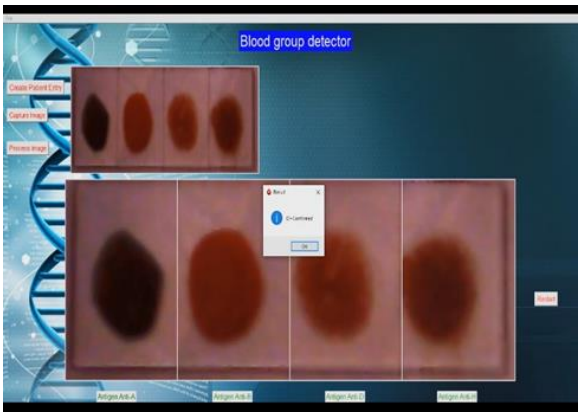

Fig.10. Result page

VII. Conclusion And Future Scope

Image processing methods are used as feasible methods for determination of blood type, this work allow the use of sample test by detecting the occurrence of agglutination by permitting ABO-Rh and HH group type of a person. This experiment has proved to be acceptable and feasible methodology to detect the blood type.

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.

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