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BLOOD GROUP DETECTION USING IMAGE PROCESSING

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Abstract : Blood group detection is necessary before performing blood transfusions in severe situations. It is performed before a blood transfusion in an emergency or when a person& blood group is checked for donation. In the laboratory, tests are currently performed manually by lab personnel. The process takes time and can result in human error when determining blood type. The purpose of the study survey is to use image processing to reduce the amount of physical labour required to identify blood groups. This project proposes a non- invasive method for measuring blood groups. Also, it compares variations in data collection sites, bio-signal processing techniques, theoretical foundations, photoplethysmogram (PPG) signal and feature extraction, Image Processing algorithms, and Detection models to calculate blood groups. The blood group will be determined by the presence or absence of an agglutination reaction with antigen. A suitable choice for building this solution would be Image Processing, which can be found in both rich and resource-constrained areas. As a result of this analysis, we were able to recommend realistic approaches to the development of a non-invasive Image Processing-based point-of-care blood group measurement tool.

KEYWORDS: DeepNeuralNetwork,NIR Spectroscopy.

I. INTRODUCTION

Blood is an essential to life. It circulates through human body and brings oxygen and nutrients to all the parts of body so that they can keep working. It carries carbon dioxide and other waste material to the lungs, kidneys and digestive system so that waste material to be removed from the system. Blood group is a classification of blood based on the presence or absence of antigenic substances in blood cells. Blood types where first discovered by an Austrian physician, Karl Landsteiner. In 1901, he observed that there are substances in the blood like antigen and antibody that form clumping of red cells when one type of blood is added to another type of blood. Based on this he recognizes three type of blood groups as A, B and C.

He explained that group A and group B agglutinate similarly, but group C blood is different since it agglutinates with both group A and group B. As a result, he found two antigens and two antibodies. Ludwik Hirszfeld and Emil Freiherr von Dungern coined the name O(null) in 1910 to describe the Landsteiner-designated C group, which lacks antigens but does have antibodies against A and B. Sturli and Von Decastello identified the fourth less common blood group, AB, which contains both A and B antigens but no antibodies. Karl Landsteiner and A.S.Weiner discovered the Rh blood group in 1940;they categorise blood groups based on the presence or absence of the Rh antigen.

The human body has the following blood group types listed below.

1) Group A positive or A negative

Blood cells have antigens on their surface. There are anti-B antibodies in the plasma.

2) Group B positive or B negative

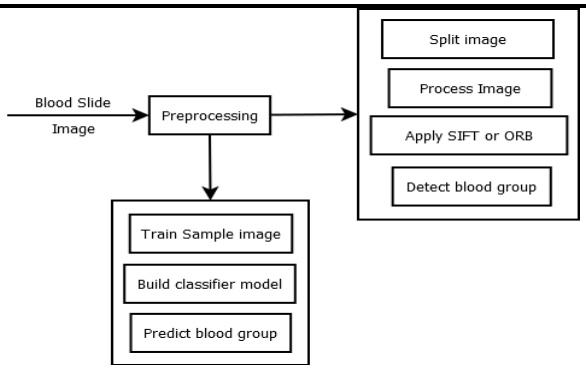
Blood cells have B antigens on their surface. There are anti-A antibodies in the plasma.

3) Group AB positive or AB negative

A and B antigens are present on surface of blood cells. There are no antibodies in the plasma.People with group AB positive blood can usuall receive from any group.

4) Group O positive or O negative

There are no antigens are present on surface of blood cells. Both anti-B and anti-A antibodies in the plasma. O is a universal donor. People with O blood group can donate blood to people with any blood group.



Architecture diagram

II.EXISTING SYSTEM

Blood Group level measurement is a blood diagnosis process to determine the concentration of cell count in the blood . Although the invasive (blood sample collection) approach remains the most common. Invasive processes involve the addition of various chemicals to a blood sample and then optical variations are calculated using spectroscopic data to measure the Blood Group level.

ISSUES IN EXISTING SYSTEM:

• Challenging data collection methods

• Complex data analysis and feature extraction processes.

• Lack of user-friendliness with costly external modules.

• Lack of affordability and portability

III.PROPOSED SYSTEM

The non-invasive method uses spectroscopic data to determine the Blood Group level and data collected from blood samples using image sensors. Near-infrared (NIR) light sources have been suggested as potential ones for getting a blood group response from living tissue. According to a dual-wavelength theoretical framework, PPG signal characteristics recorded under NIR LEDs are regarded as the optimum signal combinations. Each video produces a PPG signal, which is then utilised to extract several characteristic characteristics from it. The best features are then chosen using genetic algorithms (GA), frequency analysis and the PPG signal's derivatives. The strategy is anticipated to deliver the best-estimated accuracy of about 98%**.**

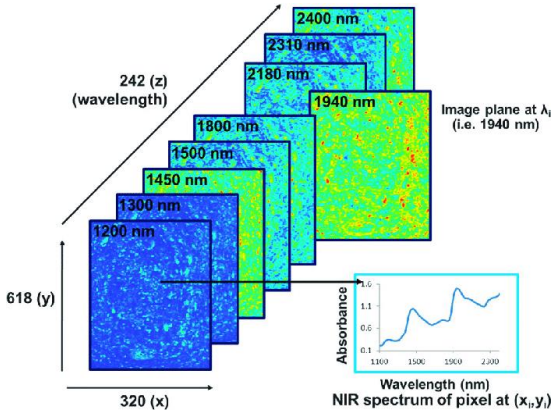
Near-infrared spectroscopy (NIRS) :

A spectroscopic technique called near-infrared spectroscopy (NIRS) uses the near-infrared portion of the electromagnetic spectrum (between 780 nm and 2500 nm). Common applications include physiological and medical research and diagnostics, such as blood glucose, pulse oximetry, neurological function, sports medicine, elite sports training, ergonomics, rehabilitation, neonatal studies, brain-computer interface, urology (bladder contraction) and neurology (vascular synapse). In addition, it is also used in astronomy, atmospheric chemical research, quality control of pharmaceuticals, food and agrochemicals.

Molecular harmonics and coherent vibrations are the basis of near-infrared spectroscopy. The selective laws of quantum physics rule out such transitions. Therefore, the molecular absorbance in the near infrared region is usually quite low. Compared to the comparable basic mid-infrared absorption band, the NIR absorption band is typically 10 to 100 times weaker. The molecular overtone and aggregate bands visible withinside the near-IR are commonly very broad, main to complicated spectra; it is able to be hard to assign particular functions to particular chemical additives .Multivariate (more than one variables)calibration strategies (e.g., primary additives analysis, partial least squares, or synthetic neural networks) are regularly hired to extract the favored chemical information. Careful improvement of a hard and fast of calibration samples and alertness of multivariate calibration strategies is important for near-infrared analytical methods.

Hyperspectral imaging is a chemical imaging method primarily based totally on reflectance spectroscopy (the mild meditated via way of means of materials).This tool makes the gathering of reflectance spectra in every factor of the sector of view for the Near Infrared.

In NIR spectroscopy, the unknown substance is illuminated with a broad-spectrum (many wavelengths or frequencies) of near infrared light, which can be absorbed, transmitted, reflected or scattered by the sample of interest.The illumination is typically in the wavelength range of 0.8 to 2.5 microns (800 to 2500nm)



NIR Spectroscopic images

IV.MODULES DESCSRIPTION

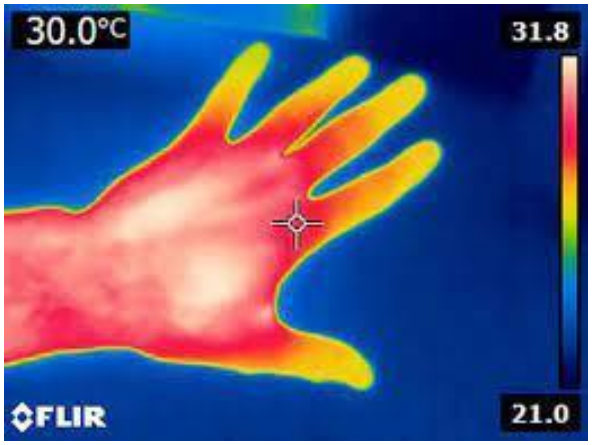
Login: When an user login into the system its ends the request to a database. The Database confirms username and password are correct or not. Also, user can successfully login into the system. After successful login user can register as a new user.

Dataset collection: The spectroscopic images of all the blood groups will be collected from Kaggle as a dataset. There are several ways to collect the data, like web scraping, manual interventions, etc. The NIR dataset is taken from Kaggle and some other sources. The dataset consists of Multiple individual NIR Image data

Data Preparation: We'll transform the data. By getting relief of missing data and removing some columns. First, we will produce a list of column names that we want to keep or retain. Next, we drop or remove all columns except for the columns that we want to retain. ultimately, we drop or remove the rows that have missing values from the data set.

Model Selection: While creating a machine literacy model, we need two datasets, one for training and the other for testing. We'll also divide the data frame into a point column and a marker column. An important system called a Deep Neural Network which is used as a classifier in a blood group discovery is a neural network with some position of complexity. The main purpose of a neural network is to admit a set of inputs, perform precipitously complex, computations on them, and give an affair to break real-world problems. We have an input, an affair, and an inflow of successional data in a deep network.

Analyze and Prediction: The analysis is done by point birth, which refers to the process of transubstantiating raw data into numerical features that can be reused while conserving the information in the original data set.



Trained Model: Trained models include examining the test data set that's used to train an ML algorithm. It consists of the sample affair data and the corresponding sets of input data that have an influence on the output. The training model is used to run the input data through the algorithm to relate the reused affair against the sample affair.

Accuracy on test set: We got an accuracy of 98%, on the test set.

V.REQUIREMENTS

HARDWARE REQUIREMENTS

Processor : Any Processor above 500MHz

Ram : 4 GB

Hard Disk : 500 GB.

Input device : Standard Keyboard and Mouse.

Output device : VGA and High Resolution Monitor

SOFTWARE REQUIREMENT

Operating System : Windows Family

ProgrammingLanguage :Python,Matlab,C

IDE :Matlab or Python

VI.CONCLUSION

Currently, we've seen the significance of right prediction of blood group for colorful purpose. So, to increase the delicacy computer can play an important part in prediction of blood group. This motivated us to design a machine literacy grounded model for directly classify the different blood group. The software developed in image processing is effective and it effectively detects the circumstance of cohesion and accordingly the blood group of the case in a short interval of time. The system would achieve high chance of perceptivity and particularity which will be useful in determining the blood group in exigency situations.

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