

DESIGN AND DEVELOPMENT OF BLOOD SAMPLE ANALYZER USING INTELLIGENT MACHINE VISION TECHNIQUES

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ABSTRACT

The implementation of a new methodology to design and develop an intelligent portable blood analyzing device to detect blood group identification and blood count applications in RBC and WBC. The analysis of blood testing is done using the feature extraction of blood samples in image processing and by using an adaptive Hough transform techniques. The aim of this project is for switching over from manual method of blood grouping to the automated method which is used to decrease the risks of human error and ensure reliability and traceability in each step of the test performed. The simulation of blood group identification is done with the help of MATLAB 15 software. The hardware is done using the python language in Raspberry pi processor.

The blood cell smears and blood group images were obtained from APOLLO Specialty Hospital, Perungudi. The proposed image processing based identification of blood groups of different patients will be very helpful for automatic, sleek and effective diagnosis of the groups and the diseases.

I. INTRODUCTION

The practice of analyzing blood cells to find the behavior of antigens that are available in a blood sample is called as Blood Group (BG) typing. Blood Group types deals with a unique chemical reaction between a particular antibody and BG antigens to observe agglutination or blood clumping. In this way, the needed information about the behavior of those particular antigens can be acquired. There is a broad distinct analytical exams and tools for BG typing, including some classical ones, such as tube or slide tests, whereas micro plate and gel centrifugation are comparatively modernized technique for blood group typing. In addition, nucleic acid amplification techniques are feasible, especially in those cases where BGs are difficult to identify by serological methods. The ultrasound back scattering strategy was also exploited for blood typing to monitor the agglutination reaction. This method offers suitable quantitative information about the agglutinated particles at an early stage and it also explains the effect of shear stress on agglutinate equilibrium. In both classical and advance techniques, there is a compromise between sensitivity, time of analysis and ultimate cost of that specific test. Furthermore, in some techniques, highly-trained personnel are required for interpreting blood typing analysis reports. Therefore, it is difficult to prefer a single testing method that offers sensitive and speedy results at a relatively low cost.

Before performing a blood transfusion, it is necessary to perform certain tests that are properly standardized. One of these tests is the determination of blood type and this test is essential for the realization of a safe blood transfusion, to administer a blood type that is compatible with the type of receiver. However, there are certain emergency situations which due the risk of patient's life, it is necessary to administer blood immediately. In these cases, as the tests currently available require moving the laboratory, it may not be time enough to determine the blood type and is administered blood type 0 negative considered universal donor and provides less risk of incompatibility. However, despite the risk of incompatibilities be less sometimes occur transfusion reactions that cause death of the patient and it is essential to avoid them, administering blood based on the principle of universal donor only in emergencies.

Thus, the ideal would be to determine the blood type of the patient even in emergency situations and administering compatible blood type from the first unit of blood transfusion. Secondly, the pre-transfusion tests are performed manually by technician's analysts, which sometimes lead to the occurrence of human errors in procedures, reading and interpreting of results. Since these human errors can translate into fatal consequences for the patient, being one of the most significant causes of fatal blood transfusions is extremely important to automate the procedure of these tests, the reading and interpretation of the results.

In routine clinical analysis, there is a wide range of established procedures and practices for blood typing, where nearly all of them deal with the formation of agglutinates. Even though some of these classical methods are not highly sensitive, nonetheless, they still hold importance in ABO grouping tests. There is a wide range of blood typing techniques, which differ from each other in terms of sensitivity, reagents and equipment required, the time of operation and throughput analysis. Herein, we describe some general approaches of blood grouping along with their inbuilt advantages and drawbacks.