

IoT Based Non-Invasive Approach for Blood Group Detection using Led

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Abstract- There are 4 major blood groups (A, B, AB and O). People's blood group is determined by the genes they inherit from their parents. Each group can be either Rh positive or Rh negative, which means total there are 8 blood groups. Blood contains RBC (red blood cells), WBC (white blood cells), platelets and plasma. People blood group is identified by the presence of antibodies and antigens in the blood. Antibodies are found outside the RBC i.e. in plasma. Antigens are surface makers on RBC. During blood transfusion, the blood given by the donor works with the type of blood the acceptor has (either A, B, AB, or O). Otherwise, antibodies in acceptor blood will attack it, and cause problems. That's the reason why blood banks screen for blood type, Rh-factor (positive or negative), as well as everything that can cause infection. But conventional took lots of time. Miss transfusion of blood will lead to death. In case of an emergency blood group should be identified as soon as possible. To overcome this problem LED with IoT(Internet of Things) technique is used. The optical signal from the LED is sent through the fingertip and reflected signals are detected using LDR placed beside. The blood groups are determined by analyzing the variation of voltage level. Using IoT technology we can easily give and get blood in emergency situations.

Keyword- Blood groups, LED, LDR, IoT.

I. INTRODUCTION

The blood group is a classification of blood, based on the being and not being of antibodies and inherited antigenic substances. Blood testing is a method to tell what type of blood he/she has. Blood typing is done so people can safely donate their blood or receive a blood transfusion. Blood group plays a major key role for transfusion of blood and for classifying blood during blood donation. It is also done to see if humans have a substance called Rh factor on the surface of your red blood cells. Human blood type is based on whether or not certain proteins are present on their red blood cells. These proteins are called antigens. Blood type (or blood group) depends on what types one's parents passed down to them. The eight main blood groups are: A (+)positive, A (-)negative, B (+)positive, B (-)negative, AB (+)positive, AB (-)negative, O (+)positive and O (-)negative. In conventional methods blood groups are identified in the following ways. A blood sample is needed. The test is done to determine

one's blood group is called ABO typing. The blood sample is mixed with antigens against type A and B blood. Then, the blood sample is checked to see whether or not the blood cells bind together. If blood cells bind together, it means the blood reacted with one of the antibodies. The second step is called back typing. The plasma of the blood without cells (serum) is mixed with blood that is known to be type A and type B. People with type A blood have anti-B antibodies. People with type B blood have anti-A antibodies. Type O blood contains both types of antibodies. The 2 steps above can determine your blood type. Rhesus(Rh) typing uses a method alike to ABO typing. When blood typing is done to see if he/she has Rh factor on the surface of their red blood cells, the results will be one of these:

- Rh+ (positive), if he/she has this cell surface protein.
- Rh- (negative), if he/she does not have this cell surface protein.

In this method the needle is usually connected to special tubing or a syringe to collect blood. Release the tourniquet and remove the needle from the arm or hand, applying gentle pressure with a gauze or bandage to prevent further bleeding. When the blood is drawn for test it may lead to bleeding under the skin, fainting, infection in the particular region. Clinical error during blood transfusion leads to the common cause of death, if improper transfusion is done after or during surgeries it leads to agglutination, blood clumping which ends up with fatal consequences. This process took lots of time. Hence there is a need to discover new equipment which eliminates all types of problems in conventional methods. Here we come up with an idea. Our proposed idea is to find the blood group non-invasively and effectively without puncturing the skin. Light acts as a source for optical signals which is allowed to pass through the finger and LDR detects the varying voltage. As the optical property of blood varies for unlike antigen present on the RBC, the voltage value obtained also gets varied. Depending upon the output voltage of the resistor, blood groups are determined. The process is straightforward and convenient to determine ABO blood group in a short period of time, so

it can be economically used for blood tests during emergencies and war fields.

II. LITERATURE SURVEY

In clinical examination, there is a wide range of conventional procedures and practices for blood group determination where all of them deal with agglutination. There are several methods with their advantages and disadvantages.

- Slide Method
- Tube Method
- Micro-plate Method
- Column/Gel Centrifugation Method

1. Slide Method: The slide method is the least sensitive method while comparing with other blood group detection methods. In this method blood sample is placed in a glass plate, then antisera A, B and D are added to find the clumping of blood in particular samples. This test cannot be conducted for weakly or rarely reactive antigens.

2. Tube Method: In tube method blood sample is mixed with antisera in a test tube and the test tube is then shaken to view clumping of blood. Here centrifugation takes place for the proper mixing of blood with antigen. Hence it requires more time.

3. Micro-plate Method: It consists of multiple wells which are used as small test tubes. In Micro-plate technique antibodies, plasma and antigens on red blood cells are determined. This method is fast and highly sensitive.

4. Column/Gel centrifugation Method: In this method blood sample is mixed with gel culture and with the help of centrifuge machine blood group is determined. This process is highly sensitive and time consuming.

III. PROBLEM DEFINITION

Blood testing is the test that determines a person's blood type. This test is essential if he/she has planned to have a blood transfusion or planning to donate blood. Not all blood types are adaptable, so it's important to know everyone's blood group. Receiving blood that's conflicting with your blood type could trigger a dangerous immune response. Everyone's blood group is determined by what kind of antigens their red blood cells have on the surface. Antigens are matters that help people body to differentiate between their own cells and foreign, potentially dangerous ones. If your body thinks a cell is foreign, it will set out to smash it. The ABO blood typing system groups everyone's blood into one of four categories:

- Type A has A antigen.
- Type B has B antigen.
- Type AB has both antigen A and antigens B.
- Type O has none of the both A and B antigens.

Blood typing is the way to ensure that the acceptor receives the right kind of blood during surgery or after an injury or during pregnancy time. If an acceptor is given incompatible blood, it can lead to blood clumping, or agglutination, which can be fatal. In order to save people's lives in very critical and important situations we are proposing an IoT Based Non-Invasive Approach for Blood Group detection using LED, which can detect the blood group non-invasively and produce the output. In the case of emergency with the help of a request button, IoT and GSM we can easily get the blood from nearby donors or from blood banks.

IV. WORKING OF PROJECT

The working model consists of following blocks:

Hardware:

- PIC Micro-controller board
- Power Supply
- LED
- LDR
- RFID Reader
- Request Button
- Node MCU
- GSM
- LCD
- Server
- Mobile Application
- User Software:
- Embedded C

Light which emerges from LED (Light Emitting Diode) is allowed to pass through the finger and LDR (Light Dependent Resistor) is used to find the intensity of transmitted light from the finger. LDR detects the intensity of the light signal and gives the corresponding voltage level. The obtained voltage level is compared with the pre-programmed voltage level of blood groups at Micro-controller. The final result will be displayed on LCD. In the case of emergency Request Button is used to find the blood groups in the nearby blood banks with the help of IoT (Internet of Things) Technology. Here Node MCU acts as a Wi-Fi. The connection between Node MCU and the server is bi-directional. The request is displayed in a mobile application, if the donor is ready to donate blood he/she can accept the request. The acceptance message is displayed in LCD. It contains the donor name and contact number. With the help of GSM a request message will be send to the donors as SMS.

V. BLOCK DIAGRAM

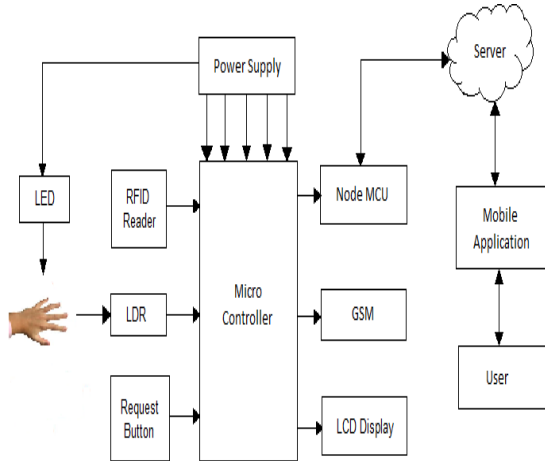


Figure 1. Block Diagram of project

VI. PROJECT SETUP

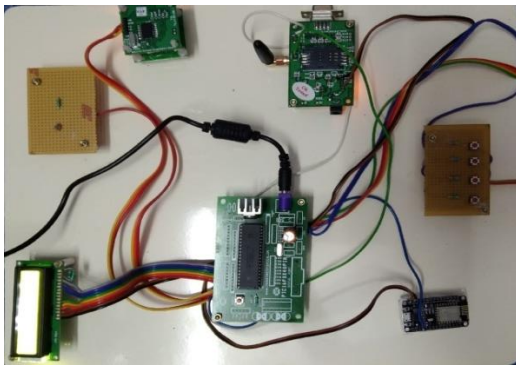
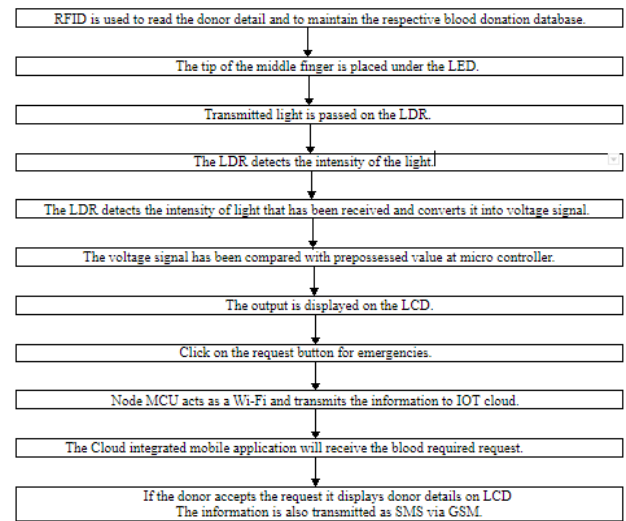


Figure 2. Snapshot of project setup

VII. FLOWCHART



VIII. RESULT

Sr. No	Name	Obtained Blood Group	Age
1	Parkavi	O+	18yrs
2	Krishnan	A+	21yrs
3	Ashwin	O+	28yrs
4	Vinisha	B+	30yrs
5	Abi	O+	20yrs

IX. CONCLUSION

The conventional methods of blood group detection involve puncturing of skin, infections, fainting, time consuming and some reagents are needed. The proposed system is compact in size, low cost, less time and output obtained quickly. The blood group is identified in a very short time, when compared to conventional methods. There is no need for puncturing the skin, non-invasively we can find the blood group. This will serve very useful for the hospitals to detect the blood group at a very short time in the case of emergencies.

TABLE I. REFERENCE VOLTAGE IS EQUAL TO 5V

Voltage level(V)	Group
3.9-4.0	O+
4.1-4.2	B+
4.2-4.3	A+
4.3-4.4	A-

X. APPLICATION

The Blood Group detection technique is very reliable and may be widely used in future for detection of many pathological parameters.

There are some general applications given below:

- It will be useful in hospitals for detecting the blood group of patients within a few seconds.
- This equipment can also be useful to find blood groups for people having bleeding disorders like hemophilia, Von Willebrand Disease (VWD).

XI. ADVANTAGES

Non-Invasive blood group machines have many advantages over the conventional methods which are used in the hospitals. It is a new invention in the history of Medical science which is directly giving the correct output of the blood group that patients require. Some advantages are as follow:

- This equipment is going to identify the correct blood group of more than one patient without any confusion.
- This is small equipment which can be used anywhere, even for use in field trials.
- We can find out a patient's blood group within a few seconds.
- Infection occurrence will be reduced.

XII. FUTURE SCOPE

This equipment is portable and has wide application in many fields. Non-invasive blood group detection has great scope in future. This equipment as collaboration with blood gas analyzer, due to this we can also determine blood group as well as other parameters of blood (WBC, RBC, platelets, etc.) We can also develop this to find glucose level non-invasively. We may also add a temperature sensor to find the body temperature of the patient, in order to avoid spreading of corona disease.

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