

Non Invasive Determination of Blood Group Typing Blood Glucose and Haemoglobin Analysis

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Abstract: Practice of current which is widely used for blood group depend upon the antigen-antibody reaction and for blood glucose and hemoglobin analysis involves needle for pricking blood sample which is painful and can cause discomfort to the patient. All samples test also requires a novel test-strip for blood testing. From this work, non-invasive method for identifying the blood group without pricking the skin. The technique of embeds infrared LED emits infrared radiation; the sensor's output is determined by the photodiode's strength of reception. Linked with intensity range, blood group is identified. The hemoglobin level is measured using near-infrared and average level of blood glucose can be identified using (IR) sensor. Raspberry pi is used as control unit.

Key words: Blood Group, Blood Glucose level, Hemoglobin (IR Sensor), Heart Beat Sensor.

1. Introduction

The beating heart circulates blood from one part of the body to another through blood vessels. For animals two processes takes place one is blood is carried by lungs by oxygen for air that was inhaled in to body tissues second blood is carries by lungs by carbon dioxide then the process contains waste metabolism in tissues and transport it to lungs, where it is exhaled.

This is made up of plasma and cells known as blood, circulates around the body. It is especially for fluid body that transports vital sequence such as sugars, oxygen, and hormones in the body.

WBC (White Blood Cells) were defending the infections from the body are i) external tissues ii) abnormal cells. In the blood platelets can be encouraging the blood coagulation or clotting. The platelets induced to create a blood clot when bleeding is occurred. Clot may be a scab or stops, the exploiting helps to protect the infections.

2. Hemoglobin

Hemoglobin in the blood supplies oxygen and nutrients or gills while the body is at rest. When it releases oxygen the energy can provide by aerobic respiration, to the function of power organism this process also known as metabolism. In every 100 ml hemoglobin of blood contains the 12 to 20 grams for healthy person.

Hemoglobin deficiency may be caused by a reduction in the number of hemoglobin molecules in the blood, by a reduced every molecules ability to around the same level of oxygen, bind oxygen, as in hypoxia. Both may be caused by hemoglobinopathies, which are genetic abnormalities caused by an irregular structure of the hemoglobin molecule.

Hemoglobin deficiency can be distinguished from hypoxemia by its decreased blood oxygen-carrying capacity at this time. Although both are causes of hypoxia, it is characterized as a reduced partial percentage of oxygen pressure in the blood. When hemoglobin is low some general problems are deficiency nutritional, failure of kidney, chemotherapy, bone marrow problems, or hemoglobin abnormal. Changes in blood pH or CO₂ modify the hemoglobin molecule's capacity to take oxygen, resulting in altered oxygen of hemoglobin dissociation curve.

3. Diagnostic Values

Normal levels of Hemoglobin for Men, Women, Children, Pregnant women.

For Boys	-	13.8 - 18.0 (grams per decilitre) ; 8.56 - 11.17 (millimoles per litre)
For Girls	-	12.1 - 15.1 (grams per decilitre) ; 7.51 to 9.37 (millimoles per litre)
For Pregnant Lady	-	11 - 14 (grams per decilitre) ; 6.83 to 8.69 (millimoles per litre) (during pregnancy value 9.5 to 15)
For Kids	-	11 to 16 (grams per decilitre) ; 6.83 to 8.69 (millimoles per litre)

4. Literature Survey

T.M Selvakumari, (2011) proposed method of a non-invasive for blood group no actually stabbing the skin. The proposal has been developed using fibre optic based devices which paved using optics to find the ABO Blood group. Light source is a signal optical are eligible to pass through the finger. A work condition of detector are used to detects the voltage of varying variation. The Photo detector used to detect output of the voltage variations due to change of ABO blood groups. The levels of the voltage of the various persons are detected and then the blood group typing is done.

Gaurav S. Mehare (2018), proposed a non-invasive are used for the types of blood based on image processing. Which technique uses a light scattering approach as light travels through capillaries to classify blood cells dynamically based on the form of various antigens present the surface of (RBCs) Red Blood cells. Types of blood are determined using a camera that captures the dispersed light pattern from red blood cells.

Priyadharshini.R (2014), Using laser technology, a novel approach to blood group identification has been developed. In this method, electronic instruments such as a laser light, a photocell, and a comparator are used. Blood samples are mounted on a test slide, and the laser light is passed through the blood sample. Below the test slides are photocells that detect light and produce a small amount of voltage. Finally, the voltage level is compared using a comparator. The voltage level observed varies depending on the blood type.

J.Yadav (2014), The Near-infrared (NIR) technique was used to suggest a sensor device used to measure blood glucose by non-invasive. To assess the system's sensitivity for different glucose concentrations, an prototype measurement of in-vitro was produced utilised CW (continuouswave) from an 940 nm in NIR LED. Then the detector patch was created utilised an LDE and photodetector to analyze reflected diffraction patterns of the subjects. The results of this technique were compared to intrusive finger tip glucometers that are commercially available.

ZhanxiaoGeng (2017), a proposed a multisensory-based, non-invasive at low and high frequencies, a continuous glucometer is combined with impedance spectroscopy. Multiple sensors are obtained time data series continuously, a method for estimating glucose variation using temperature, optical properties next humidity was created.

5. Proposed Method

In this paper we proposed an idea that the technique embeds infrared LED at the wavelength of 0.75 μ m to 1000 μ m and emits infrared radiation. The intensity of reception dictates the output of the sensor by photodiode. The blood glucose is measured using NIR transmission at the wavelength of 0.75 μ m to 3 μ m through a finger. NIR energy is introduced into one side of a finger For detecting NIR energy emerging from an opposite side of the finger, a photo-detector is used.

The block diagram shown in figure 1 illustrates the proposed system. The whole system works on a Raspberry pi. The heart beat sensors and glucose sensor connected to raspberry pi through an converter (A to D) Analog to Digital as the sensors create A values i.e., Analog value. The digital values are sending to Raspberry pi. The average level of blood glucose can be measured by the amount of hemoglobin content present in the body. NIR energy is introduced into one side of a finger for detecting NIR energy emerging from an opposite side of the finger, a photodetector is used.

5.1. Heart Beat Sensor

Photo ptythesmography principle is for heart beat sensor. It measures the difference in blood volume through any organ of the body that induces a change in light power through that organ also known as a vascular locale when the finger tissue is enlightened utilizing a light source, it get regulated after the light is communicated. The light indicators obtained this balanced light. (LDR) Light Dependent Resistor is using a light indicator. It working condition is depends on the rule. Followed rule are when light drop on resistor, the obstruction changes. When the force of light expands, opposition diminishes. When dropping of voltage across the resistor gets decreases. When a human tissue is enlightened utilizing the light source, the power of the light diminishes. As this decreased light power falls on the LDR, the obstruction increments and accordingly the voltage drop increments

5.2 NIR Glucose sensor

According to Infrared sensor may also be used to determined the amount of heat emitted by an object and to detect movement. As infrared light hits the photodiode, the defences and yield voltages change in proportion to

the size of the infrared light. Near Infrared conveyance light source includes and situated light locator on one or the other side of finger. The amount of near-infrared light passing through the finger is determined by the amount of blood glucose in the region. Close to Infrared light is applied onto finger one side, while an identifier gets the light weakened from opposite side. This constricted sign are taken care of into an enhancer to enhance the powerless NIR signals. Close Infrared is picked because of its affectability, selectivity, minimal effort, and versatility.

5.3 Raspberry Pi

The Raspberry Pi is a charge card measured PC that connects to your TV and a console, which can be utilized for a significant number of the things that normal work area does - accounting pages, word-preparing, games and it additionally plays top notch video. The Raspberry Pi's hard drive is an SD card that is inserted into the board's opening. It gives a bunch of (GPIO) General Purpose Input or Output sticks that allow you to monitor electronic components for real-time logging and research into the Internet of Things (IoT).

6. Results and Discussions

By entering patient details to the database those data's will be entered manually to the hospital server so that we can easily see and use the patients detail when we required it shown in Figure 2. Using the software all the patients details are entered periodically and that will be stored in system. Figure 3 shows the data entry of single patient and also the data entry per day.

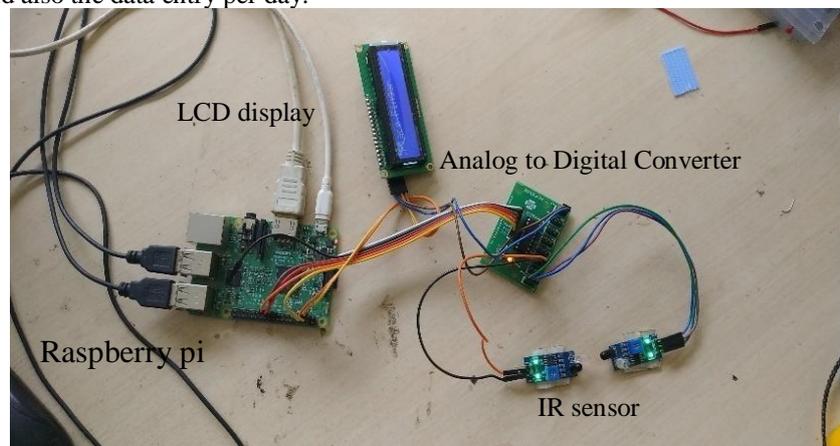


Figure 2. Hardware Setup of Proposed System

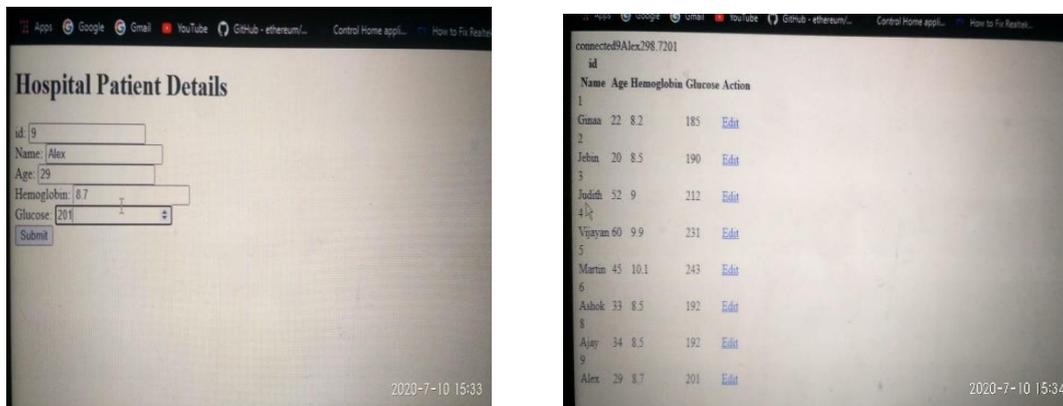


Figure 3. Patients details entry

Blood group detection using fiber optics. In this technique, the transmitter is utilized to create beats of recurrence. At that point these heartbeats are taken care of to the Light Emitting Diode [LED], which convert electrical variations into optical variations. From that point forward, the optical signs were dispatched into the fiber. At that point it is fed to the blood test and it is gotten by the collector which changes over the optical variations again into electrical varieties. For all blood types, the electrical differences found are distinct. There would be a corresponding voltage difference in the performance of the photodetector due to the optical differences in various blood groups. As a result, blood groups (ABO) can be calculated without the use of antigens, and strength levels can be used to identify them. However, the Rh blood group (both positive and negative) has not been discussed.

Table 6.1, 6.2 and 6.3 shows the different group corresponding blood sugar level with various patient age to be considered.

Table:6.1 BloodGroup

BLOOD GROUP	INTENSITYRANGE(lux)
A	65-75
B	76-83
O	84-94

Table: 6.2 HemoglobinLevel

Type of Patient	HAEMOGLOBINRANGE(g/l)
ADULTMALE	(13.5-17.5)
ADULTFEMALE	(11.5-15.0)
CHILD	(11.0-13.5)
NEWBORN	(15.0-20.0)

Table: 6.3 Analysis of Results

S.No.	Experimental Hemoglobin value (%)	Corresponding Average Blood Sugar level
1	8.2	185
2	9.0	212
3	9.9	231
4	10.1	243
5	8.5	192
6	8.5	192
7	10.7	260
8	9.3	224
9	9.7	245
10	9.9	235

7. CONCLUSION AND FUTURE SCOPE

The proposed work of Raspberry Pi found much compact, Raspberry Pi is user friendly and low complex, for repetitive tasks and several tedious are performed which can be ready. This method blood group, blood glucose level and haemoglobin analysis are identified within a short time and concluded that blood glucose level are 99% correlated with clinical values for non-diabetic patients and anaemic patients.

Future improvements to the work may also be oriented toward making the process more compact and comfortable. This can be accomplished by using a wireless link to transfer data to a device instead of a physical connection. The data will then have to be sampled by a controller and returned to the computer after sampling. Mobile application can be developed with the help of flashlight in mobile to identify the blood group and to measure blood glucose level. Blood group types can be identified using both in-vitro and in-vivo for optical sensing by saving effort and time.

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