e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:05/Issue:01/January-2023 Impact Factor- 6.752 www.irjmets.com

HEART RATE AND BLOOD OXYGEN LEVEL MEASUREMENT

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DOI : https://www.doi.org/10.56726/IRJMETS32816

ABSTRACT

In this project, we will measure the pulse rate and blood oxygen level using a pulse oximeter sensor. This pulse oximeter is designed by using a pulse oximeter sensor which consists the one IR light and one RED light and another photodiode and the other photodiode is used on the same side. When this light falls on the finger then the light bombards blood from the finger and then it reflects, that reflected signal is received by the photodiode. The photodiode converts light energy into electrical form and is fed to the ATmega328 Microcontroller. That will take the signal and shows pulses and oxygen saturation on LCD.

Keywords: Measuring Heart Rate And Blood Oxygen Level; Reflectance Pulse Oximeter; Non-Invasive Blood Oxygen Saturation.

I. INTRODUCTION

In this project, pulse oximetry is a non-invasive technique. there are two non-invasive techniques. one is transmissive and the other is reflectance to perform pulse oximetry (SPO2). Heart rate and oxygen saturation of blood which measured by a transmissive pulse oximeter consisting of the pulse oximeter sensor. Oxygen saturation is the measurement of the amount of oxygen dissolved in blood-based on whether it is hemoglobin or deoxyhemoglobin. Two different lights are used to measure the actual difference in the absorption of hemoglobin and deoxyhemoglobin. deoxygenated hemoglobin (Hb) has a higher absorption at 660nm and oxygenated hemoglobin (HbO2) has a higher absorption at 940nm. The pulse oximeter determines the light absorption of two wavelengths and calculates the absorption

Pulse Oximetry

Fig 1. Detection methods for measuring the blood oxygen level

SPO2 = Vir / Vred * 100 The ratio of 0.9 represents SPO2 of 90%

II. DESCRIPTION

A pulse oximeter sensor is used at the input. This sensor consists of two LEDs one is red led and the other one is IR led and the photodiode is also used to detect the red light and IR light. whenever this light falls on the finger, that passes into the body finger, light bombards the blood and then reflects, That reflected signal is received by a photodiode. The photodiode converts light energy into the form of electrical energy. The output of the pulse oximeter sensor is given to the Atmega328 microcontroller by using i2c protocol, with help of SDA and SCL pin, that signal is received by the microcontroller. Here oxygen saturation is a measurement of the amount of oxygen dissolved in blood based on, that is hemoglobin and deoxyhemoglobin. Two different lights are there red light and IR light are used to measure the actual difference in the absorption of hemoglobin and deoxyhemoglobin. By using these two properties we will calculate oxygen saturation. When the heart is pumping

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blood and there is an increase in oxygenated blood as a result of having more blood. As the heart relaxes, the volume ofoxygenated blood decreases. That the time between the increase and decrease of oxygenated blood, and pulse rate is determined.

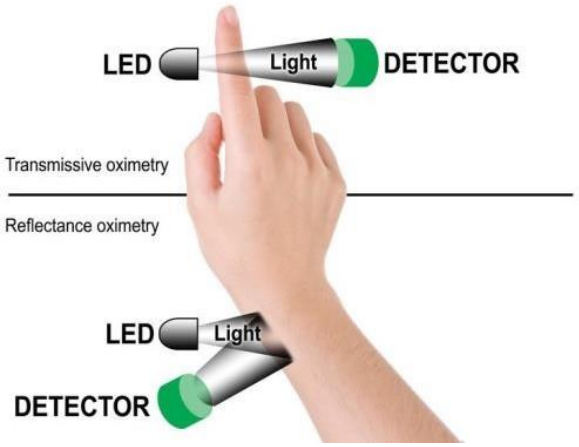

Fig 2. Pulse Oximeter Sensor

III. PROPOSED METHODOLOGY

Block Diagram:

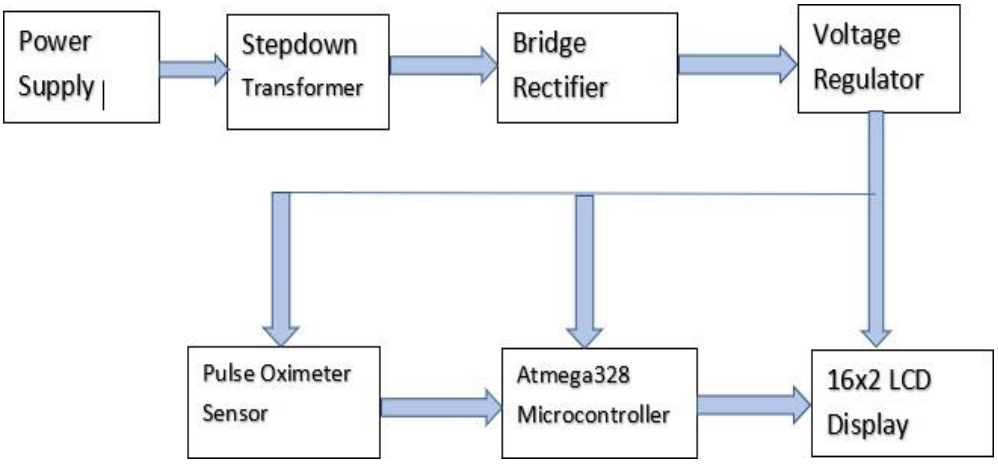

Fig 3. Block Diagram of System

Power supply:

The power supply provides a 5V and 12v supply to the circuit. The power supply has four stages that are a transformer. Rectifier, filter, and voltage regulator. In this circuit, we are using a stepdown transformer that takes 230V AC and provides an output of 15V at the secondary winding. this 15VAC will be rectified by a bridge rectifier using four diodes, that bridge rectifier converts the AC wave into a fully rectified wave. After that filter is used there which consists ofthe capacitor, which converts a fully rectified wave into a DC wave. At the last regulator is used, that regulator removes theentire ripple and gives pure DC. (1) Transformer: We have used a stepdown transformer for generating a 5V supply. That's why we have used a 12V/500mA transformer, which means its output will be 12V AC with a current rate of 500mA. (2)Rectifier: The rectifier is used to rectify the negative half cycle of the output signal of the secondary winding of the transformer. the input of the rectifier is it will be an AC signal with both positive and negative cycles and the output of the rectifier is only positive cycles. We have to use a capacitor to filter out the AC of the output signal. (4) Voltage Regulator: After the capacitor filter voltage regulator is used. It generates a constant DC voltage supply of 5V. The output of the capacitor filter is given to the voltage regulator then we will get a 5V supply at the output of the voltage regulator.

Pulse oximeter Sensor:

The sensor has 7 pins that are Vin, Ground, SCL, SDA, INT,IRD, and RD. the sensor consists of two LEDs that is IR

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and RED. Light passes in the finger and reflects along with the photodetector detects the reflected light. The output of the photodetector is given to the A-to-D converter. That digital data will get filtered and that data collected from the registerand send to the microcontroller using the I2C communicationprotocol.

ATmega328 Microcontroller:

It has a total of 28 pins and 3 ports PORTB, PORTC, and PORTD. By uploading the program to the microcontroller we can see the heart rate and blood oxygen level as well according to the program command.

LCD Display:

We are using an alphanumeric LCD (Liquid Crystal Display)16x2. The LCD is a very basic module and we can use it in various devices and circuits as well. Because LCD program is very easy and it is also economical. In that projecton LCD, we will see the heart rate and blood oxygen level.

IV. FLOWCHART

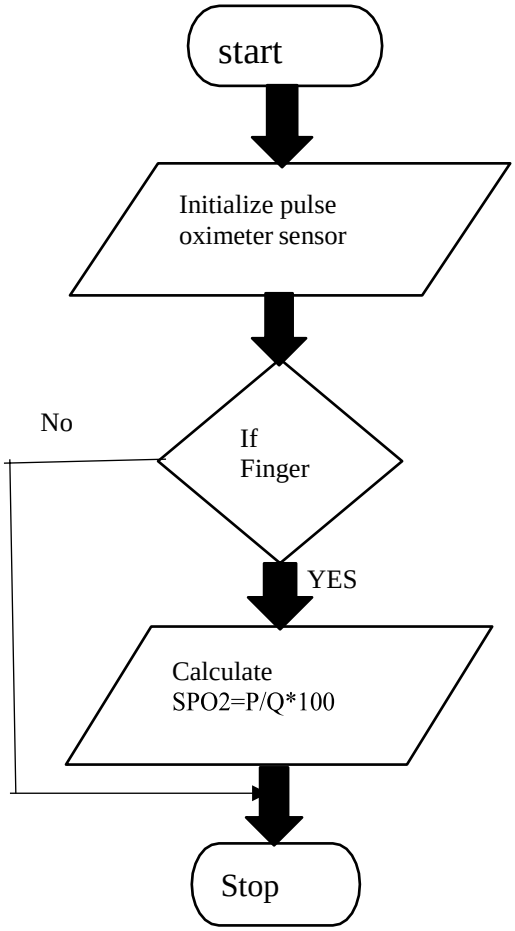

Fig 4. Flowchart

The sensor is attached to the finger, as the sensor is reflected type, so lights from the sensor will be reflected in asensor. Then infrared light absorbs by the oxygenated blood and red light absorbs by deoxygenated blood. Then that signal is given to the microcontroller. As the program, the amount of absorbs red light and infrared light in the blood is compared and data will be displayed on the LCD. Hence patients can be get known immediately about their health condition.

V. RESULT AND DISCUSSION

As we know the average SPO2 of a normal person is about 95% to 98%. Initially, we used a pulse oximeter sensor for accurate readings. Firstly we go through the software design of our project for circuit design and simulation we used proteus software.

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Table No.1

Sr.No	Age	Health Condition	SPO2(In MedicalDevice)
1	25	Healthy	99.85
2	21	Healthy	99.65
3	16	Healthy	98.23

VI. CONCLUSION

From this project, we got more knowledge regarding theATmega328 microcontroller interfacing with LCD and the pulse oximeter sensor. We can calculate the reading of our project using this circuit with a pulse oximeter sensor for measuring the heart rate and blood oxygen level.

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