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	Design			• • • • • • • • • • • • • • • • • • • •	De la Dalas Orientes		
	Design	And Develo	opment Of	Microcontroller I	Base Pulse Oximeter		
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Abstract:

Percentage oxygen saturation in blood, Heart rate and the Body temperature are the prominent parameters to be known by the medical Technicians and Doctors for knowing the patient's health condition in general and in the situations like Covid-19 in particular, since the Doctor gets less than three minutes to survive the patient when the percentage oxygen level in blood starts going below the critical value of 89% followed by lowering of the heart rate. Here the designing of microcontroller based pulse oximeter is proposed in order to have direct [Non invasive] measurement of % oxygen saturation in the blood and the heart rate by even a non medical person. Microcontroller, a dedicated processor is universally employed in almost all the electronic gadgets, devices and machines which are popularly identified as embedded systems and have applicability in almost every field inclusive of biomedical electronics for the accurate, fast and even online readings. Also the designing of such pulse oximeter will be cost effective and hence can be used at small hospitals and even at small places

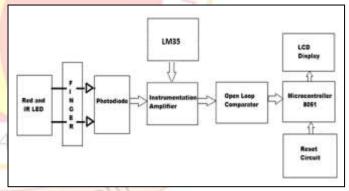
Index Terms - Percentage oxygen saturation in blood, Heart Rate, Covid-19, Non invasive, Dedicated Processor, Gadgets, Embedded Systems

1. Introduction

Entire circuit on a single chip is a concept of

embedded system and it came into existence with the development of microcontrollers. Almost all the systems built around microcontrollers today follows the basic steps like sensing, processing and displaying or outputting the result as per the requirement. Since it's a dedicated system or a processor with limited amount of RAM, ROM, timer and counters; they are identified as a SYSTEM ON CHIP. The systems built around the microcontrollers are having an added advantage of portability. Here in this paper, the microcontroller is proposed to be used with the associated circuitry for the measurement of all the three prominent parameters namely Percentage oxygen saturation in blood, Heart rate and the Body temperature, which are considered as the most important parameters in a situation like COVID-19.Though the microcontroller 8051 is shown in the block diagram; since the parameters to be measured needs utmost accuracy being health related, hence one has to move to the higher versions of the microcontroller accordingly.[1]

2. Proposed Block Diagram



3. Various blocks in a Block Diagram 3.1 Red and IR LED & Photodiode:

Generally, two common methods are used in pulse oximetry namely; the Reflectance and the transmittance method. Of which the transmittance method is used here. Light from the Red LED (660 nm wavelength) and IR (Infrared) LED (940nm wavelength) is passed through the tissues of the finger and detected at the other end by the photo detector. Oxygenated hemoglobin absorbs more infrared light and allows more red light to pass through whereas Deoxygenated hemoglobin absorbs more red light and allows more infrared light to pass through. The change is detected by the photo

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detector and the equivalent electrical signal (voltage) is obtain at its output. [2]

3.2 IC LM35:

Is a 3 terminal temperature sensor IC measuring the temperature in °C in the range of -55 °C to 150 °C with accuracy of $\pm 0.5\%$. Universally the body temperature is measured in °C and hence the IC LM35 is chosen.

3.3 Instrumentation Amplifier:

Receives both the above measurand. Basically a Differential amplifier equipped with input buffer amplifiers (To eliminate the need for input impedance matching). Hence useful in measurement and test equipment from heavy duty industrial automation to precision medical devices.

When light from LEDs passes through tissues the interference of unwanted light signals (noise) takes place and the signal received by the photodiode may be with noise. The Instrumentation Amplifier has an advantage to measure small signal in noisy environment and hence are used for great accuracy and stability.

3.4 Open loop Comparator:

Compares, One Analogue signal with another or a reference voltage and outputs a binary signal based on the comparison. The comparator is basically an analogue-to-digital converter.

3.5 Microcontroller:

Needs to be programmed for the inputs received from the open loop comparator and sending the result i.e. Pulse Rate, Percentage Oxygen saturation in the blood and the body temperature in °F to LCD display. All computation part is done inside the controller.

3.6 LCD Display:

Is a 16x4 LCD Display used for displaying the actual Pulse rate, Percentage Oxygen saturation in the blood and the body temperature.

3.7 Reset Circuitry:

Resets the microcontroller, clearing the display so as to take the next measurement. [3]

4. Data processing:

Here the data for three major parameters namely percentage oxygen saturation in blood and heart rate from the photo detector's output and the body temperature from the IC LM35 will be received by the instrumentation amplifier at the first stage where the noiseless data will only be outputted by the instrumentation amplifier as it being the quality of an instrumentation amplifier and will be forwarded to the microcontroller through the open loop comparator (where these parameters will be compared with the standard or reference values for the further processing; for which the microcontroller needs to be programmed. On manipulating these parameters with the help of microcontroller the result will be displayed at LCD output. After taking the readings from the display to reset the system the reset circuitry is used, this will allow taking the readings for the next. [4]

5. Conclusion:

Ultimate intention behind the designing of pulse oximeter is to have quality and in time health assistance and is a great concern and the basic need in the medical field. Though, today's Multispecialty and Superspeciality hospitals are equipped with the high-tech facilities, they are complex and quite expensive. Under such circumstances the proposed design could have been proved to be much effective. The design as above using Red LED, IR LED, photo detector and IC LM35 for measuring the body temperature in degree Celsius. The components, design & technology used makes the system cost effective.

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