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DETECTION OF HEART RATE COUNT AND SpO2

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ABSTRACT

The 'contactless environment' involves less risk of direct human contact. This is importantnot only to minimize transmission and health risks for patients but also for healthcareproviders and doctors etc. We are implementing the methods to measure the heart rate count and oxygen level for Knowing the status of Covid-19 Patients.

1. INTRODUCTION

A pulse oximeter is a light-based device used due its simplicity to measure heart rate (HR) and thearterial oxygen saturation (SpO2) as a percentage of the haemoglobin in blood. Accordingly, thePhotoplethysmography (PPG) signal is used to monitor the HR by detecting the variation in the blood volume in the investigated area.The variation in the heart rate relies primarily on the state of the patient(exercise, sleep, stress, etc.). While, the average heart rate at rest should be between 60 to 100 bpm.Consequently, heart rates outside this range could be an indication of a medical condition. On the otherhand, oxygen saturation depends on the concentration of haemoglobin in red blood cells, where theaverage normal value is 95 % to 100 %. Therefore, low values could be an indication of some diseasessuch as anaemia. Additionally, its values are directly proportional to the amount of oxygen available inthesurroundingatmosphere.

2. LITERATURE REVIEW

According to Handbook of Biomedical Instrumentation by R.S. Khandpur [7], techniques of measuring heart rate are:

Average Calculation:

An averagerate iscalculated bycounting the number of pulses in given time. This methoddoes not show changes in time

between beats and thus does not represent the true picture of heart's response to exercise, stress and environment.

Beat To Beat Calculation: This is done by measuring the time (T) in seconds, between two consecutive pulses, and converting the time into beats/min, using the formula beat/min = 60/T.

Combination Of Beat To Beat Calculation With Averaging:

This is based on four or six beats average. The advantage of this technique over the averaging techniques is its similarity with beat-to-beat monitoring system.

Pulse oximetry relies on measurement of physiologicalsignal called photoplethismography, which is an optical measurement of the change in blood volume in the arteries. Pulse oximetry acquires PPG signals by irradiating twodifferent wavelengths of light through the tissue, andcompares thelight absorption characteristicsof blood underthese wavelengths. These absorptions obey Beer Lambert's law. According to Beer Lambert's law transmittance of light through the tissue can be calculated using:

$$I_{out} = I_{in} e^A$$

Where I_{out} is the light intensity transmitted through fingertip tissue, I_{in} is the intensity of the light going into the fingertip tissue and A is the absorption factor.

According to Yousuf Jawahar, Pulse oximetry can be done by two methods

Transmittance Method: In this method, light is transmitted through tissue using the LED and is detected on the other end using a photo-detector. It is more suited to the areas of body that lend themselves better to light transmittance through them, e.g. fingers or ear lobe. This configuration cannot be used in other areas of body when there are obstacles such as bones or muscles.
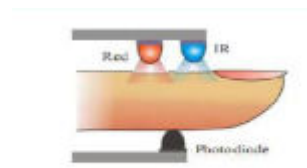
Fig. 1 Transmittance Method

Reflectance Method: In reflectance pulse oximetry it uses a photo detector on the same side as the LED to detect the light reflected by the tissue. This method is more useful where the vasculature is available close to the surface of skin e.g. forehead, wrist, forearm.

Fig. 2 Reflectance Method

Based on all these review, there are two methods are chosen to calculate heart rate and blood oxygen saturation level.

Heart rate calculation: In this project is based on the beat to beat heart rate calculation process. In this process, number of pulses for a given period T is calculated and converted tobpm by multiplying with 60/T, that gives the

instantaneous heart rate in bpm. So this can be expressed as

$$\text{Heart rate} = \frac{\text{No. Pulses for a given period T} \times 60}{T} \text{ bpm}$$

3. BLOCK DIAGRAM:

4. DESCRPTION OF COMPONENTS
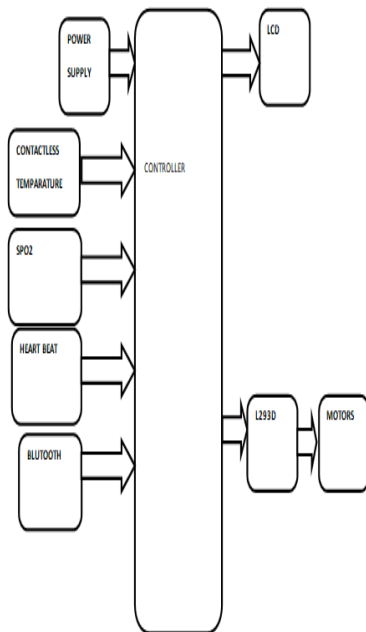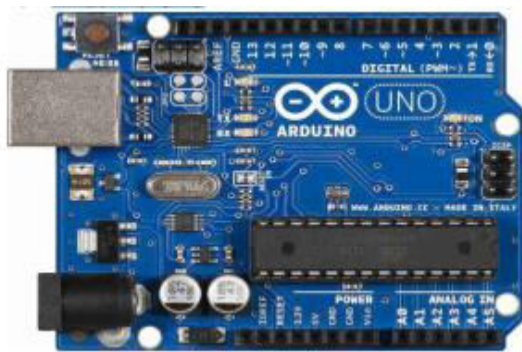
Arduino.

The Arduino Uno is a microcontroller that is free source. Digital and analogue I/O pin sets are available on the board. It includes fourteen digital I/O pins, six PWM outputs, and six analogue I/O pins, and it can be programmed with the Arduino Uno. It accepts voltages ranging from 7 to 20 volts and may be powered by a USB cable or an external 9 volt battery.

LCD/DISPLAY

Liquid Crystal Display also called as LCD is very helpful in providing user interface as well as for debugging purpose. The most commonly used Character based LCDs are based on Hitachi's HD44780 controller or other which are compatible with HD44580.
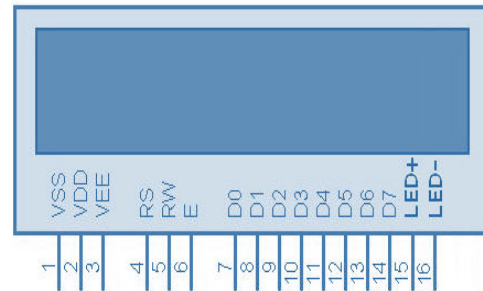
SP02 SENSOR

Pulse oximetry is a noninvasive and painless test that measures your oxygen saturation level, or the oxygen levels in your blood. It can rapidly detect even small changes in how efficiently oxygen is being carried to the extremities furthest from the heart, including the legs and the arms.

TEMPERATURE SENSOR:

t is widely used to measure temperature in hard environments like in chemical solutions, mines or soil etc. The constriction of the sensor is rugged and also can be purchased with a waterproof

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option making the mounting process easy. It can measure a wide range of temperature from -55°C to +125° with a decent accuracy of ±5°C.

Temperature Sensor
BLUETOOTH

This module enables you to wireless transmit & receive serial data. It is a drop in replacement for wired serial connections allowing transparent two way data communication. You can simply use it for serial port replacement to establish connection between MCU or embedded project and PC for data transfer.

HC-05

L293d Motor Driver Ic

5.RESULTS

Operated Robot
CONCLUSION

In this, we have analyzed Microcontroller based health monitoring system . Any abnormalities in the health conditions can be known directly and are informed to the particular person through via internet. The proposed system is simple, power efficient and easy to understand. It acts as a connection between patient and doctor.

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