**SpO2 Signal processing using PYTHON**

**Introduction:**

In order to monitor a patient’s health status, it is important to monitor the efficiency of gas exchange in the lungs. This includes the measurement of oxygen in blood. This will be helpful in determining whether the patient’s health status is stable or not. It is highly preferable to do this measurement in a non-invasive way as any invasive method will add discomfort to the already ill patient. This is where non-invasive pulse oximetry comes into play. The principle of pulse oximeter is that, Oxygen chemically bonds with haemoglobin (Red pigment) in blood. SpO2 or oxygen saturation is the ratio of oxyhaemoglobin to that of normal haemoglobin. With the help difference in absorption spectra of HbO2 and Hb measurement of oxygen saturation can be

done. This is done by measuring light transmitted through the fingertip in two different wavelengths which are red and infrared.

The raw SpO2 signal obtained from pulse oximeter is processed and refined using PYTHON and the sPo2 VALUE IS FOUND.

**Aim:**

To filter off the noises and refine the raw SpO2 signal and to generate the SpO2 value.

**Input:**

* .csv file which contains the raw SpO2 signal obtained in two wavelengths i.e. Infrared and red.

**Assumptions:**

* RMS value of the signals in order to calculate SpO2
* DC component will be assumed to be constant ,hence it is eliminated.

**Conditions:**

* Cut-off frequency of low pass filter : 0.018 Hz
* R = .
* SpO2 = 110-25R

**Classes, variables and functions used:**

**Class:** SpO2

**Attributes (data members):**

* file

**Constructor:**

To pass a.csv file using magic method \_\_init\_\_

**Methods:**

* data\_extraction()
* plotting()
* filter()
* range()
* cal()

**Variables:**

* x1 ( signal of red)
* x2(AC signal of IR )
* X1 (Signal selected within range 0 to 40,000 of red)
* X2 (Signal selected within range 0 to 40,000 of Infra red)
* z1 (Filtered signal of red)
* z2 (Filtered signal of Infra red)
* Z1(Narrowed down range of the red signal where signal quality is good.)
* Z2 (Narrowed down range of the IR signal where signal quality is good.)
* RED( rms of Z1)
* IR (rms of Z2)
* R =(Z1/Z2)
* S =(110-(25\*R))
* SpO2= round(S)

**Output:**

* SpO2 plot.
* R values
* S value
* SpO2

**Pseudo code:**

1. Get the .csv file from the user using the constructor
2. Extract the Red and IR samples from the .csv file using pandas module.
3. Set the range for the signals to avoid the regions where the signals were left unmeasured.
4. Plot the raw signal using matplotlib module.
5. Filter the signal by designing a low pass filter using a scipy module.
6. Obtain the range of the signal in which the signal is distinguishably visible and to calculate the SpO2.
7. RMS value of obtained signal is calculated using numpy module.
8. R value is calculated using the formula R= RMS(red)/RMS(ir)
9. S value is calculated using the linear regression formula ( 110-(25\*R))
10. SpO2 value is calculated using rounding S

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