**For consideration under COVID -19 Initiatives by NITs**

# Title: Algorithm to extract respiration waveform from PPG signal to diagnose COVID 19

Category:

**OUTCOME/ABSTRACT/DESCRIPTION:**

Problem Statement

Developing algorithm to extract Respiration waveform from PPG waveform to diagnose the spread and severity of COVID 19 disease in patients.


Abstract

For the COVID-19 pandemic there is no standard testing kit to diagnose the severity of the disease in patients. Covid virus started to affect lung and lead the person death. It will be useful to detect COVID 19 if we get changes in respiratory rate for a person. In this project we propose to extract the respiratory waveform from PPG signal by developing efficient algorithm.

Respiratory rate (RR) is an important physiological parameter which provides valuable diagnostic and prognostic information. It has been found to be predictive of lower respiratory tract infections, indicative of the severity of pneumonia , and associated with mortality in intensive care unit (ICU) patients .Respiratory rate is measured in breaths per minute (bpm). Current routine practice for obtaining RR measurements outside of Critical Care involves manually counting chest movements. This practice is time-consuming, inaccurate , and poorly carried out. Therefore, there is an urgent need to develop an accurate, auto-mated method for measuring RR in ambulatory patients. Furthermore, an automated method of measuring RR could facilitate remote monitoring of COVID 19.

A potential solution is to estimate RR from a convenient non-invasive signal which is modulated by respiration and is easily, and preferably routinely, measured. Two such signals are the electrocardiogram (ECG) and the photoplethysmogram(PPG). Both signals exhibit baseline wander (BW), amplitude modulation(AM) and frequency modulation (FM) due to respiration. Furthermore, both signals can be acquired continuously from ambulatory patients using novel wearable sensors. For example, the SensiumVitals®system (Sensium Healthcare) provides continuous ECG monitoring using a lightweight patch with a battery life of up tofive days. The ViSi Mobile®(Sotera Wireless) provides continuous ECG and PPG monitoring using a wrist-worn monitor with additional ECG electrodes. In addition, non-contact video-based technology is being developed for continuous monitoring of the PPG without the

need for any equipment to be attached to a patient .Many algorithms have been developed for estimating RR from the ECG andPPG, but have not yet been widely adopted into clinical practice. In this project we propose to develop algorithms to extract RR pattern from PPG signal to detect COVID 19 in patients.

**Expected Time-line: 2-3 Months**

**Remarks:** Funding requirement -Rs. 1 Lakh

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