

# Respiratory Signal

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## I. OBJECTIVE

- 1) To describe the operation of the functions

## II. RESPIRATORY SIGNAL FUNCTIONS

### A. Process Flow

In progress report 18, the functions that have been used were (1) `delineator.m` (2) `corrDelineator.m` (3) `interpRR.m` and (4) `getModulation.m`. These functions are located in respiratory estimation toolbox. Figure 1 shows the process flow of using these functions.

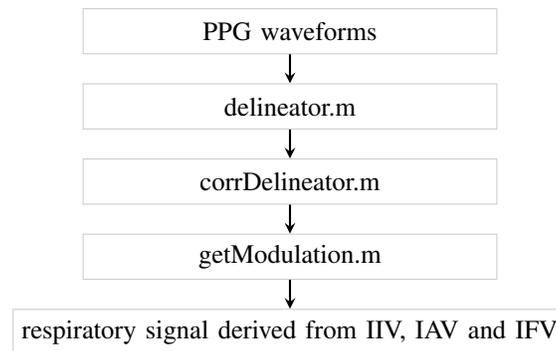


Fig. 1. The flow of extracting Respiratory Signal for PPG

### B. Operation of the function

1) *delineator.m*: This function is used to identify fiducial points of the input PPG waveforms. The inputs for this function are 1. PPG waveforms, and 2. sampling frequency. It will give output of two fiducial points 1. beginning of each beat (onset) and 2. systolic peaks (peak). In the next report, I will put write down how those fiducial points are identified.

2) *corrDelineator.m*: This function refines the *delineator.m* in detecting the onsets and peaks. The inputs are peak and onset from *delineator.m* output, waveform data and sampling frequency.

3) *getModulation.m*: This function is used to (1) extract different sources of modulation; A. respiratory-induced intensity variations (RIIVs),  $IV = iv = [peaks/Fs, y(peaks)]$ ; B. respiratory-induced amplitude variations (RIAVs),  $av = [(onsets+peaks)/2/Fs, y(peaks)-y(onsets)]$  C. respiratory-induced frequency variations (RIFVs),  $fv = [peaks(2:end)/Fs, diff(peaks)/Fs]$ ;

(2) discard the outliers, (3) performing interpolation to 4 Hz and (4) detrend signals. The peaks and onset of Dialysis 3 PPG signal are shown in Fig.2 and the extracted respiratory signals are shown in Fig.3.

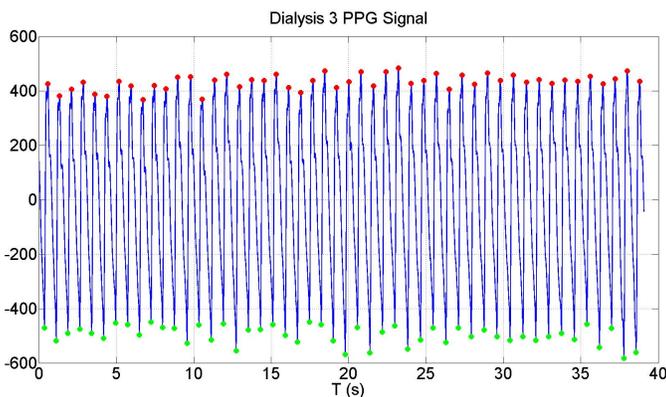


Fig. 2. PPG data DF01\_131122.mat of Dialysis 3

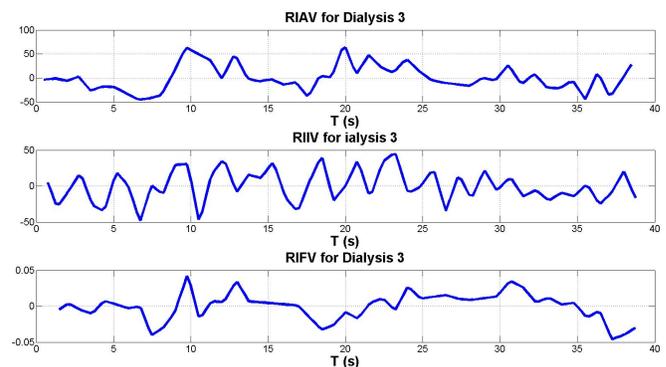


Fig. 3. Respiratory Signal using IAV, IIV and IFV