

MIMIC-II RR Fusion and RR for Reference Respiratory Signal

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I. OBJECTIVE

- 1) To present respiratory rate (RR) fusion results for MIMIC-II PPG signals
- 2) To estimate the reference RR from the reference respiratory signal

II. MIMIC-II PPG AND RESPIRATORY SIGNAL

In progress report 25, Synthetic and Vortal datasets have been used to calculate the fusion and smart fusion from the three PPG signal modulations. The comparison to the reference respiratory rate has also been carried out. The main objective is to get as close as possible to the reference respiratory rate. In Synthetic and Vortal datasets prepared by Mr. Peter Charlton, the reference respiratory signal is given by the 'breath timing'. In other words, the conversion from 'breath timing' to the respiratory rate is straight forward. In this report, the fusion of MIMIC-II datasets and the estimation of RR from reference respiratory signal are presented. In this analysis, 688 PPG data of MIMIC-II, which have Med SQI >0.8 have been chosen. The whole 8-min data, sampled at 125 Hz have been used.

III. METHODOLOGY, RESULTS AND DISCUSSION

The matlab functions which have been used to fuse RR from IAV, IIV and IFV are; `delineator.m` and `corrDelineator.m`. From these functions, the output are peak and onset. These inputs and the PPG signals are then used to produce `iav`, `iiv` and `ifv` using `getModulation.m`. After that, `adaptPulseSegment.m` function is utilized to get the peaks, onsets and artifacts of the three derived modulated signals. Finally, `smartFusion Adapt` is executed to gain the `rrsmartfusion`, `rrfusion`, `riav`, `riiv`, `rifv`. In order to calculate RR from the reference respiratory signal, I am using two functions taken from the respiratory toolbox, i.e. `arspec.m` and `arxcor.m`. The respiratory rate is accepted if the difference gained from `arspec` and `arxcor` is less than 2 breaths/min. At this moment, `arspec` is still not giving a good result, most of the result shows 'not applicable'. Thus, in this report, most of the RR from reference signal are calculated using `arxcor.m`. The results which is the RR from reference respiratory signal, RR estimation using fusion and smart fusion are shown in Fig. 1. The preliminary results show a high MAE of 17 breaths/min when using smart fusion and 16 breaths/min using fusion. From this result, a lot more refining are needed to be done, especially on the PPG data reference respiratory signal preprocessing.

IV. STAR-2 PROJECT

Several meeting with Dave Springer and John Prince have been done. We also had a meeting with Marten and Andrew Farmer. Among the tasks that have been completed are setting up code repo in eclipse and sourcetree on our personal computers. The cloning of David Springer's directory has also been done. The task which I plan to complete next week are to setup personal logins, setup 'sana' login credentials and upload basic encounter for the new OpenMRS server. from today's meeting the pilot study will be carried out in August and the system will go 'live' in October.

V. CONCLUSION

The preliminary result when using fusion and smart fusion techniques on the three modulated signal are not showing a good result where the MAE is 16 and 17 breath/min, respectively. Further evaluation on the preprocessing method for the PPG signal and reference respiratory signals needs to be done. Evaluation using CapnoBase PPG data will be scheduled next week.

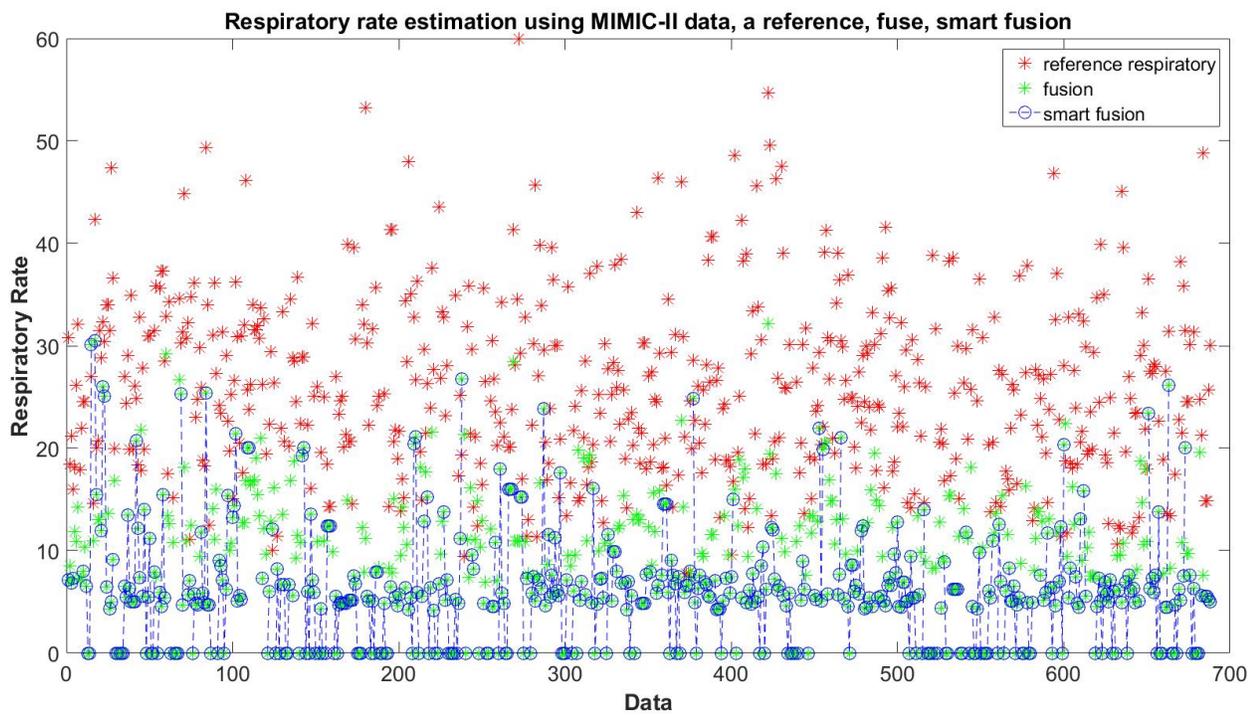


Fig. 1. MIMIC-II: RR estimation from PPG signals and comparison to reference RR