RR estimation from PPG datasets

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I. Objective

1) To correct the errors when applying RR algorithm and to demonstrate that the RR estimation is sensible.

II. Datasets and respiratory signal

Last week, all the erros that occur while estimating RR from PPG signal of 7 datasets have been eliminated as summarized in Table I. The errors are caused by the PPG peak detection location. I would say, now, it is verified that the RR algorithms can be applied to all the 7 datasets. In this report, the comparison study between the estimate RR and the reference RR is carried out. This is to demonstrate that the estimated RR is sensible. Thus, the datasets used in this report are MIMIC-II, CapnoBase, Dialysis 1, Dialysis2 and Dialysis2. For Calms2 and PICRAM, at this moment, they do not have reference respiratory waveforms. In each figure below, RIAV, RIIV, RIFV and Reference RR waveforms are arranged.

A. MIMIC-II

From the observation of Fig.1 and Fig.2, RIIV shows a clear and more accurate is determining RR.

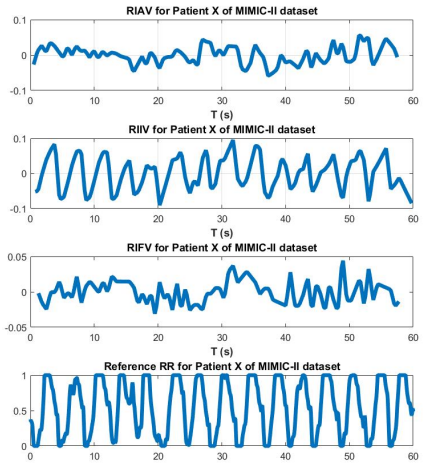

Fig. 1. s11342_2777_07_19_19_33.mat

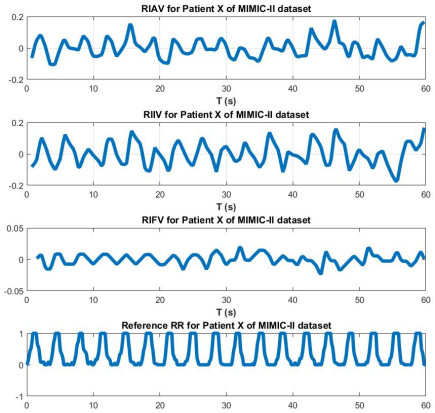

Fig. 2. s29093_2539_01_17_04_44.mat

B. CapnoBase

From Fig.3 and Fig.4, it shows, different patient's data has different responds to the modulation. In Capnobase, it can be said that all RIAV, RIIV and RIFV show a good estimation method.

C. Dialysis1

In Fig. 5 and Fig.6 of Dialysis 1 datasets, estimation using all 3 modulations show a good result.

D. Dialysis2

For Dialysis 2 datasets, as shown in Fig. 7 and Fig.8, estimation using all 3 modulations are showing the respiratory signals.

E. Dialysis3

For Dialysis 3, as shown in Fig.9 and Fig.10, eventhough the estimated signals are not as good as other datasets, the RR is comparable with the references.

III. Conclusion

From these analysis, it is varified that the datasets are now good for the RR estimation. Preliminary results show that the estimated RR is near to the reference RR.

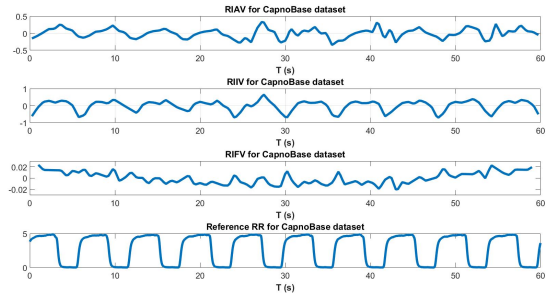

Fig. 3. 0328_8min.mat

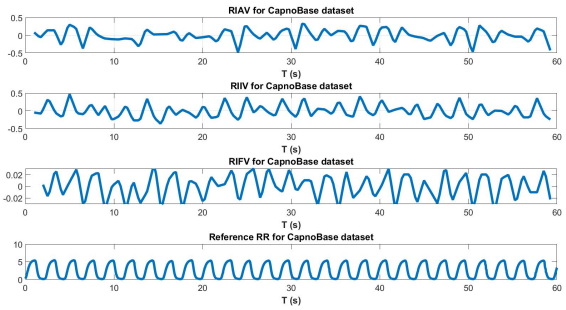

Fig. 4. 0332_8min.mat

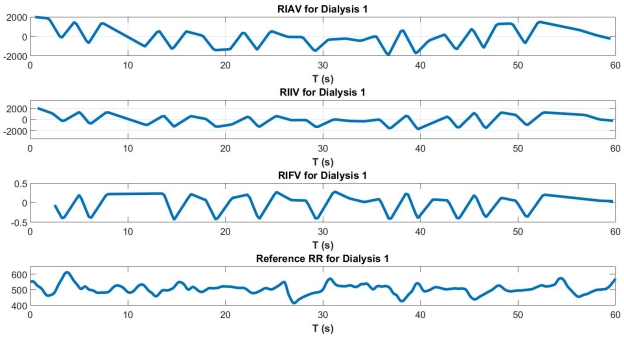

Fig. 5. HM14 110411.mat

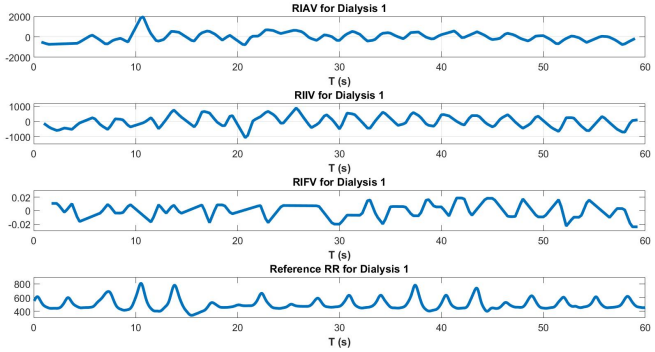

Fig. 6. HM20 110525.mat

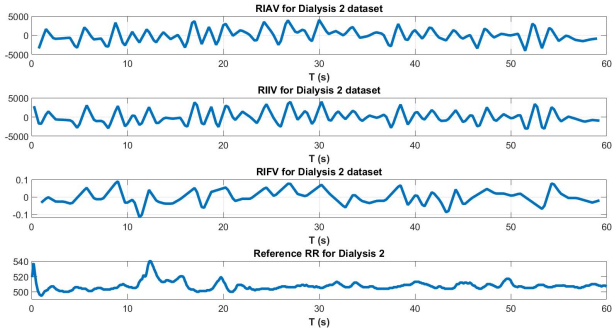

Fig. 7. OB12 120227.mat

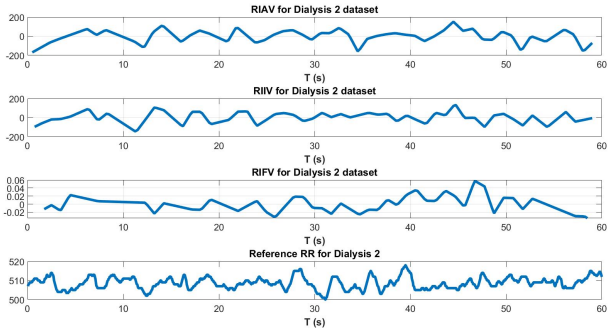

Fig. 8. OB14 120704.mat

TABLE I
PHOTOPLETHYSMOGRAPHY DATA ANALYSIS

Name	MIMICII	CapnoBase	Dialysis 1	Dialysis 2	Dialysis 3	Calms-2	Picram
PPG Data Available	✓	✓	✓	✓	✓	✓	✓
PPG Data ⇑ 'bspprojects9\OURR'	✓	✓	✓	✓	✓	✓	Ox: ✓ Rd:✓
PPG Records (based on IDs)	954	42	96	574	374	336	Ox:199 , Rd:68
Reference Resp	950	42	96	574	374	(getting info)	Ox: 0, Rd: 0
Recording time	8 m	8 m	4.9∼5.2 h	2.3∼4.4 h	0.8∼6.0 h	0.2 h∼30.9 d	Ox: max single 75.2 days
Sampling Frequency (Hz)	125	300	75	75	256	75	75
Median PPG SQI $>$ 0.8	839 (88%)	42 (100%)	93 (97%)	525(91.5%)	300 (80%)	327 (97.3%)	Ox:103 (51.8%) Rd:30 (44.1%)
Resp. Signal Extraction Done	✓	✓	✓	✓	✓	✓	✓
Data shown errors when processing	0 (0.0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	Ox: 0 (0%), Rd: 0 (0%)

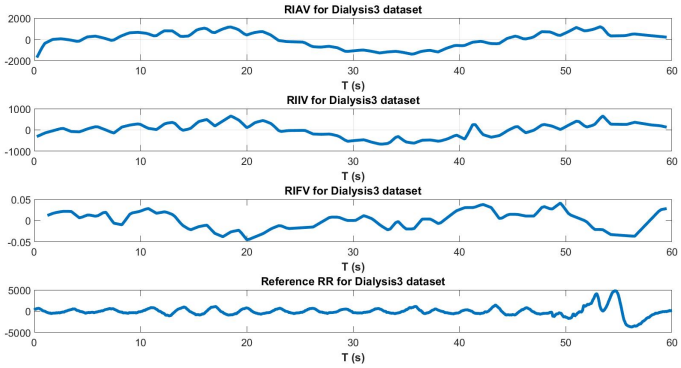

Fig. 9. DF05_131130.mat

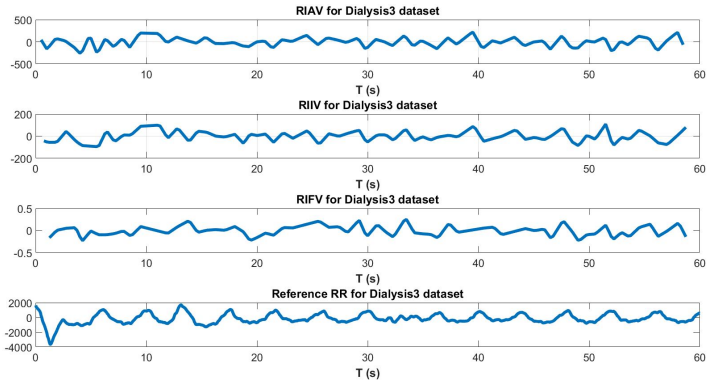

Fig. 10. DF07_131125.mat