

The summary of ECG SQI and preliminary study of the method to calculate PPG SQI

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I. OBJECTIVE

- 1) To summarize the Signal Quality Indices (SQI) of the ECG for all the 6 data sets.
- 2) To start evaluating method to calculate SQI for PPG using MIMICII.

II. COMPLETED TASKS

A. SQI for available datasets

In the previous reports (ProgReport9 and ProgReport10), SQI for MIMICII, CapnoBase, Fantasia, Dialysis1 and Dialysis3 have been calculated. Analysis on Dialysis2 ECG SQI has been carried out then and the result are as shown in Fig.1. Further analysis to validate the low quality signal of OB11120110 shows a true reject as described in Fig. 2. The summary of the ECG SQI for all the six data sets are shown in Table I. By taking the threshold of 'good' Med SQI as 0.8, Dialysis2 has the smallest 'pass' which is 12.5%. MIMICII has the highest number of 'good' ECG signal which is 957 records or 94.1%.

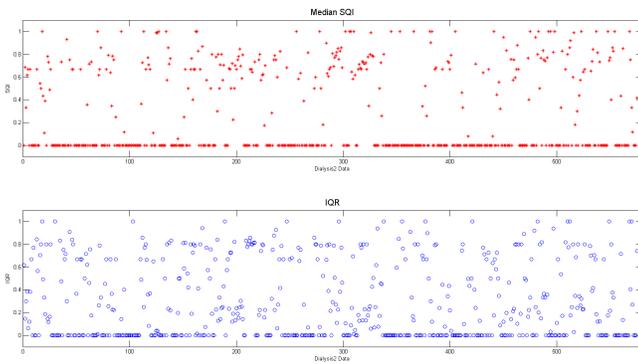


Fig. 1. Median SQI and IQR SQI for Dialysis2 data

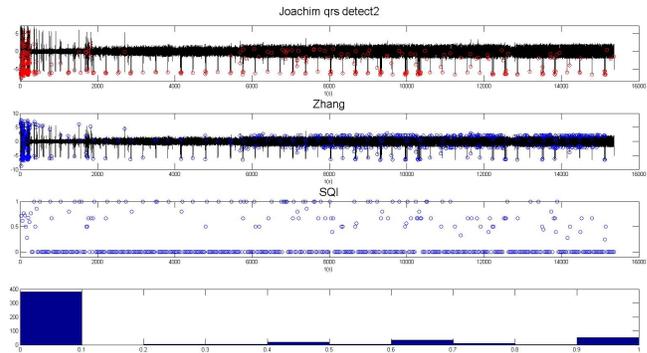


Fig. 2. Analysis on the SQI=0, using data OB11120110 of Dialysis2 data set

TABLE I
SUMMARY OF ECG SQI

Name	MIMICII	CapnoBase	Fantasia	Dialysis 1	Dialysis 2	Dialysis 3
ECG Data ↑ 'bspprojects9\OOURR'	1017	42	40	96	575	374
Median ECG SQI ≥ 0.9	950 (93.4%)	41 (97.6%)	42 (100%)	47 (49.0%)	39 (6.8%)	347 (92.8%)
Median ECG SQI ≥ 0.8	957 (94.1%)	41 (97.6%)	42 (100%)	45 (46.9%)	72 (12.5%)	350 (93.6%)
Median ECG SQI = 0.0	42 (4.1%)	0 (0.0%)	0 (0.0%)	30 (31.3%)	325 (56.5%)	9 (2.4%)
IQR ECG SQI ≤ 0.1	919 (90.4%)	41 (97.6%)	29 (72.5%)	65 (67.7%)	256 (44.5%)	343 (91.7%)

B. SQI for PPG datasets

For this task, two papers by Orphanidou et. al [1] and Li and Clifford [2] have been used as references. The method suggested by Orphanidou et. al [1] which use the function 'calcSQI_PPG_CO (sig,samp_freq,peakp)' is implemented in this report. From the reading and my understanding, the method to calculate SQI for PPG is as described in Fig3. The result of the preliminary study using this function is shown in Fig.4–7.

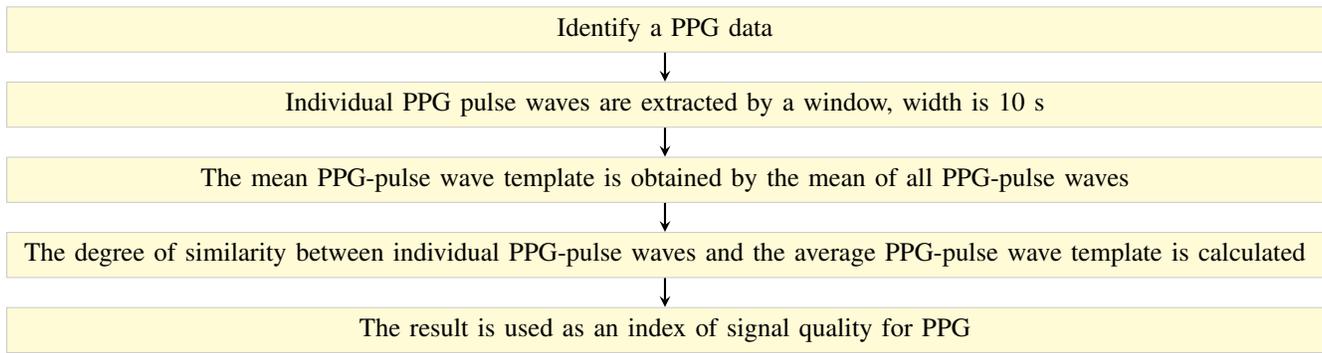


Fig. 3. Method of determining SQI for PPG

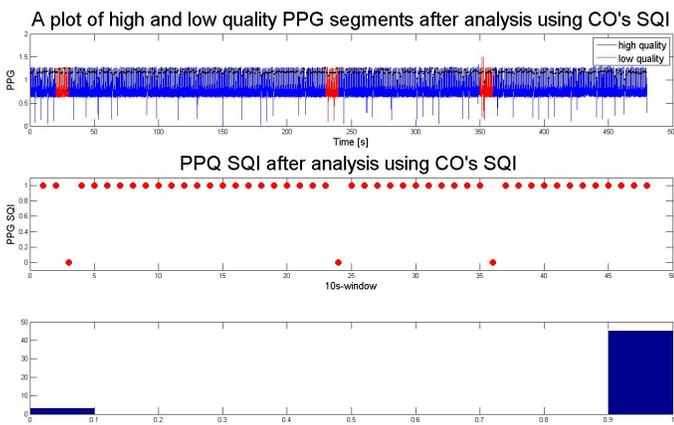


Fig. 4. PPG SQI for MIMICII's s00402_3438_01_04_23_07.mat

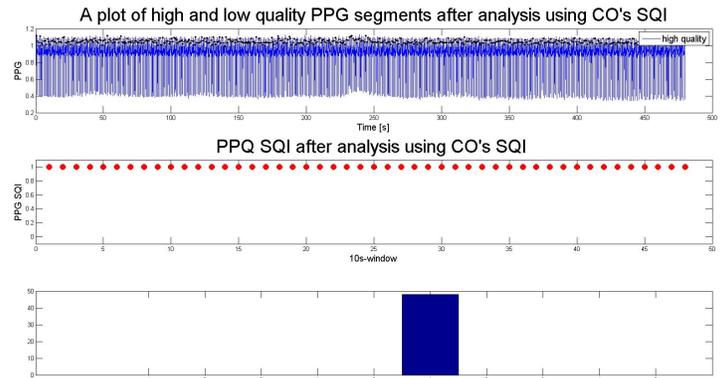


Fig. 5. PPG SQI 'good' MIMICII's s02921_2752_06_05_22_29.mat

III. CONCLUSION

The SQI calculated for PPG using MIMICII data set has been done. The next step is to run the code to all the data sets to find the total Med SQI and IQR as were done on ECG.

ACKNOWLEDGMENT

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REFERENCES

- [1] Orphanidou, C. Bonnici, T. Charlton, P. Clifton, D. Vallance, D. Tarassenko, L. Signal-quality indices for the electrocardiogram and photoplethysmogram: derivation and applications to wireless monitoring. *IEEE J Biomed Health Inform* 19(3) 1–8, 2015.
- [2] Li, Q and Clifford G.D., Dynamic time warping and machine learning for signal quality assessment of pulsatile signals. *Physio Meas.* 33(9): 2012.

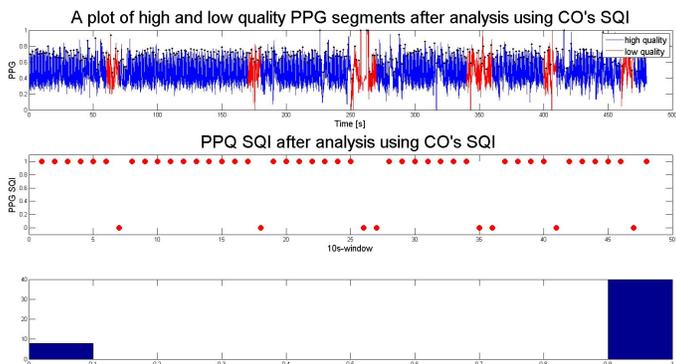


Fig. 6. PPG SQI for MIMICII's s03386_2577_08_19_18_08.mat

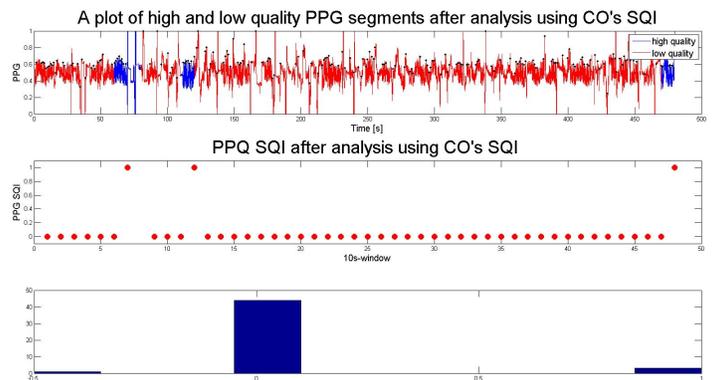


Fig. 7. PPG SQI for 'bad' MIMICII's s16864_2841_05_13_00_53.mat