

## ECG Artifact Removal

### Motivation

In ECG, different noise sources can interfere with obtained signals in practice. The three main noise sources are baseline wander (in record 'bw'), muscle (EMG) artifact (in record 'ma'), and electrode motion artifact (in record 'em'). Electrode motion artifact is generally considered the most troublesome, since it can mimic the appearance of ectopic beats and also cannot be removed easily by simple filters, as can noise of other types. An active area of research in ECG is related to the design of filters that can improve the ECG recordings by removing such noise while keeping the ECG information intact.

### Design Problem

Design suitable digital filters that allow removing all of the above noise sources from ECG recordings.

### Design Input

- A set of ECG recordings containing baseline wander, EMG, or electrode motion artifacts.
- Original noise-free ECG signal as a reference (used as desired signal to compare your filtered output to).

### Design Output

A report and documented Matlab code for a set of best three digital filter designs that handle ONLY ONE type of artifact of your choice (that is, either baseline wander, EMG, or electrode motion artifact should be considered).

### Design Evaluation Criteria

- Qualitatively by comparing the output filtered signal to the noise-free record provided.
- Quantitatively by comparing the sum of absolute difference between the output filtered signal and the noise-free record provided.

### References

[1] <http://physionet.org/physiobank/database/nstdb/>