

Electrocardiogram Artifact Detection via one- dimension to two-dimension data visualization

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To ensure the proper diagnosis of cardiac activity based on remotely sent electrocardiograms (ECGs) collected by inexperienced people, via mobile phones, it is fundamental to prescreen for artifacts due to erroneous recording of a given ECG.

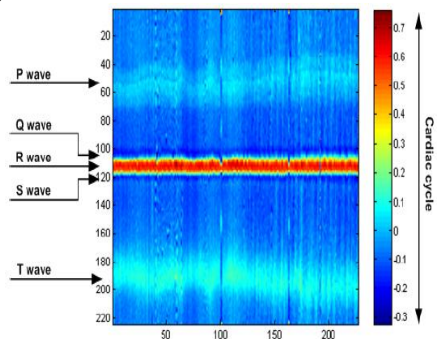
Our participation in the PhysioNet/CinC challenge deals with the first event and it is based on a **1-D to 2-D data visualization and analysis** approach. In fact, the visualization of pseudo-repetitive **textured 1-D** signals, such as ECG data, produces a well-structured image, with clear foreground and background areas. This offers two immediate advantages:

On the perceptual level: ECG data visualization gives an **instantaneous pictorial display** of the 12 ECG leads, while any 1-D analysis of the original ECG signals has to take into account the temporal/sequential nature of the raw data.

On the computational level: the class of obtained images are of special and simple structures, given the 1-D textured signals behind, making them well suited for low-complexity image processing.

Our visualization method is based on Rastogram generation. It is a Matlab code that guides to a better interpretation since it helps to detect changes in peaks that are not visible to the eye by the classic representation of an ECG. In fact, it detects QRS complex in each curve and then decompose it into equal cycles. It superposes all cycles and rotates them vertically. We get finally an image which width is equal to the cycle length using raster visualization as shown in the next figure.

Preliminary results of the proposed rastogram-based approach show that we are able not only to detect a large number of artifacts, but also to identify the causes in some cases.



Rastogram of a smooth ECG