

A dynamical model for generating synthetic electrocardiogram signals

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Abstract

A dynamical model based on three coupled ordinary differential equations is introduced which is capable of generating realistic synthetic electrocardiogram (ECG) signals. The operator can specify the mean and standard deviation of the heart rate, the morphology of the PQRST cycle, and the power spectrum of the RR tachogram. In particular, both respiratory sinus arrhythmia at the high frequencies (HFs) and Mayer waves at the low frequencies (LFs) together with the LF/HF ratio are incorporated in the model. Much of the beat-to-beat variation in morphology and timing of the human ECG, including QT dispersion and R-peak amplitude modulation are shown to result. This model may be employed to assess biomedical signal processing techniques which are used to compute clinical statistics from the ECG.

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