GENERATING SYNTHETIC ELECTROCARDIOGRAM SIGNALS WITHCONTROLLED TEMPORAL AND SPECTRAL CHARACTERISTICS

Natacha Gueorguieva
Computer Science
College of Staten Island
New York, USA

Iren Valova
Computer & Information Science
University of Massachusetts
North Dartmouth, MA, USA

Benjumin Hui
Computer Science
College of SI
New York, USA

Abstract

The primary function of the heart is to supply blood and nutrients to the body. The regular beating of the heart moves the blood throughout the body. Each heartbeat is controlled by electrical impulses traveling through the heart. In the normal heart these electrical impulses occur in regular intervals. When something goes wrong with the heart's electrical system, the heart does not beat regularly. The irregular beating results in a rhythm disorder, or arrhythmia. ECG is a record of electrical impulses which precede the heart contractions. A single sinus (normal) cycle of the ECG, corresponding to one heart beat, is traditionally labeled with the letters P,Q,R,S and T which correspond to P-wave, PQ interval, QRS complex, QT interval, ST interval and T-wave.

Heart arrhythmias result from any disturbance in the rate, regularity, and site of origin or conduction of the cardiac electric impulse. Premature ventricular contraction (PVC), left bundle brunch block (LBBB), and right bundle branch block (RBBB) are the three cardiac arrhythmias which can lead to or indicate the risk of heart failure.

Our research is focused on constructing model parameters in order to generate different morphologies for the PQRST-complex. By prescribing specific characteristics of the heart rate dynamics such as the mean and standard deviation of the heart rate, spectral properties etc, we built a database which will be used for calculating the effectiveness of different techniques for noise and artifacts removal as well as for designing a pattern classifier able to recognize the above cardiac arrhythmias.