# Homework 5

BE/EE189 Design and Construction of Biodevices

Spring 2017

Due: 14 Feb 2017

1. Design a VI that processes an electrocardiogram (ECG) signal. A typical one-cycle ECG signal is shown below. The following figure shows an example of the electrocardiogram (ECG) signal. Design a filter to remove the baseline wander and the high-frequency noise that can be observed in the figure. After denoising, design and implement an algorithm to find the R-peaks, and calculate the heart rate according the peaks positions. An ECG trace can be found in ecg.txt, which includes 2000 data points. The entire trace is taken within a 5-second time window.
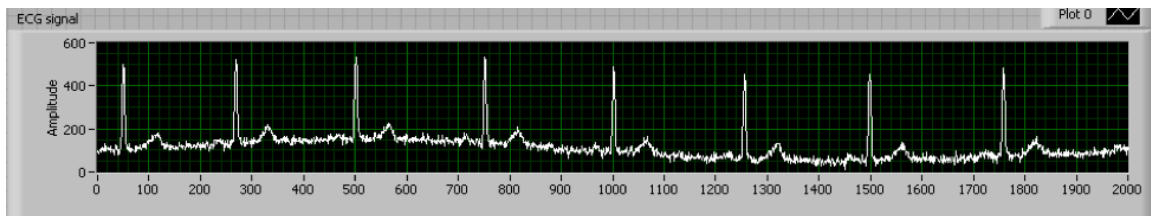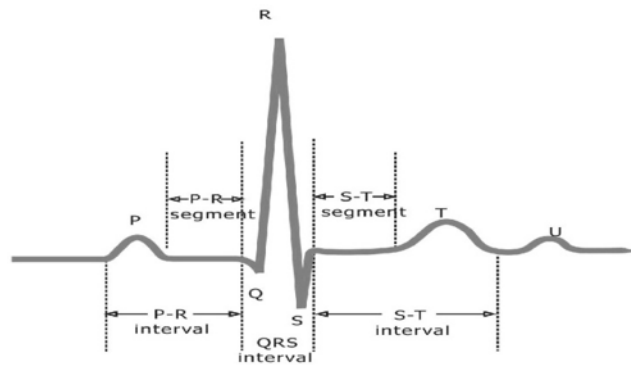
2. Computerized tomography (CT) measurements generally use a Radon transform to reconstruct images. Use web-based or other resources to learn more about the transform. Matlab has implemented the transform its inverse in the functions `radon` and `iradon`. Design a VI that integrates Matlab code to process the original phantom image (obtained by using `phantom(256)` in Matlab) by first doing a Radon transform, and then doing an inverse Radon transform to reconstruct the image. Use a control to set the number of angles between 0 and 180 degrees (e.g., if the number of angles is 3, then the radon transform will be performed at the angles 0°, 60°, and 120°) that is used in the Radon transform and observe the dependence of the quality of reconstructed image on the number of angles. The final VI will be similar as the one shown below.