

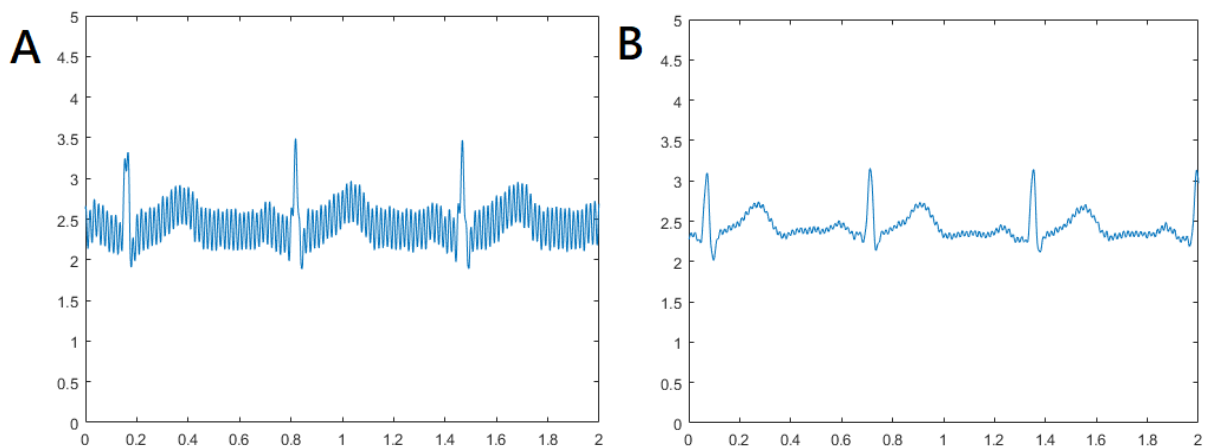
Introduction to Biomedical Engineering: Spring 2021

Homework 3

Due: 5/20 PM 1:10

As usual, please submit your homework in .doc/.docx format to me (chuang@mail.ee.nsysu.edu.tw) before deadline. The file name should appear as “your student ID”-hw3. For example: B049011099-hw3.doc.

1. This week we demonstrated the measurement of ECG by connecting a differential amplifier and appropriate filters, and the influence of cutoff frequency of the low pass filter has been observed. As shown below, Figure A and B are ECG recorded with a third-order low pass filter at cutoff frequency of 100 and 50 Hz, respectively. Each plot is sampled at a sampling frequency of 2 kHz ($T_s = 0.5\text{ms}$) for a duration of 2 seconds. Raw data have been provided in .txt and .mat (data format for MATLAB) format. You can choose any kind of mathematical programming language you like, such as C++ or MATLAB, to complete this homework.



- (a) Obtain the spectrums of ECG A and B by using discrete Fourier transform. Please label the unit and scale of frequency (i.e. the horizontal axis) on your plot. Can you identify the 60Hz-interference component in your spectrum?
- (b) Try to perform any kind of signal processing on ECG A, either in time or frequency domain, to suppress the 60Hz interference, just like those have been done in waveform B. Please explain your method and provide your code with annotations if necessary.