BM4112 Medical Electronics and Instrumentation

MATLAB Assignment: Signal Estimation

Submission Guidline

- This is an individual assignment.
- Submission guidelines:

Submission document	Submission method
Report	Upload the softcopy to Moodle
MATLAB scripts	Upload a single ZIP file including all the .m files to Moodle

- You should include observations and discussions with relevant plots to support your answers. Also, name each script according to the question number and include necessary comments on the scripts for better readability.

Task 01: Wiener Filter for ECG Denoising

1. Download the provided noisy ECG *'ECG_rec.mat'* and clean ECG *'idealECG.mat'* files from Moodle and load it into MATLAB.
2. Write a MATLAB script for a Wiener filter. [10 marks]
3. Plot the **time domain and time-frequency domain** input/noisy ECG signal and the output/denoised ECG signals on the same plot using subplot command and compare. [5 marks]

Task 02: Kalman Filter for ECG Denoising

1. Write a MATLAB script for a Kalman filter. For the transition matrix initialization in the **prediction state**, you can substitute the Wiener filter weight matrix from task 01 and update them recursively. Please make sure you identify the parameters correctly. [10 marks]
2. Plot the **time domain and time-frequency domain** input/noisy ECG signal and the output/denoised ECG signals on the same plot using subplot command and compare. [5 marks]
3. Which method/filter enhances the ECG signal better? [10 marks]
4. Explain your answer. [10 marks]