Ain Shams University
Faculty of Engineering
Computer & Systems Eng. Dept.

CSE 462 – Biomedical Engineering 2017-2018

Assignment #2

(Due on: Saturday, December 16 at mid-night by e-mail)

Problem 1

Implement the needle EMG decomposition algorithm given in Lecture 7.pdf. Your function should take as inputs the EMG signal to process and the moving average window size T mentioned on slides 14 and 17. The function should return a vector that contains the timestamps of the peaks of the detected MUAPs for each detected MU and a vector for the template of each MU. Apply your function to the EMG signal provided in the file "Data.txt" with T =20 samples and *DiffTh* defined in slide 18 is set to 12.65^5.

Deliverables:

- Your code
- A figure showing from sample 30000 to sample 35000 of the EMG signal with an "*" marking the detected MUAPs colored with different colors depending on the MU each MUAP belongs to (Similar to slide 19). Name the figure "DetectedMUAP.jpg"
- A figure showing the waveform of each template of the detected MUs (Similar to slide 20). Name the figure "Templates.jpg"

Problem 2

In this problem, you are going to use K-means clustering to identify the MUAPs belonging to each MU as explained on slides 21 to 26 of Lecture 7.pdf. You can use the `kmeans` function already implemented in MATLAB in your code. For the value of K, use the number of templates you obtained in Problem 1. The function should return a vector that contains the timestamps of the peaks of the detected MUAPs for each detected MU and a vector for the template of each MU. Use the same settings as Problem 1 (T =20 samples).

Deliverables:

- Your code
- A figure showing from sample 30000 to sample 35000 of the EMG signal with an "*" marking the detected MUAPs colored with different colors depending on the MU each MUAP belongs to (Similar to slide 19). Name the figure "DetectedMUAP_K.jpg"
- A figure showing the waveform of each template of the detected MUs (Similar to slide 20). Name the figure "Templates_K.jpg"