

CSCE 363/3611 – Digital Signal Processing

Project

(Due on: July 18, 2023 at mid-night)
(Submit on Blackboard as one .zip file)

Project Title: Needle EMG Decomposition

Implement the needle EMG decomposition algorithm given in the file EMG Decomposition.pdf. Your code should take as inputs the EMG signal to process and the moving average window size T mentioned on slides 13 and 16. 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 12.65⁵.

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 18). Name the figure “DetectedMUAP.jpg”
- A figure showing the waveform of each template of the detected MUs (Similar to slide 19). Name the figure “Templates.jpg”
- The spectrum of signal representing the MUAPs of each detected MU. Construct first a binary vector for each MU, with one indicating the time of MUAP generation, and zero otherwise. Find the spectrum of each binary vector. Name the files “Spectrum_1.jpg”, “Spectrum_2.jpg”,...

Submission:

- Your MATLAB or Python code to be submitted on Blackboard on **July 18 at mid-night**
- A report (to be submitted on Blackboard on **July 18 at mid-night**) that includes the following:
 - Description of the approach used
 - Outputs of the project as described in the deliverables
- Submission of the above items should be done as one .zip file by the deadline

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Guidelines:

- This is a group project. A maximum of 3 students per group is allowed.
- Each team must send an e-mail by **Thursday, July 13 at mid-night** specifying the members of the team.
- **Changing teams will not be allowed.**
- Project evaluation will occur in the class of **July 17.**
- Project grading will be as follows (out of 15):
 - 5 points on the code submitted
 - 5 points on the submitted report
 - 5 points on the evaluation and discussion