

EE 795 Course Project December 2011

The subject area of this course project is Electromyography. The data collection can be carried out using the Clevedmed data acquisition software found on the computers used for EE 4BD4 (ITB 142). Work in teams of 2, one being the subject the other managing the data collection. Attached to this e-mail you will find the lab packages for EMG supplied by Clevedmed (EMG-1 and Motor Control). You may perform these labs or parts of them to gain experience in recording and processing EMG signals. I will supply electrodes and a dumb-bell with a variety of weights. The muscle you will record data from is the biceps brachii. The project requirements are as follows:

- 1** Investigate the effects of elbow joint angle on the EMG rms amplitude and power spectrum for a range of joint angles from 60 degrees to 150 degrees. Select a suitable weight for the dumbbell so you can hold the weight still for at least 5 sec at each selected joint angle over the entire range without fatiguing (about 0.5 of your maximum weight held at 90 degrees for 30 sec.). Collect a suitable record length of EMG data for analysis at each joint angle. The dumb-bell shaft itself weighs 2.5 pounds.
- 2** Investigate the effects of electrode distance on the EMG rms amplitude and power spectrum using the same weight as above with an elbow angle of 90 degrees. Use electrode centre to centre spacings from 1.5 cm to 5 cm over the belly of the muscle.
- 3** Investigate methods of processing EMG to remove motion artefact. For the weight used above rapidly bend the elbow from 180 degrees to 90 degrees a number of times in a sinusoidal manner. Record for at least 5 complete cycles. Examine the raw signal and its power spectrum. How is it different from the recordings of sections 1 and 2. Post process the EMG to remove the motion artefact components.
- 4** Investigate the effects of fatigue on the EMG power spectrum (use centroid frequency or other descriptors). With an elbow angle of 90 degrees hold a heavy weight and record the raw EMG until you are no longer able to maintain that position (1 to 2 min). Process the EMG for each 3 -5 sec epoch and calculate the parameters.

In your investigations you are expected to record the data in the lab and do your analysis off-line using Matlab. You are expected to give a final report showing your data and explanations of what you have observed. You are expected to use background articles dealing with these issues as well as your own conclusions. The project can be performed now or during the first two weeks of the new year with a project report due no later than Friday January 13, 2012 5 pm. For the data collection you should work in pairs but are expected to hand in separate reports.