University of Washington
Computer Science and Engineering
Winter 2007

CSE 490 I: Design in Neurobotics

Problem Set 6 (Last assignment!)   Due: 10:30am on 3/1/2007

This is the second assignment using the real brain signals collected through electrocorticographic (ECoG) as was demonstrated by Kai Miller in his lectures.

In this assignment, you will use the finger position (d1(t) --- d5(t)): This is the actual movement of fingers recorded from a dataglove (same glove as what you use in the lab).

Use Behavioral Data from Glove
(finger displacement as a function of time)
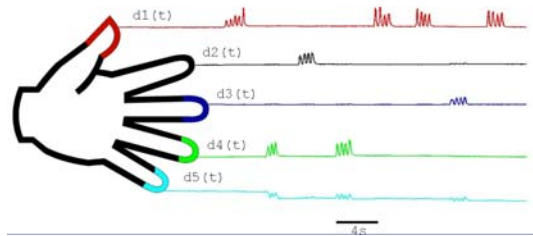
You will then correlated it with the signals from the brain surface (as you did with S(t) in the last assignment) for all fingers and find out if there is an overlap between fingers in the brain area.

YOU CAN DO THIS ASSIGNMENT BY PICKING *TWO* OF YOUR FAVORITE SUBJECTS RATHER THAN DOING THIS FOR EVERY SUBJECT.

1. The first part of this assignment is similar to what you have already done in the last assignment. Given the frequency band you chose in the last assignment (or if that didn't work so well, you can use the default range used in Kai Miller's lectures), you should find the channels that correlate to each of five fingers d1 through d5 the best. You should report for every subject,

(a) The channels you identified (should be five of them corresponding to d1-d5), and

(b) The technique you used to find them. In the explanation, make sure to touch on the following issues: the pruning process (i.e. going from, say, 3 candidates to one channel), if any of the adjacent channels were more correlated (and if so why), how well it is correlated, etc.

2. Now you will find out whether there is an overlap between fingers in the brain area.

(a) Describe how close the selected channels are for the fingers on the brain surface (even when the channel numbers are far apart, make sure to check with the map to see how close they are physically). If there are overlaps, identify which fingers.

(b) Now you are going to find out whether this overlap (or closeness) comes from the fact that these fingers are represented together in the brain, or whether it is coming from the fact that they are behaviorally coupled (i.e. when the ring finger moved back and forth, the middle finger was also wiggling at the same time, so it appears as if they are represented together in the brain). You can now be creative to show off your ability to do research in Neurobotics! This part is worth 50% of the assignment. You should provide your answers with 2-3 MATLAB plots and about ½ page of explanation. If you come up with ideas that haven't been explored, you could produce a publishable result in Neurobotics! Hint: running cross-correlations between finger position data would be a good start.