CS295-7 Homework #2

Due before class on Feb. 23

Goals

1. To familiarize you with linear filtering and regression.
2. To provide you with a baseline decoding algorithm to which you can refer later.
3. To get you used to using Matlab to quickly implement an idea from a paper.

The Assignment

Your task is to implement the linear filter decoding method described in the Serruya et al papers using the same data you used in Homework #1. This is even more open ended than the first assignment in that we don't tell you exactly how to apply linear filtering to neural data. Read the papers and come to TA office hours with questions if you have any.

What to Hand In

A "lab report" and your code. Your report will be graded according to the rubric posted to the newsgroup. Your code will be checked for uniqueness and commenting. The report should *minimally* contain plots of reconstructed *x* and *y* position vs. actual direction and speed. It should also contain a numerical analysis of your results including correlation coefficient and mean square error. It should also introduce, review, and discuss the linear filter technique and how it worked (or why it didn't). Also compare your results with your population vector results. Plot and comment on the filter coefficients. This is not an acceptable introduction or method section:

> "Refer to Serruya et al"

Tips

The way the matrix inversion is done in the paper probably won't work for our training data unless you have more memory on your computer than we have on ours. You might want to investigate the matlab function: "pinv".

Extra Credit

1) Try different numbers of time bins (N in the paper). Vary from, say 1 to 20 and plot the correlation coefficient. Is there an optimal time history to use?

2) Try different amounts of training data. Use fewer time instants for training and plot the correlation coefficient for reconstructing the test data. How little data can you get away with and still get a good reconstruction?