

ECE 802-601 Review Paper 2

due March 25, 2008

Reading: Matching Pursuit and Its Applications

For this review paper, you are given three recent papers on Matching Pursuit and its applications. Matching Pursuit is an extension of the wavelet transform with overcomplete dictionaries. The elements of the dictionary are usually multiscale atoms that try to capture the time-varying behavior of the signals. Since the dictionaries are overcomplete, there is no unique solution to the decomposition and usually the decomposition with the smallest number of coefficients is preferred, i.e. the sparsest representation. For this review paper, you will read three articles which discuss the application of matching pursuit algorithm to different type of signals and systems. For your reviews, you should write a 1-2 page report first summarizing the three papers in your own words and discussing the major points made in the papers. After you summarize the papers, try to answer the following questions in your report:

1. How is channel estimation using matching pursuit described by Cotter et al. different than the signal estimation addressed in the other two papers?
2. Discuss the modifications to MP that Lovisolo et al. propose. Do they improve the representation? Are they specific to the application?
3. What are the post-echo and pre-echo errors?
4. Discuss the modifications to MP made by Gribonval and Bacry and compare them to the modifications proposed by Lovisolo et al.
5. Gribonval and Barcy introduce harmonic Gabor atoms for audio signals. What are some other possible modifications to Gabor atoms such that they are suitable for a larger class of signals?
6. Comment on the optimality of MP.
7. What are some modifications that can be made to the matching pursuit algorithm to lower the computational complexity and improve convergence rate?