

MMI 505/606

Last Homework assignment!!!

Due in one week (Tuesday, April 21)

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## The Phase Vocoder

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### Part One

(1) Read Bill Sethares' phase Vocoder page:

<http://eceserv0.ece.wisc.edu/~sethares/vocoders/phasevocoder.html>

Also read Chapter 5 of Bill's new book, available free online:

<http://eceserv0.ece.wisc.edu/~sethares/vocoders/Transforms.pdf>

(2) Download and play with his MATLAB phase Vocoder. You will need two files:

<http://eceserv0.ece.wisc.edu/~sethares/vocoders/PV.m>

<http://eceserv0.ece.wisc.edu/~sethares/vocoders/findPeaks4.m>

(3) Modify his code to make a *pitch-synchronous* phase vocoder to be applied to an audio sample of a musical instrument (e.g., download your input file from the University of Iowa's online repository:

<http://theremin.music.uiowa.edu/MIS.html>). Modify the analysis and resynthesis hop factors such that they are nicely related to the actual fundamental frequency of your input sample. Apply time-stretching operations to the input sample, and comment on any differences you hear compared to the non-pitch-synchronous phase Vocoder.

(4) Modify the algorithm in #3 to remain pitch-synchronous even for pitch-transformation operations.

### Part Two

(5) Play with Paul Koonce's PVC package. Create a one-minute sound collage using at least seven (7) different audio samples from a variety of sources that are transformed in such a way that the entire sound collage produces a single pitch percept as much as possible. (As an example, consider transitioning from a train whistle to a cello to a baby cry.) Try to transition between adjacent sounds using techniques other than simple cross-fades (e.g., time-varying filters to common partials).