(DRAFT) Math 399 Final Programming Project - Spring 2018

Do at least One of Four Optional Parts

Please submit all project parts on the Moodle page for MAT399. You should include all necessary files to recompile, and a working executable, all in a zipped folder (one file for upload). Time-stamp determines the submit time, due by midnight on the due-date.

Projects will be presented during the final exam time in lieu of a written final exam.

Due: Thursday, April 26

- ### A. HRTF-VBAP with 7 binaural virtual speakers

  Use the HRTF impulse response, preferably shortest one, to create 7 filters. Each filter simply uses the impulse response samples as coefficients in an FIR filter. The number of coefficients can be reasonably reduced by ignoring most of the flat tail in the impulse response file. Run these 7 filters in real-time. A mono source should be run through one of these, or panned between two of them, depending on position. Position should be determined by a UI slider with 7 equally-spaced points representing the speakers. As the user moves the slider in real-time, the sound source should pan between the virtual speakers.

- ### B. HRTF randomized test app

  This app will be designed to use in our lab to test the impulse responses that students have produced to play back a short mono wav file in one of the 7 locations over headphones. The test should be randomized and the choice of which HRTF is being used for any particular playback should be blind to the user. The goal is to compare the effectiveness of the user's own HRTF to others.

- ### C. ITD-only azimuth panner

  This is similar to the first part in functionality and UI, except that instead of panning HRTF between the 7 locations, now we use the ITD formula of Woodward to play back a binaural signal. There is no HRTF involved, simply the time difference between each ear channel.

- ### D. ITD extraction from HRTF

  In this part, the HRTF impulse responses are used as input to a program which does ITD extraction with several different methods: i) threshold testing for onset of signal, ii) cross-correlation method, iii) Hilbert transform method. At least two of the three methods should be implemented. The output is a single value equal to the approximate ITD. Methods ii) and iii) typically also use up-sampling of the signals.