Hearing Virtual Reality, Building the Utilities

Yusuf Van Gieson, Adrian Ly, Steve Satterfield
Information Technology Lab, National Institute of Standards and Technology

Background

When it comes to virtual reality, NIST has a CAVE (Computer Assisted Virtual Environment) in place that runs the HEV (High End Visualization) software. The hev-playAudioFiles utility originally would play an audio file from a set of files, as implied by the name, but nothing else.
My partner and I were tasked with adding additional functions and performance changes to the program to provide more depth.

Added Functionality

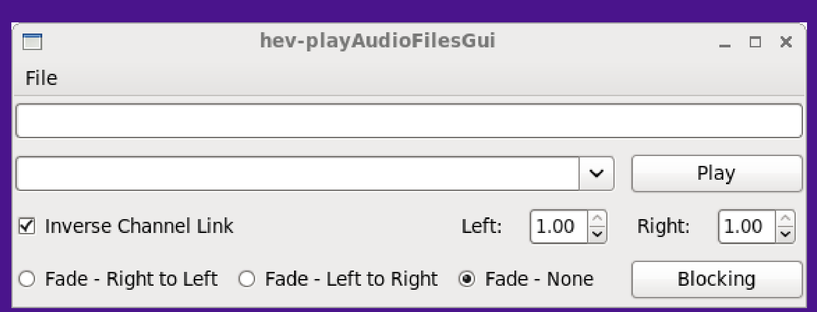
Blocking

In the improved version of the program, the user has the option to toggle between both blocking and non-blocking playback options. Blocking is the simply when regardless of input speed, the next file does not start playing until the current one has completed. However, with the use of multiple processes, the user also has the option to use non-blocking mode, in which the playback of multiple files can overlap and occur simultaneously.

GUI

When attempting to figure out which configuration of settings is the best, not all users are going to be comfortable or accustomed to the format of playing audio files from the command line, so the alternative of a GUI was created. The GUI provides an intuitive and visual way to keep track of what the current settings are or what files are loaded.

Though this is great for testing to find a proper configuration, what can the GUI do to help once it has been found? Easy, the GUI provides the ability to save the current settings to a separate config file which can then be loaded in the command line. This allows for the easy testing and saving of a configuration in a GUI, then the loading and implementation when running a demo or simulation in the command line.



Channels and Fading

Additionally, we added the ability to specifically control which channel the audio file is playing out to, right or left, An extension of channel control, the ability to fade from right to left and vice versa across one file was added.

In a virtual reality situation, spacial playback instead of static is a large part of properly immersing the user into the environment.

Additional Command Line Args

Originally, the only command line arguments passed in when calling the hev-playAudioFiles command were the names of the audio files, but now 3 additional options were added.

-b Blocking - toggle between the blocking and non-blocking modes

-c [filename] Config - load a config file for the settings, enables "-k" or keep mode

-k Keep - keep the previously entered settings when playing a file. ie. entering "0 0.7 0.3 +f" followed by "1" would play the second file as though the user entered "1 0.7 0.3 +f", default behavior is off

Previously, all input to the command line was in the format of a series of numbers, with each number representing one of the files passed as a command line argument, 0 being the first, 1 being the second, and so on. But now, there are 3 optional tags that can accompany each file

The first two are decimals ranging from 0 to 1, and represent the volume percentage of the left and right channels respectively. When only the left channel is given, the right channel is assumed to be the remaining percentage, ie.: 30% in the left would correspond to 70% in the right.

The third is a string of either “+f” for left to right fade or “-f” for right to left fade.

So instead of just entering “0” or “5” the user can now specify “0 0.4 0.7 +f” or “5 0.7”

Memory

One of the less noticeable or flashy improvements was the bettering of memory management, as every time a file was played, the program used to open and read the file. Now that only happens the first time a file is played, from there that information is stored and recalled from local memory so the file IO only has to occur once per file.

Acknowledgments

My partner Adrian Ly – handled many of the features mentioned in this poster, such as the channel control and memory improvements
My Mentor Steve Satterfield – for his support and guidance