Tools for Auditory Display Research

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TDT will demonstrate its Power sDAC Convolver and RP2 Real-Time Processor systems for generating real-time 3D auditory displays based on head-related transfer functions (HRTFs) and head-tracker data. These tools are designed to support research into the efficacy of auditory display techniques by giving the user complete control over signal generation, presentation, and dynamic updating of position-specific HRTFs. They allow display of multiple acoustic images and creation of reverberant models. TDT has also created a library of HRTF's measured from over 100 subjects in a custom anechoic chamber with a speaker mounted on a robot arm.

POWER sDAC
The PD1 Power sDAC combines a parallel DSP complex for real-time convolution with a multi-channel delay processor, high quality 16-bit analog input and output, an optical interface to a host PC, an interface to the Polhemus 3D tracker. The PD1 allows creation of full 3D auditory displays through dynamic loading of HRTF's to DSPs performing convolution.

RP2 REAL-TIME PROCESSOR
The RP2 builds on TDT's experience with the PD1 to provide a powerful 150 MIP Sharc DSP-based signal processing module. The RP2 is programmed through a drag-and-drop graphical programming environment (figure 1). The RP2 can simulate 3D sound through convolution as well as a number of other signal processing routines. The RP2 has onboard memory that can store an entire HRTF library that allows for rapid switching among azimuth and elevation specific HRTFs.

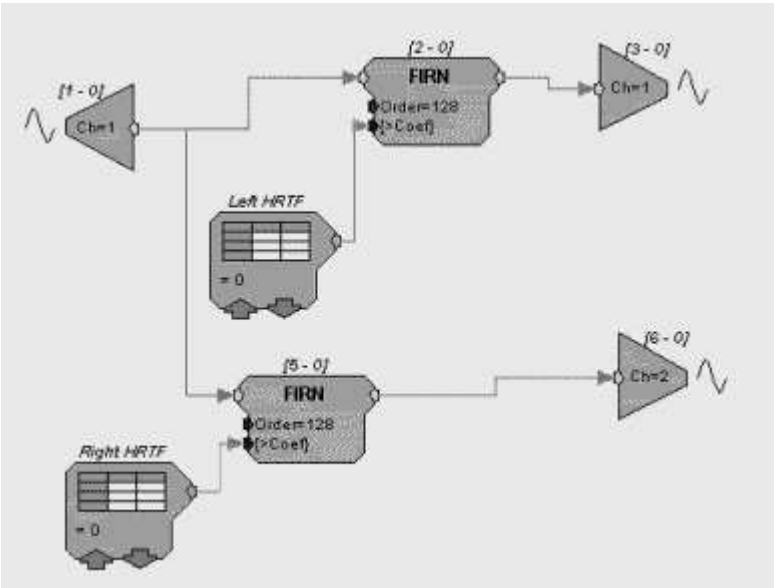

Figure 1. Example of a RP2 circuit that will spatialize a sound with 128 tap HRTF filters.

Keywords: Real-time filtering, HRTF, 3D auditory display