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Final Paper Topic

Digital Audio Effects and Its Place in Recorded Music

I will be working with Monica Rodriguez on this paper.

The topic of Digital Audio Effects is one that encompasses many subsections. In this paper, Monica and I, will be investigating the use of digital signal processing, its applications to sound, and its musical use designed to add effects on a sound. The main idea of this project is to present the main fields of digital audio effects. Specifically we will be talking about filters, delays, spatial effects, and time segment processing. This paper will be divided into two parts where my job will be to write about spatial effects and time segment processing. Spatial effects includes the topics:

- 1) Basic effects - precedence effect, distance and space rendering, doppler effect, and sound trajectories
- 2) 3D with Headphones – localization, interaural differences, externalizations, and head related transfer functions
- 3) 3D with Loudspeakers – localization with multiple speakers, 3D panning, ambisonics, and transaural stereo
- 4) Reverberation – acoustic and perceptual foundations, feedback delay networks, and convolution with room impulse response

Time segment processing includes the topics:

- 1) Time stretching – historical methods, synchronous overlap, and pitch synchronous overlap
- 2) Pitch shifting – pitch shifting through time stretching and resampling, pitch shifting with delay line modifications, and historical methods
- 3) Time shifting and granulation

These topics with the addition of filtering and delays, which will be provided by Monica, will give the reader a good overall sense of digital audio effects.

Filter: Is defined as a device (or software stimulation of one) that can reduce or increase energy at specific frequencies or ranges thereof from a signal presented to its input. It may also have a time delay or phase response that varies with frequency. A filter can be defined as: A linear transform that removes or boosts some components from its input, usually a range of frequencies, but doesn't add any new frequencies. In this sense, a filter is a linear transform. It can also be reversible if the filter doesn't reduce any input component to a zero output.

Delay: Delay based effects are among those most commonly used these days, especially when computers are in the mix, because they are more easily produced digitally than with analog techniques and, perhaps because of this, aren't "worn-out" yet. Delay based effects include but aren't limited to, flanging, chorusing, echo, stereo image manipulation, and reverb.

Sources:

Coulter, Doug. Digital Audio Processing. Kansas: CMP Media, 2000.

Fehr, Robert. Digital Audio. New York: First Printing, 1983.

Kahrs, Mark and Brandenburg, Karlheinz. Applications of Digital Signal Processing to Audio and Acoustics. Kluwer Academic Publishers: Boston, 1998.

Zolzer, Udo. DAFX: Digital Audio Effects. John Wiley and Sons LTD.: England, 2002.