MAS 432: Audio Production
Midterm Exam Review

Signal Processors

Four kinds of processors:
spectrum processors – affects frequency balance in a signal (equalization)
time processors – affect the time interval between a signal and its repetitions (reverb)
amplitude processors – affects a signal's dynamic range (compressor)
noise processors – reduces various types of noise. We don't really use them.

Some fall into more than one category. An equalizer affects spectrum, but it also changes the amplitude of specific frequencies. A de-esser is a compressor that alters amplitude and frequency.

Signal processors may be inboard (incorporated into the console), or they may be outboard stand-alone units, or they may be plug-ins, which are software emulations of processing units.

Spectrum processors are all some form of equalizer – a device that alters frequency response by increasing or decreasing the level of a signal at a specific portion of the spectrum.

Shelving increases or decreases amplitude by a fixed amount, gradually flattening out (shelving) at the maximum selected level when the chosen frequency is reached.

Fixed-frequency equalizers are so called because they operate at a fixed frequency selected at from two to four ranges. You know these as the bass, mid, and high controls on a stereo or amp. You don't have a lot of latitude. You can only turn up or down the already determined frequency ranges.

A **graphic** equalizer is a device that allows you a lot of flexibility to adjust many different frequency ranges. The positioning of the sliders gives you a graphic representation of the EQ you have created. But you can't change the bandwidth of each frequency.

The **parametric** equalizer allows you to change the bandwidth of selected frequency ranges from very broad to very narrow and then adjust them as you would with a graphic equalizer. You get to customize your bandwidths and create both shelves and filters.

Filters come in four varieties: high-pass, low-pass, band-pass, and notch. The first two do just what they sound like. A high-pass filter allows high frequencies through and cuts low frequencies. The low-pass does the opposite. A band-pass filter cuts both low and high frequencies and allows midrange frequencies to pass. A notch filter is generally

used for corrective purposes. They are usually very narrow, and are meant to get rid of an unusual hum or noise.

Time Processors are devices that affect the time relationships of signals. The two main types are reverb and delay.

Reverb is created by random, multiple, blended variations of the original sound source or signal. It's what adds depth, spatial dimension, and aural excitement to a sound. It has two main elements – initial reflections and the decay of those reflections. It's those initial reflections that determine the size of the space you are creating. We call a sound without reverb a dry sound, and a sound with reverb the wet sound. Usually, we mix the two together.

When using digital reverb, the predelay is an important component because it reflects the amount of time between the onset of the original sound and the appearance of the first reflections.

Convolution reverb is the effort on the part of audio engineers to create a reverb device or plugin that exactly recreates the acoustics of a specific place, like Carnegie Hall, or the National Cathedral, or Ryman Hall of the Grand Ol' Opry.

Plate reverb is an early electro-mechanical device to create reverb in the studio. You would know its characteristic sound from Surf music. All audio plugins include some form of emulated plate reverb, because it's a classic.

Delay is the time interval between a sound or signal and its repetition. It allows you to create chorus and echo effects.

Delay has a number of creative applications. Common effects are doubling, chorus, slap back echo, prereverb delay. Doubling is just that: It give an instrument or voice a fuller, fatter sound by doubling the track with a delay of about 15 to 35 ms between them. The chorus effect recirculates the doubling effect and makes one sound source sound like many. Two voices can be made to sound like a choir, hence the name chorus. A slap back echo is perceived as one distinct echo, kind of like the ping-ping sound of underwater sonar devices. It's great for bass guitar. Prereverb delay improves the overall quality of reverb units.

Flanging and Phasing are very similar. Without going into the details of a comb-filter effect, they make sounds swooshy and spacy and circular. Think of classic Jimi Hendrix guitar solos and lots of current ambient music.

Amplitude processors affect dynamic range. Typical examples are compression, limiting, and noise-gating.

A **compressor** is a processor whose output level increases at a slower rate as the input level increases. You should think of it in terms of ratios. They have four basic controls: ratio, threshold, attack time, and release time, each of which affect the others. The basic idea is to smooth out the variations in dynamic range of a signal. It will make the softer parts louder and the louder parts softer while still leaving the listener with the perception of soft and loud.

A limiter is a compressor whose output level stays at or below a certain preset limit regardless of how much you turn up the input level. In other words, it put a hard cap on how loud the track will be, allowing you to really pump up the softer parts. It's used primarily for drums, bass, and vocals.

A de-esser is a very fast-acting compressor that acts on high frequencies by attenuating them. Thus, it gets rid of a lot sibilance, or excessive essss sounds.

A noise gate acts the opposite of a compressor. Once you set a certain threshold, any sound that falls below the threshold, in terms of signal strength, is simply eliminated from the track. It is used primarily as a fix-it kind of tool to remove unwanted rumble or mic leakage from tracks.