Glossary

ADT Automatic double tracking: A time-based signal processor that simulates the effect of playing a part, then overdubbing a second part to give a thicker sound.

Aliasing Frequency components above half the sampling frequency of a sampled signal that are folded back into the audio spectrum (0−20 kHz).

AT constant Time needed for a signal to reach 63% (−4 dB) of its final amplitude. After three time constants it will have reached 95% (−0.4 dB) of its final amplitude.

Attack time AT Time for a signal to rise from 10% to 90% from its final amplitude.

Audio effect A modification of a sound by use of a signal-processing technique. It is sometimes called Audio-FX.

Auto pan To change a signal's spatial position in the stereo field via some modulation source.

Brassage French for time shuffling.

Chorus Detuning effect where the original signal is mixed with a pitch-modulated copy of the original signal. Pitch modulation is achieved by a random variation of the length of a delay line.

Click A slight sharp noise, usually due to a discontinuity of the signal or to some computation error. In some forms of musical production, such as techno or live sampling, the clicks become such an important musical relevance, that they are even emphasized.

Clipping Severe distortion of the signal because the amplitude is larger than the processing system can handle.

Comb filter Filter effect occurring if the original signal is mixed with a delayed version of the original signal. The effect produces notches in the frequency domain at regular frequency intervals.

Compressor A compressor is used for reducing the dynamics of an audio signal. Quiet parts or low levels of a signal are not modified, but high levels or loud parts are reduced according to a static curve.

Controller A device used to modify one or several parameters of an effect.

Convolution Mathematical algorithm which is based on an input signal and another short signal (for example, an impulse response) and leads to an output signal.

Cross-synthesis This effect takes two sound inputs and generates a third one which is a combination of the two input sounds. The general idea is to combine two sounds by spectrally shaping the first sound by the second one and preserving the pitch of the first sound.

Decay rate The time rate at which a signal decreases in amplitude. Usually expressed in decibel per second (dB/s).

Decay time Time for a signal to decrease from 90% to 10% from its initial amplitude.

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De-emphasis See **pre-emphasis**.

De-esser A de-esser is a signal processing device for processing speech and vocals and is used to suppress high-frequency sibilance.

Denoising To decrease the noise within a sound.

Dispersion Spreading a sound in time by a frequency-dependent time delay.

Distance rendering The distance of a sound source is largely controllable by insertion of artificial wall reflections or reverberant room responses.

Distortion A modification of the signal that is usually objectionable. When a signal is processed by a nonlinear system, some components appear that were not part of the original signal. They are called distortion products. Some musical instruments such as the electric guitar take advantage of distortions to enlarge and vary their timbre. This modifies the sound color by introducing nonlinear distortion products of the input signal. Related effects are Overdrive, Fuzz, Blender, Screamer.

Dithering Adding a low-level noise to the signal before quantization. It improves the signal quality by decorrelating the quantification error and the signal.

Doppler effect The Doppler effect raises the pitch of a sound source approaching the listener and lowers the pitch of a sound source departing the listener.

Dropout A temporary loss of audio information. This is a typical problem of magnetic-tape-based storage and processing systems.

Dry In general a "dry" sound is a sound that has not been processed by any means. It qualified originally sounds that were recorded in an anechoic room. In our application the phrase "dry signal" denotes the sound before processing. See also **wet**.

Dubbing Adding further material to an existing recording. Also known as overdubbing.

Ducking A system for controlling the level of one audio signal with another. For example, background music can be made to "duck" whenever there is a voiceover [Whi99].

Echo Several delayed versions of the original signal.

Equalizer Filter system to shape the overall sound spectrum. Certain frequency ranges can be either increased or cut. A parametric equalizer allows individual setting of boost or cut, center frequency, bandwidth and filter type.

Exciter Signal processor that emphasizes or de-emphasizes certain frequencies in order to change a signal's timbre.

Expander Expanders operate on low-level signals and increase the dynamics of these low-level signals.

Fade-in Gradually increasing the amplitude of a signal from silence.

Fade-out Gradually decreasing the amplitude of a signal to silence.

Feedback To send some of an effect's output signal back to the input. Also called regeneration.

Flanger Sound effect occurring if the original signal is mixed with a delayed copy (less than 15 msec) of the original signal. The delay time is continuously varied with a low-frequency sinusoid of 1 Hz.

Flatterzunge A sound effect which is produced by rolling the tongue, blowing air through the mouth and performing a rapid fluttering motion of the tongue.

Flutter Variations due to short-term speed variations at relatively rapid rates (above 6 Hz) [Met93]. See **wow**.

Foley Imitation of real sounds for cinema applications. See also **sound effect**.

Formant changing This effect produces a "Donald Duck" voice without any alteration of the fundamental frequency. It can be used for performing an alteration of a sound whenever there is a formant structure.

Freezing (1) Selecting a fragment of sound and playing it as a loop. The time seems to be frozen to the date when the fragment was sampled. (2) Memorizing the spectrum envelope of a sound at a given time in order to apply this envelope onto another sound [Hal95, pp. 59–60].

Frequency shifter A signal processor that translates all the frequency components of the signal by the same amount $f_i \rightarrow f_i + \Delta f$.

Frequency warping A alteration of the linearity of the frequency axis.

FX Shortcut for effects.

Gaussian noise A random noise whose instantaneous amplitudes occur according to the Gaussian distribution.

Glissando Linear transition from one pitch to another. This implies that the frequencies corresponding to the pitches vary according to a logarithmic law. See **portamento**.

Glitch An unwanted short-term corruption of a signal, or the unexplained, short-term malfunction of a piece of equipment. See **click**.

Granulation Extracting short segments from the input signal and rearranging them to synthesize complex new sounds.

Halaphon A four-channel sound projection system that was developed in 1971 by Hans Peter Haller and Peter Lawo. Four amplitude envelope oscillators with different waveforms driving four amplitude modulators allowed complex sound projection patterns at various speeds. An eight-channel version was used in 1973 for the production of "Explosante fixe" by Pierre Boulez and a ten-channel version for the production of "Prometeo" by Luigi Nono. The methods for spatialization proposed by John Chowning could also be implemented [Hal95, pp. 77–90].

Harmonizer A trademark of Eventide for a pitch shifter.

Impulse response The response of a system which is fed by an impulse signal.

Inharmonizer This effect is obtained by frequency warping an original harmonic sound. The resulting sound is enriched by inharmonic partials.

Jitter Degradation of a signal by sampling it at irregular sampling intervals. It can be interpreted as a modulation process where the audio signal equals the carrier and the jitter signal equals the modulation source.

Leslie This effect was initially produced by rotating micro-phones or rotating loudspeakers. It can be approximated by a combination of tremolo and doppler effect.

Leveler A dynamic processor that maintains (or "levels") the amount of one audio signal based upon the level of a second audio signal. Normally, the second signal is from an ambient noise sensing microphone. For example, a restaurant is a typical application where it is desired to maintain paging and background music a specified loudness above the ambient noise. The leveler monitors the background noise, dynamically increasing and decreasing the main audio signal as necessary to maintain a constant loudness differential between the two. Also called SPL controller [Boh00].

LFO Low frequency oscillator. See **modulation**.

Limiter Signal processor that lets the input signal pass through when its level is lower than a defined threshold and limits the output signal to a fixed level when the limiter threshold is exceeded.

Live sampling A musical style that relies on the replay of sounds or fragments of them that are sampled during the performance from other performers or sound sources.

Masking Phenomenon whereby one sound obscures another, usually one weaker and higher in frequency [Alt90].

Modulation Process of altering a parameter, usually through some automatic or programmed means such as an LFO. See **vibrato** and **tremolo**.

Morphing (1) Imposing a feature of one sound onto another. (2) A transition from one sound to another. (3) Generation of an intermediate sound between two others. (4) Generation of one sound out of the characteristics of another sounds. (5) Transforming one sound's spectrum into that of another. See **spectral mutation**.

Morphophone A tape-based multi-delay system with a bandpass filter on the input signal as well as on each of the 10 playback heads. The mixed output can be fed back to the input. This device was designed by J. Poullin [Pou60] and A. Moles [Mol60, p. 73].

Multi-effect A signal processor containing several different effects in a single package.

Mute Cuts off a sound or reduce its level considerably.

Noise gate Signal processor that lets the input signal pass through when its level is higher than a defined threshold.

Normalize To amplify the sound so much that its maximum reaches the maximum level before clipping. This operation optimizes the use of the available dynamic range of the audio format and reduces the risk of corruption of the signal by low-level perturbations that could happen during a further processing or the transmission of the sound.

Octavider Producing a signal one octave below the input signal.

Off-line A process is said to be off-line when it is applied on a recorded signal instead of on a real-time signal. Some processes are inherently off-line such as time contraction. Others are too computationally intensive to be performed in real-time.

Overdubbing See **dubbing**.

Overload To exceed the operating capacity of a representation, transmission or processing system.

Panorama Composing a panorama of acoustic events in the space spanned by loudspeakers.

Patch Another word for program, left over from the days of analog synthesizers. Also, the process of interconnecting various devices.

Peak filter Tunable filter which boosts or cuts certain frequency bands with a bell-like frequency response.

Phasing Effect where phase shifts of a copy of the original signal and mixing with the original signal cause phase cancellations and enhancements that sweep up and down the frequency axis.

Phonogène A special tape recorder playing a loop at various speeds. It "has a circular arrangement of 12 capstan to change the tape speed within the 12 steps of the tempered scale". The pinch roller facing each capstan is activated by a piano-like keyboard. This device was designed by P. Schaeffer. A further development of this device is called the "Phonogène universel". It allows continuous transposition and/or time contraction and expansion. It relies on the rotating drum carrying four heads that was proposed by Springer [Mol60, p. 73], [Sch73, p. 47], [Pou60, Bod84].

Pink noise Noise which has a continuous frequency spectrum and where each frequency band of constant relative bandwidth $\Delta f/f$ contains the same power, e.g., each octave has the same power.

Pitch Subjective perception of frequency.

Pitch scaling See **pitch shifting**.

Pitch shifting Modification of the pitch of a signal. All the frequency components of the signal are multiplied by the same ratio. $f_i \rightarrow r \cdot f_i$. Asynchronous pitch shifting is achieved by varying the output sampling rate [Mas98] (see Section 6.2).

Pitch transposer A signal processor that duplicates the input at a defined pitch interval.

Portamento A gliding effect where the pitch of a sound is changed gradually rather than abruptly when a pitch modification is required.

Post-echo See **print through**.

Precedence effect In a stereo loudspeaker set-up, if we step to one side of the central position and listen to a monophonic music program, we locate the apparent sound source in the same position as our closest loudspeaker, and the apparent position does not move, even if the other channel is significantly louder.

Pre-echo See **print through**.

Pre-emphasis A system to boost high frequencies of a sound before processing it. A de-emphasis should be performed before playing the sound back after processing. This procedure attenuates high-frequency noise contributed by the processing or transmission system.

Print through The undesirable process that causes some magnetic information from a recorded analog tape to become imprinted onto an adjacent layer. This can produce low-level pre- or post-echoes.

Quantize Coding the amplitude of a signal with a given number of bits. Reducing the number of bits used to represent a signal usually degrades the quality of the signal. This effect can be attenuated by the use of dithering. Quantizing and dithering occur usually at the AD and DA stages of an audio processing system.

Random noise A noise whose amplitude cannot be predicted precisely at any given time.

Ratio Quotient of two quantities having the same unit. The transposition ratio is the quotient of the output frequencies to the input frequencies when they are expressed in Hz. The compression or expansion ratio is the quotient of the output amplitudes to the input amplitude when they are expressed in dB.

Real-time A process is said to be real-time when it processes sound in the moment when it appears. A real-time system is fast enough to perform all the necessary computations to process one sample of sound within a sampling period.

Recirculate See **feedback**.

Regeneration See **feedback**.

Release time RT Time for a signal to decrease from 90% to 10% of its final amplitude.

Resonator Narrow bandwidth filter that amplifies frequencies around a center frequency.

Reverberation Natural phenomenon occurring when sound waves propagate in an enclosed space.

Rise time Time for a signal to rise from 10% to 90% of its final amplitude.

Robotization Applying a fixed pitch onto a sound.

RT constant Time needed for a signal to reach 37% (−9 dB) of its initial amplitude. After five time constants it will have reached 1% (−43 dB) of its initial amplitude.

Sampler A digital system for recording and playing back short musical sounds in real-time. It is controlled by a MIDI keyboard or controller.

Scaling As applied to continuous controllers, this determines how far a parameter will vary from the programmed setting in response to a given amount of controller change.

Shelving filter Tunable filter which boosts or cuts the lower/higher end of the audio spectrum.

Shuffling Out of a sequence of time or frequency elements of sound, producing a new sound with a new random order. The time shuffling is called *brassage* in french.

Sibilance High-frequency whistling or lisping sound that affects vocal recordings, due either to poor mic technique, excessive equalization or exaggerated vocal characteristics [Whi99].

Side chain In a signal-processing circuit, such as one employing a VCA, a secondary signal path in parallel with the main signal path in which the condition or parameter of an audio signal that will cause a processor to begin working is sensed or detected. Typical applications use the side-chain information to control the gain of a VCA. The circuit may detect level or frequency or both. Devices utilizing side chains for control generally fall into the classification of dynamic controllers [Boh00].

Side-chain input The side-chain input is necessary for the "ducking" effect, used by disc jockeys to automatically compress the music when they are talking [Whi99].

Side-chain insert This insert can be used to insert an additional equalizer into the side chain, to turn a standard compressor into a de-esser, for example [Whi99].

Slapback Echo effect where only one replica of the original signal is produced.

Sound effect A sound that comes as an audible illustration in an audio-visual or multi-media production.

Speaker emulator A signal processor designed to imitate the effect of running a signal through a guitar amplifier cabinet.

Spectral mutation Timbral interpolation between two sounds, the source sound and the target sound, in order to produce a third sound, the mutant. Operates on the phase and magnitude data pair of each frequency band of the source and target spectra [PE96].

Spectrum inverter An amplitude modulator where the modulating frequency is equal to $f_s/2$. By usual audio sampling frequencies, this effect is usually unpleasant because most of the energy of the signal is located close to the higher limit of the frequency range.

Sweetening Enhancing the sound of a recording with equalization and various other signal-processing techniques, usually during editing and mixing of a production.

Time-constant A time required by a quantity that varies exponentially with time, but less any constant component, to change by the factor $1/e = 0.3679$. The quantity has reached 99% of its final value after five time-constants.

Time warping An alteration of the linearity of the time axis.

Transposition See **pitch shifting**.

Tremolo A slow periodic amplitude variation, at a typical rate of 0.5 to 20 Hz.

Undersampling Sampling a signal at a frequency lower than twice the signal bandwidth. It produces aliasing.

Varispeed Playing back a signal with time-varying speed.

VCA Voltage controlled amplifier.

Vibrato A cyclical pitch variation at a frequency of a few hertz, typically 3 to 8 Hz.

Vocal gender change Changing the gender of a given vocal sound.

Vocoding See **cross-synthesis**.

Wah-wah A foot-controlled signal processor containing a bandpass filter with variable center frequency. Moving the pedal back and forth changes the center frequency of the bandpass.

Wet In practice the sound processed by an audio effect is often mixed with the initial sound. In this case, the processed sound is called the "wet signal" whereas the initial signal is called the "dry signal." The term "wet" was initially used to qualify sounds affected by a lot of reverberation, whether contributed by a room or by an audio processor.

Whisperization Applying a whisper effect onto a sound.

White noise A sound whose power spectral density is essentially independent of frequency (white noise need not be random noise).

Wow Instantaneous variation of speed at moderately slow rates. See **flutter**.

Zigzag During a zigzag process, a sound is played at the nominal speed but alternatively forwards and backwards. The reversal points are set by the performer [Wis94, Mir98].

Zipper noise Audible steps that occur when a parameter is being varied in a digital audio effect [Whi99].

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