Review of Terminology

Time signal or waveform
The description of a sound in the time domain as fluctuations in some physical property like pressure over time. Often, because the pressure fluctuations have been transduced by a microphone or other measurement instrument, we have converted pressure fluctuations to voltage fluctuations over time.

Fourier transform or spectrum
The description of a sound in the frequency-domain as the amplitude or extent of fluctuation occurring at different frequencies.

Line Spectrum
The kind of spectrum that is found for sounds that are purely periodic, that is, for sounds that repeat the same pattern infinitely. Each line in a line spectrum is a harmonic of the fundamental period of the waveform and represents a sinusoid at a particular frequency and amplitude. Line spectra are the ideal case of harmonic spectra.

Harmonic Spectrum
Similar to a line spectrum except that sounds giving rise to harmonic spectra are not *purely* periodic, but only approximately so. Such sounds produce an harmonic spectrum in which the lines have some discernible width. As sounds deviate increasingly from true periodicity, their spectra deviate increasingly from line spectra to approach a continuous spectrum. For example, any sound that has finite duration is not strictly periodic. Many natural sounds, like the human voice, are quasi-periodic in that the sound deviates in a variety of ways from one period to the next.

Continuous Spectrum
A spectrum exhibiting non-zero amplitude for one or more broad regions of the continuous frequency spectrum. This is the kind of spectrum that is found for aperiodic sounds, that is, sounds that do not repeat any pattern at all. The ``ideal'' aperiodic sound is an impulse, that is, a sound consisting of a single instantaneous pressure spike. The impulse is a sound which has equal amplitude at all frequencies.

Period or T0
The duration of a single complete cycle of a periodic waveform. We sometimes notate the period of a signal as *T0*.

Fundamental Frequency or F0
The fundamental frequency is 1.0/T0, that is, the inverse of the period. Normally, we express F0 in units of cycles per second or Hz. This can be slightly confusing since we often express T0 in units of msec. You must remember to multiply T0 by 1000.0 if it is expressed in msec to arrive at F0 expressed in Hz. For complex sounds, F0 will normally be the frequency of the first, or lowest frequency harmonic.

Harmonic
A line (or near-line) in the spectrum of a periodic (or near-periodic) signal that can occur at any integer multiple of the fundamental frequency. In a harmonic spectrum, the harmonics are spaced F0-Hz apart.

Pitch
The perceptual correlate of frequency. Normally, the pitch of a complex sound is a function of its F0. Equal steps in pitch are roughly equal to logarithmic steps in frequency.

Loudness
The perceptual correlate of amplitude. Equal steps in loudness are roughly equal to logarithmic steps in amplitude.

Decibel (dB)
A logarithmic scale of amplitude which is roughly associated with our perception of loudness. Zero Decibels is near the threshold for hearing and each Decibel increment in amplitude is roughly one Just Noticeable Difference in loudness. The formula for computing decibels is:
Decibels = 20.0 * log(Amplitude/Reference)
where Reference is generally something like the smallest perceptible amplitude fluctuation.

Hertz (Hz)
Frequency expressed in cycles per second.

Mel Scale
A logarithmic scale of frequency based on human pitch perception. Equal intervals in Mel units correspond to equal pitch intervals.

Bark Scale

A logarithmic scale of frequency based on human frequency resolution. Sounds which are separated by more than about one Bark unit are generally resolvable as separate sounds and do not interact with each other at a sensory level.

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