Level Detector

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Definition

The Level Detector is a small code placed before any effect that aims to compute the input audio level. The level can then be used by any effect with LFFG (Low Frequency and Function Generator) configured with LFO_LEVEL or LFO_REVERSE_LEVEL to modulate a specific parameter, like the Wah Wah or Tremolo, for instance. The effects that can be affected by Level Detector are

- Chorus (*chr*)
- Phaser (*phr*)
- Tremolo (*tml*)
- Vibrato (*vbt*)
- Volume (*vol*)
- Wahwah (*wah*)

Level Detector

The adopted algorithm for the Level Detector is exactly the same of the Compressor[1,2] effect, except that it does not compress the input audio. The model for the Level Detector was extracted from Compressor documentation and is reproduced here.

Given the input at sampled time n, $x_L[n]$, the best approach to compute the input level $y_L[n]$ is achieved with the decoupled smooth peak detector[3] which responds quickly when the input level rises, but decreases slowly when the input level fades:

$$y_1[n] = \max\left(x_L[n], \alpha_R\, y_1[n-1] + (1-\alpha_R)\, x_L[n]\right)$$

So the smoothed output level becomes

$$y_L[n] = \alpha_A\, y_L[n-1] + (1-\alpha_A)\, y_1[n]$$

where α_A and α_R are the low-pass filter attack and release parameters, respectively, obtained from

$$\alpha_A = \mathrm{e}^{-\frac{1}{\tau_A f_s}}$$

and

$$\alpha_R = \mathrm{e}^{-\frac{1}{\tau_R f_s}}$$

in which τ_A is the attack time and τ_R is the release time.

References

[1] Wikipedia. Dynamic Range Compression. Available at: <https://en.wikipedia.org/wiki/Dynamic_range_compression>, 2023.

[2] McNally, G. W. Dinamic Range Control of Digital Audio Signals. Journal of the Audio Engineering Society, Vol. 32, No. 5, May 1984.

[3] Giannoulis, D.; Massberg, M.; Reiss, J. Digital Dynamic Range Compressor Design – A Tutorial and Analysis. Journal Audio Engineering Society, Vol. 60, No. 6, June 2012.